



Volume 1, Spring 2011

Journal Editor

Dr. James E. Witte

Auburn University

witteje@auburn.edu

<http://www.learningstyles.org/>

Volume 1, Spring 2011
Table of Contents

The Ideal Classroom: A Comparative Study of Education and Nursing Student Learning and Psychosocial Environmental Preferences Ginette D. Roberge, Lissa L. Gagnon, & Bruce E. Oddson Laurentian University	1
Students' Learning Styles Compared with their Teachers' Learning Styles in Secondary Schools Lena Boström, Mid Sweden University Sweden.....	17

The Ideal Classroom: A Comparative Study of Education and Nursing Student Learning and Psychosocial Environmental Preferences

Genette D. Roberge, Lissa L. Gagnon, & Bruce E. Oddson
Laurentian University

Abstract

This study compared the self-reported learning styles and psychosocial environmental preferences of students in two different programs in order to assess which classroom conditions best allow for optimal learning outcomes. A sample of 101 students from education and nursing programs each reported their preferences using the visual, aural, read/write, kinesthetic (VARK) learning style inventory, and a modified version of the What is Happening in this Class? (WIHIC) classroom environment survey. A wide variety of preferred learning styles were revealed; participants also identified many dimensions of the classroom psychosocial environment as relevant. The authors discuss implications for effective higher education practices.

Introduction

Students enter the postsecondary classroom with a wide range of experiences, characteristics, and socio-cultural backgrounds. Research has shown that when educators understand and respond to student diversity, they can enhance the classroom experience (Hassanien, 2007). Effectively recognizing the knowledge and experiences that students bring to the classroom environment is one of the many challenges faced by educators. As such, differentiated instructional practices have been widely studied and applied in elementary and secondary school settings (Brown, 2004; Gardner, 1993; Chapman & King, 2005; King-Shaver & Hunter, 2003; Tomlinson, 1999).

Researchers such as Gardner (1993) and Tomlinson (1999) have focused their efforts on identifying individual student characteristics and on developing pedagogical approaches for the purpose of addressing individual learning needs. The depth of research based in early education is not matched by considerations of postsecondary education. Strengthening student learning in higher education is important in order to prepare learners for the complex demands of their future professions, thus helping them better serve the population. In higher education settings, there is an underlying expectation for students to be autonomous and responsible for their own learning. Students sometimes leave their university studies as a result of being unprepared for the demands of academic life beyond high school (Kuh, 2008). In light of this fact, it is evident that college and university educators should seek information from their

students in terms of their interests, their needs, and their dominant learning styles in order to deliver a quality education.

Although numerous researchers have uncovered psychosocial environmental trends specific to student learning preferences (Astin, Closs & Hughes, 2006; den Brok, Fishers, Rickards, & Bull, 2006; Noble et al., 2008), there has been little focus on the diversity of student preferences. Research of this nature is important because it could highlight commonalities and differences in postsecondary student learning that are independent of their current program of study. Sharing this knowledge exposes educators to a wider range of pedagogical practices to enhance psychosocial environments and improve student outcomes in higher education.

The following research questions were addressed: (1) What similarities and differences exist in pre-service education and nursing students' learning styles? (2) Which classroom conditions do these students perceive to be ideal in their psychosocial educational environment? Student learning styles and psychosocial environment preferences will be examined through their responses to the visual, aural, read/write, kinesthetic (VARK) inventory and the What is Happening in this Class? (WIHIC) surveys. These findings could help educators create a learning environment that maximizes student diversity. In essence, results obtained from this study may provide a deeper understanding of learners' postsecondary experiences, which could in turn guide educators in the development of pedagogical practices that are conducive to meeting their students' diverse educational needs.

Challenges Faced by Students and Educators

For the most part, students are responsible for their academic learning. Some students are more aware of their learning abilities and value an opportunity to articulate the ways they best learn (Bradshaw, 2007; Melrose, 2004). Increased awareness about preferred learning needs can enable faculty to develop strategies to enhance student performance. In light of this awareness, educators can address issues that impact cognitive processes. In particular, once educators are familiar with course objectives, difficulties sometimes remain in the "how to" deliver effective material in class.

Educators are also challenged to recognize the psychosocial and cultural diversity among students to better create equitable postsecondary experiences (den Brok et al., 2006; Fraser, 1998; Melrose, 2004). Faculty is responsible for tailoring the classroom environment to optimize student outcomes by tailoring the classroom. Therefore, considering the congruence between faculty's style and learner's preferences

is a key element in effective teaching (Bradshaw, 2007). Educational experiences emerging from identified preferred learning styles should be developed and utilized in classrooms.

Learning Styles Inventories: An Assessment to Guide Content Delivery

Every individual has distinct personal qualities that characterize his or her identity. These individual differences are manifested through diverse prevailing preferences about how to receive and communicate information. Also known as learning styles, the exploration of cognitive structures used in knowledge acquisition can guide educators in adapting pedagogical practices that adhere to the needs of their students. Many researchers continue to focus on the importance of determining student learning styles to adapt instruction, even in postsecondary education (Amerson, 2006; Carrier, 2009; Fountain & Alfred, 2009; Howles & Jeong, 2009). Howles and Jeong (2009) stipulate that it is of primary importance to discover the ways in which students learn best. Similarly, Amerson (2006) notes that student mastery is enhanced when the learning needs of students are met.

A variety of instruments have been developed for assessing the learning style of students. In higher education, learning style inventories are sometimes used at the outset of a program. These inventories could serve as a diagnostic assessment to shape course learning activities or as a metacognitive tool to help students in determining their own learning strengths and areas of growth. The VARK inventory, which was selected for the current study, was developed by Fleming and Mills (1992). In conjunction with a classroom environment assessment, the VARK contributes to generating student learning profiles.

Molding the Psychosocial Learning Environment

The classroom environment involves an interaction of aspects of learners' psychological and social behaviors. Research in recent years has confirmed that the value of the classroom culture has a considerable influence on the quality of student learning experiences (den Brok et al., 2006; Fraser, 1998). Den Brok and colleagues (2006) maintain that student perceptions of an ideal classroom significantly affect their performance outcomes. The fact that the psychosocial environment plays a key role in valuable knowledge representation underlines the fact that a learning style inventory in isolation is insufficient to assess learner needs; rather, educators should also examine the psychosocial environment.

In the current study, the WIHIC (Aldridge & Fraser, 2000) inventory was utilized. The instrument was chosen for numerous reasons. First, the survey focuses on learning environment dimensions between educators and students. Second, the WIHIC

has cross cultural validity (Sadaquat, Rohindra & Coll, 2008). Third, the instrument reflects cognitive and emotional student outcomes. As a final point, the WIHIC requires little time to complete and questions are clear and concise. The WIHIC has been validated through a number of research studies (Dorman, 1999; Dorman, 2008; Sadaquat et al., 2008; Zandvliet & Straker, 2001).

Research Design

The present study consisted of an empirical investigation of the dominant undergraduate student learning styles in education and nursing as well as of their relation to the participants' perceptions of the constitution of an ideal educational environment. Two quantitative questionnaires, which are described in detail below, were utilized to examine student learning preferences. The main objective was to verify how educators can create an ideal postsecondary learning environment using the dominant learning styles and the classroom environment preferences of their students as a basis.

Participants

Participants included education and nursing students who had a minimum of two years of university education experience. The authors of the current study assumed that while having been exposed to university education for a significant interval of time would have no bearing on an individual's dominant learning style, participants would nonetheless have had the opportunity to develop a founded opinion on their learning environment preferences if they had been at university for a minimum of two years. Nine students did not complete both questionnaires. Of the remaining 101 participants, 80 were education students and 21 were nursing students. Participants were predominantly female in both disciplines, a fact reflected in student enrolment demographics for the academic term during which the current study was conducted. Although a more diverse group of participants may have yielded more comprehensive results, limited male enrolment in both education and nursing programs made this unfeasible.

Ethical Considerations

Ethical approval to conduct the study was obtained from the Research and Ethics Board of the institution. All participants were informed of the purpose of the study and given the opportunity to ask questions regarding their rights and contribution. Student acceptance or refusal to participate had no repercussions on their grades or on their academic standing. Willing participants then provided written consent and completed

the questionnaires. Anonymity was ensured by assigning arbitrary codes to participants' data and not recording names or other identifying information. Confidentiality was also maintained by storing informed consent forms separate from the questionnaires. All materials were kept in a secure location.

Data Collection and Analysis

To recruit participants, the Placement Coordinators in both the education and nursing programs were asked to introduce the study during a classroom session. These individuals had no direct responsibility for the summative evaluation of students. Participants were asked to voluntarily complete two questionnaires on site, which required approximately 20 minutes of their time. French and English versions of the two questionnaires were made available. Unidentified questionnaires and consent forms were then submitted in sealed envelopes and placed in two different boxes located in the classroom. Systat 13 was utilized to manage and analyze all data.

Instrumentation: Visual, Aural, Read/Write, Kinesthetic

The first questionnaire administered was the VARK, developed by Fleming and Mills (1992). Permission to use the instrument was obtained directly from the primary author. The purpose of the VARK is to measure participants' endorsement of their dominant learning style. The questionnaire contains 16 multiple-choice questions, and has an expectation of multimodality, which allows for the selection of more than one response. Questions captured hypothetical scenarios of everyday activities, where participants selected how they would process information in that particular situation. The reliability and validity of the VARK has been widely reported in the literature (Kalkan, 2008; Rogers, 2009). Table 1 outlines topics reflecting daily activities found in the VARK questionnaire.

The VARK questionnaire measured participants' endorsement of their preferred learning practices. Results indicated student reactions to situations encountered in daily life, namely the degree to which they supported visual, aural, reading/writing, and/or kinesthetic learning styles. Participants received a score for each modality by summing the number of items they endorsed based on their responses. Their dominant learning style was determined to be the one with the highest total, and was subsequently coded accordingly. Where a difference of 1 point between learning style scores was reported, the participant was then determined to have the two highest scoring modalities as his or her dominant learning style.

Table 1

Topics in VARK Questionnaire

Everyday Activities	Examples
Communication	Seeks preferred way to provide directions to an airport, receive feedback on a test, prepare a speech for a conference
Food	Seeks preferred ways to choose an item from a restaurant menu, choose a recipe to serve to company
Group Dynamics	Seeks preferred ways to teach a group of tourists
Purchases	Seeks preferred ways to purchase digital equipment, a non-fictional book
Medical Care	Seeks preferred ways to receive medical attention
Learning	Seeks preferred ways in learning a new skill, game, word
Internet	Seeks preferred website designs and functions
Authors' Compilation	

The psychosocial learning environment was assessed using an adapted version of the WIHIC instrument developed by Fraser and McRobbie (1995). Authors of the WIHIC have given permission to adapt the instrument for the current study. The WIHIC uses a 56-item set of Likert scales. These include seven categories, namely: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Investigation, Cooperation, and Equity. Participants were asked to rate their preferred frequency of occurrence of practices that transpire in the classroom on a scale of 1 to 5. While the original version of the WIHIC calls for participants to compare their current classroom environment to their ideal classroom environment, this comparative element was removed for the purposes of this study. Consequently, responses reflected perceptions of an ideal classroom exclusively, rather than a judgment on the quality of students' current learning environment. The WIHIC was standardized amongst high-school students and found to be highly reliable and valid cross-culturally (Dorman, 2003). Table 2 provides a textual description of categories found on the WIHIC questionnaire.

Table 2

Conceptualization of the WIHIC Categories

Category	Description
Student Cohesiveness	Refers to interpersonal relationships within the classroom
Teacher Support	Refers to the instructor's interest in student success
Involvement	Refers to opportunities to share ideas with the classroom community
Task Orientation	Refers to the student's role and responsibilities in terms of the course and of the coursework
Investigation	Refers to the opportunity to practically apply what has been learned in the classroom
Cooperation	Refers to group work and cooperative learning in the classroom
Equity	Refers to the equitable treatment of students from the course instructor
Authors' Compilation	

Results

The findings of the current study reflect the reported perspectives of education and nursing students. To assess student dominant learning styles, researchers administered the VARK questionnaire to measure the degree to which participants endorsed visual, aural, read/write and kinesthetic learning modalities. The WIHIC was used to identify patterns of preference in an "ideal" classroom. The authors of the current study present these results separately.

The VARK questionnaire was scored by calculating the total number of items endorsed from each modality. The dominant learning style of each participant was identified as the modality with the highest total endorsement. In the event that highest scoring modalities had the same total or a difference of 1 point, participants were placed in a multimodal category. Table 3 (below) represents the prevailing modalities of these participants.

Table 3

Endorsement of VARK Categories by Participants

Modality	Number of participants endorsing category
Visual	16
Audio	19
Read/Write	15
Kinesthetic	10
Multimodal	41

The multimodal category was far and away the most frequently observed at forty-one percent of the total. There was no significant difference in the distribution of scores across the two classes, $X^2 = 9.03$, $df = 4$, $p = .06$. The near critical value is essentially an artifact of taking the nursing class ($n=21$) across too large a number of categories. In order to examine the ideal classroom from students' perspectives, it was important to study psychosocial influences that exist within the learning environment. As such, the WIHIC questionnaire was utilized in light of the fact that it examines the interactions of various psychosocial variables between students and faculty. Table 4 (below) presents categories from highest average scores to lowest.

Table 4

Ranking of WIHIC Average Scores

Dimension	Mean endorsement of subscale questions
Task Orientation	4.32
Cooperation	4.12
Cohesiveness	4.06
Equity	4.03
Support	3.61
Investigation	3.35
Involvement	3.34

Using Wilk's lambda, it was found that the distribution of scores differed across the two classes, $F = 5.13$, $df = 7,93$, $p < .001$. However, this difference is almost completely explained by education students systematically giving higher endorsements to all categories. When this mean difference between classes is removed, there is no difference in pattern of endorsement across categories, $F < 1$. Although the table highlights the fact that Task Orientation receives the highest average ranking, participant scores were distributed so that each of all seven categories were endorsed as the most important by at least some participants. Participants rated categories quite similarly such that sixty-seven percent of participants differed by less than two points from their highest endorsement to their lowest.

Discussion

All information in the current study was gathered during the first semester of the academic term. The results are discussed with reference to recent and past literature about preferred learning styles and ideal psychosocial classroom environments and responses in higher education. Implications for postsecondary education and research are also addressed in terms of learning-teaching processes and the creation of an ideal learning environment.

Implications: Learning Styles Research

Results from the VARK questionnaire revealed a diversity of preferred styles in both the nursing and education programs. That the differences between these programs were marginal suggests that learning preferences are independent of the program of study. Such findings were similar to those of past research highlighting various learning style preferences. Astin et al. (2006) investigated Clinical Nurse Specialists' learning styles and found that the majority displayed a preference for more than one way of learning. Numerous authors who have administered similar learning style inventories in higher education have also discovered that groups do not report homogenous dominant modalities (Hawk & Shaw, 2007; Henson & Hwang, 2002; Riding & Rayner, 1998).

Another interesting finding was that, while the visual (15%) and auditory (18%) categories were the single categories most often endorsed, there was still student representation of every learning style. It is important to reflect that the multimodal category does not always reflect a combination including the visual or auditory categories. If one considers people to have a revealed preference for visual and auditory learning styles only if they endorse at least one of the categories by two points more than either the read/write or kinesthetic categories, a full sixty-five percent (65%) of students have shown no real preference for traditional visual and auditory presentations.

Generalized across disciplines, this finding would suggest that all learning styles should be represented in classrooms. All classrooms should be expected to hold a diverse student population and there is no single type of presentation that could correspond to the number of learning styles that should be expected to be present. The implication for educators is that teaching and learning activities should address all four VARK categories. Researchers have elaborated numerous strategies that support learning styles. For example, Bradshaw (2007) contends that in-class teaching strategies that allow students to attend and listen to lectures, use tape recorders, and discuss visual aids with other students best support aural learning preferences. He also discusses how students who prefer read/write as a learning style benefit from utilizing handouts and textbooks, and writing lists and definitions in class. Therefore, increasing awareness of different pedagogical techniques that address diverse learning style can help educators understand common ways that students generally process and retain information. Integrating kinesthetic approaches to material should further improve the quality of many students' academic experiences.

Implications: Psychosocial Environmental Preferences in Higher Education

In this study, education students ranked all categories of the WIHIC questionnaire higher than those of the nursing students. This was an unanticipated finding; it may be that education students closely assess the classroom environment since it will represent their future workplace. In contrast, nursing students' workplace is more likely to be outside the classroom, which may cause them to place less importance on the structure of its psychosocial construct.

Apart from the overall enthusiasm of the education students, the pattern of revealed preferences followed the same pattern. On average, participants in both groups selected Task Orientation within the classroom as a priority. This finding could suggest that students feel more comfortable in a setting where they are aware of the requirements for successful course completion, and that they feel confident in their abilities to meet these requirements. The fact that students in both disciplines dominantly endorsed Task Orientation could also suggest that they are responding to something that they perceive are lacking in their environment. Subsequent research would be warranted in order to determine whether this trend is due to a preference for Task Orientation over other delivery methods. Further research could also potentially clarify the reason that students in this study appeared to be preoccupied with academic results and whether this trend is evident in disciplines other than education and nursing. It is reasonable to infer, however, that success or failure in a course could be a

priority because of the financial implications of starting over following an unsuccessful attempt at a course, not to mention the time invested as well as the sense of personal accomplishment and increase in self-esteem that follows successful endeavors (Henderson, 2002).

The comparatively lower endorsements given to Investigation and Involvement also provoke two possibilities for future research. First, these may have been relatively less pertinent to the participants because of the hands-on nature of the professional training they were receiving. Although participants were asked to imagine their ideal classrooms, they may be reacting to their present circumstances. Second, it may be that Investigation and Involvement are so poorly represented in their current university experience that these categories simply do not form part of the image of an imagined classroom. Additional data will be needed.

The Task Orientation category was the most highly endorsed on average. However, there were participants advocating each of the elements of the psychosocial environment. There was also a limited range of scores such that many participants advocated more than one category, and the differences between their highest endorsement and the scores given other elements were quite small. Sixty seven percent had a range of scores less than 2. Similar to the finding that all of the VARK learning styles were represented, this finding suggests that the creation of a positive environment for a diverse population will involve all of the psychosocial components tapped by the WIHIC questionnaire. In previous research there is evidence that undergraduate learners value interactive activity with course content and one another (Davis, 1993; Hassanien, 2007; Ramsden, 1992). On the basis of the WIHIC results we would expect that there is no single environment that is ideal for the entire population – class and program design needs to address this variety.

Implications: Postsecondary Education

The findings from this study also raise questions about the extent of the responsibility of faculty in facilitating student learning. Instructors in a college or university setting practice academic freedom, which makes the use of specific educational practices for faculty optional. In addition, restricting academic freedom could compromise the integrity of research, which could also potentially stifle the creativity of instructors and affect the quality of course content. This issue is further complicated by the fact that research interests and methodologies are varied and result in content and delivery methods that are potentially wide-ranging in accordance to the research focus or nature of the professional experiences of the course facilitator. The classroom environment is, however, a pivotal influence of student educational experiences (Fraser, 1998). In a university setting, this educational experience is often followed by entry into the workforce. In light of the fact that recognizing student

strengths and abilities has proven to enhance student performance (den Brok et al, 2006; Hawk & Shaw, 2007), it is evident that maximizing postsecondary learning experiences of students has notable societal implications. The dilemma remains in the fact that the individual and whole-group classroom dynamics differ from year to year.

One approach would be to coordinate across faculty members to ensure that learning experiences are systematically varied across the curriculum. This permits the variety of faculty strengths to interact with the strengths and abilities of the students.

Limitations

Potential limitations of this work include sample design and small sample sizes. The authors also acknowledge that the findings of the study reflect the preferences of a sample of education and nursing students at a particular university and may not reflect those of students in other disciplines or at other universities.

Conclusion

As key players in the application of knowledge gained from a higher education institution, students can provide valuable information to faculty. The current study has highlighted the importance of creating a chance for postsecondary students to advocate for their learning environment. Fueled with knowledge of student learning preferences and desires, educators are better suited to adapt academic content that complements student diversity in the classroom. Once an effective teaching technique has been utilized, it is vital to recognize that its success may vary from group to group, even from time to time, as learning styles can shift as students develop their less dominant styles, and further advance their preferred styles. Tools such as the VARK and the WIHIC questionnaires may be helpful to faculty making decisions about how to provide opportunities for students to participate in active learning. It is advantageous for educators to locate and utilize tools that benefit both students and faculty members in order to design a flexible learning atmosphere that captures students' learning preferences.

Although the literature identifies approaches to promote the diagnostic assessment of the preferred learning needs and ideal classroom environments, there is limited evidence to evaluate how these approaches impact postsecondary students. Some unanswered questions remain that warrant further research: How can educators develop an ideal classroom assessment despite individual learner differences and the common subjectivity of course content development in higher education? Why do students in the current study seem more preoccupied with Task Orientation than other aspects of the psychosocial classroom environment? Finally, how do higher education instructors maximize student learning while ensuring that course completion standards

are sufficiently elevated to benefit the future work settings of graduates? Finding answers to such questions will promote better higher education practices.

References

- Aldridge, J. M., & Fraser, B. J. (2000). A cross-cultural study of classroom learning environments in Australia and Taiwan. *Learning Environments Research*, 3, 101-134.
- Amerson, R. (2006). Energizing the nursing lecture: Application of the theory of multiple intelligence learning. *Nursing Education Perspectives*, 27(4), 193-196.
- Astin, F., Closs, S. J., & Hughes, N. (2006). The self-reported learning style preferences of female clinical nurse specialists. *Nurse Education Today*, 26(6), 475-483.
- Bradshaw, M. J. (2007). Effective learning: what teachers need to know. In M. J. Bradshaw & A. J. Lowenstein (Eds.), *Innovative Teaching Strategies in Nursing and Related Health Professions* (pp. 3-18). Boston: Jones and Bartlett Publishers.
- Brown, L. (2004). Differentiated instruction: Inclusive strategies for standards-based learning that benefit the whole class. *American Secondary Education*, 2: 34-62.
- Carrier, S. (2009). Environmental education in the schoolyard: learning styles and gender. *Journal of Environmental Education*, 40(3), 2-12.
- Chapman, C., & King, R. (2005). Differentiated assessment strategies: One tool doesn't fit all. California: Corwin Press.
- Davis, B. (1993). *Tools for Teaching*. San Francisco, CA: Jossey-Bass.
- Den Brok, P., Fisher, D., Rickards, T., & Bull, E. (2006). Californian science students' perceptions of their classroom learning environments. *Educational Research and Evaluation*, 12(1), 3-25.
- Dorman, J. P. (1999). The development and validation of an instrument to assess institutional-level environments in universities. *Learning Environments Research*, 1, 333-352.
- Dorman, J. P. (2003). Cross-national validation of the what is happening in this class (WIHIC) questionnaire using confirmatory factor analysis. *Learning Environments Research*, 6, 231-245.

- Dorman, J.P. (2008). Using student perceptions to compare actual and preferred classroom environment in Queensland schools. *Educational Studies*, 34(4), 299-308.
- Fleming, N., & Mills, C. (1992). Not another inventory, rather a catalyst for reflection. *To Improve the Academy*, 11, 137.
- Fountain, R.A., & Alfred, D. (2009). Student satisfaction with high-fidelity simulation: Does it correlate with learning styles? *Nursing Education Research*, 30(2), 96-98.
- Fraser, B. J., & McRobbie, C. J. (1995). Science laboratory classroom environments at schools and universities: a cross-national study. *Educational Research and Evaluation*, 1, 289-317.
- Fraser, B. J. (1998). Science learning environments: Assessment effects and determinants. In B. J. Fraser & K. Tobin (eds.), *International Handbook of Science Education* (527-564). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Gardner, H. (1993). *Multiple intelligences: The theory in practice*. New York: Basic Books.
- Hassanien, A. (2007). A qualitative student evaluation of group learning in higher education. *Higher Education in Europe*, 32(2/3), 135-150.
- Hawk, T., & Shaw, A. (2007). Using learning style instruments to enhance student learning. *Decision Sciences Journal of Innovative Education*, 5(1), 1-19.
- Henderson, N. (2002). The resiliency quiz. *Resiliency in Action Inc.* Retrieved May 12, 2006, from <http://www.resiliency.com/htm/resiliencyquiz.htm>
- Hensen, R. K., & Hwang, D-Y. (2002). Variability and prediction of measurement error in Kolb's learning styles inventory scores a reliability generalization study. *Educational and Psychological Measurement*, 62(4), 712-727.
- Howles, L., & Jeong, A. (2009). Learning styles and the design of e-learning: what the research says. *Online classroom*, 1-4.
- Kalkan, M. (2008). Learning preferences and problem-based discussion sessions: a study with Turkish university maritime students. *Social Behavior and Personality*, 36(10), 1295-1302.

- King-Shaver, B., & Hunter, A. (2003). Differentiating instruction in the English classroom: Content, process, product, and assessment. New Hampshire: Heinemann.
- Kuh, G. (2008). Diagnosing why some students don't succeed. *Chronicle of Higher Education*, 55, A72.
- Melrose, S. (2004). What works? A personal account of clinical teaching strategies in nursing. *Education for Health*, 17, 236-239.
- Noble, K. A., Miller, S. M., & Heckman, J. (2008). The cognitive style of nursing students: Educational implications for teaching and learning. *Journal of Nursing Education*, 47(6), 245-253.
- Ramsden, P. (1992). *Learning to Teach in Higher Education*. London: Routledge.
- Riding, R., & Rayner, S. (1998). Cognitive styles and strategies: Understanding style differences in learning and behaviour. *Teaching English as a Second or Foreign Language*, 5(4), 2.
- Rogers, M. K. (2009). A preliminary investigation and analysis of student learning style preferences in further and higher education. *Journal of Further & Higher Education*, 33(1), 13-21.
- Sadaquat, A., Rohindra, D., & Coll, R. K. (2008). Student perceptions of a culturally diverse learning environment. *Research in Science & Technological Education*, 26(2), 149-164.
- Tomlinson, C. (1999). *The differentiated classroom: Responding to the needs of all learners*. New Jersey: Merrill Education/ Prentice Hall.
- Zandvliet, D. B., & Straker, L. M. (2001). Physical and psychosocial aspects of the learning environment in information technology rich classrooms. *Ergonomics*, 44(9), 838-857.

Biographical Notes:

Ginette Roberge is an assistant professor at École des sciences en éducation, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON (Canada) P3E 2C6

Lissa Gagnon is a lecturer in the School of Nursing at Laurentian University

Bruce Oddson is an associate professor at the School of Human Kinetics at Laurentian University

Students' Learning Styles Compared with their Teachers' Learning Styles in Secondary Schools

Lena Boström
Mid Sweden University, Sweden

Abstract

This article compares teachers' and students' learning styles profiles at the two major orientations (vocational and academic programs) in upper secondary school, to explore differences and similarities. The study involved 53 secondary school teachers and 101 high school students randomly selected. The learning styles assessment PEPS was used to identify 20 different traits. Three groups were compared and analyzed by using F-test and analysis of variance, ANOVA. The research questions were as follows: to what extent are differences in learning styles between teachers and students and between the two study areas? The statistical analysis showed that the teachers have a greater need for light and temperature, are more motivated, more adaptable, have less need for structure and authority and are more alert in the morning and less in the afternoon compared with the students. The two student groups showed no statistically significant differences between them. The vocational students differed more from teachers than their academic peers. The results indicate the need for expanded educational strategies and an in-depth didactic discussion of the practical activities.

Introduction

Both international (www.mckinsey.com) and Swedish (SOU 2009/10: 89) research show that teachers' competence is crucial for students' academic achievement. The quality of teachers is thus crucial to the quality of the education system. The only way to improve performance is to improve education. If the system supports and facilitates high quality of teaching, good results are achieved. Teacher education is going to be reformed in Sweden and the teacher bill highlights that education and skills are two of the most important factors for a successful school. Areas to be included in the educational science core include development and learning, social relationships and leadership. Both leadership and learning include an awareness of students' and groups' ways of learning, and teachers' awareness of their own learning and their teaching style to meet the mission of education for all. Students are different and teachers as well. But how much do teachers know about the student group they encounter? The individual variations are great - but how is it at the group level? Do the different classes differ from each other concerning the best

way to learn, so-called learning style? And how can teachers match them as good as possible? In secondary schools different requirements are often compared with previous studies. Many have trouble finding good study skills and appropriate learning strategies. Teachers in upper secondary schools strive for educational programming and constructive teaching. In the educational debate the concept of learning how to learn exists to a very large extent (Bostrom, 2004 b), and the questions are how to manage? *How* do you acquire knowledge, what is important, if not decisive, for how to acquire knowledge and how do you know if you have taken it in?

What is a Learning Style?

The term learning style may include more than 70 different models with conflicting assumptions about learning, and with different designs and starting points (Coffield, Ecclestone, Hall, & Moseley, 2004). There are many different theories and models of learning styles with varying dimensions and variables. They focus on different aspects, cognitive processes, skills, sensory modalities, learning processes, thinking styles, etc. Theories of learning style simply assume that everyone can learn, but in different ways and levels. The area is comprehensive and addresses both individual and group level, but also affects organizations as a whole, eg how the theory can be put into schools with parents, students and staff in collaboration (Riding, & Rayner, 1998).

In Scandinavia, the two most famous and used models are Kolb's Learning Styles Model, which describes the information processing and is frequently used as a starting point in problem based learning (Hard af Segerstad, Klasson, & Tebelius, 1996) and Dunn's Learning Styles Model, which is multidimensional and is widely used in elementary and secondary schools as well in adult education (Bostrom & Lassen, 2006).

The Dunn and Dunn Learning Styles Model

The Dunn and Dunn Learning Styles Model is probably the most internationally dispersed, researched and practically used learning styles theory (Buli-Holmgren, Guldahl & Jensen, 2007; Lauridsen, 2009). It focuses on elements that are crucial for learning new and difficult academic information. Learning styles preferencesⁱ are a combination of both biological and learned patterns, which means that identical methods, environments, materials and instructions are effective for some individuals but ineffective for others (Thies, 1999 - 2000). Most people have preferences, but the individual style elements distinguish themselves significantly. Style features vary depending on academic achievement, gender, age, culture, and information processing.

Forty years of research has shown that there are twenty different factors (also called elements) that have objective and measurable impact on learning. These twenty factors have in qualified international research revealed a statistical significance of predictability in the 95% level. The factors are divided into five basic stimuli affecting each individual's abilities: environmental, emotional, sociological, physiological and psychological elements (Dunn & Griggs, 2007).

At the individual level, it is essential to be aware of what affects motivation, concentration and retention to be able to match this with strategies. This model is applicable on direct learning situations and should not be confused with psychological models or tests. It is not about talents, personalities and attitudes. It focuses on learning of what is perceived difficult and new.

Previous Research

There are about 900 scientific studies on The Dunn and Dunn Learning Styles Model. Research on the model and the use of it is dispersed in about 130 universities worldwide (www.learningstyles.net). This model has examined many different aspects: different types of schools, age groups and populations. Many studies have focused on differences in the participants' performance, retention, attitudes and behavior. Others have focused on meta-learning and school improvement.

Learning Styles in Upper Secondary Schools

Internationally, there are many studies on Dunn's Model in upper secondary school. These studies cover different topics with methodical match, but also empirical studies in other stylistic traits than the perceptual preferences (Dunn & Griggs, 2007). A couple of dozen studies have been conducted to identify and compare the students' way of writing (15 years and 17 years) in various countries, including in Brazil, Sweden, and Hungary. The results show that there are some cultural differences, but these are larger within countries than between countries (Honigsfeld, 2007). There is no research on student groups' preferences in comparison with various study options in secondary schools.

In the Nordic countries there is one thesis on high school students and grammar teaching (Bostrom, 2004a). Students at both vocational as academic programs participated in an experimental study. The results showed statistical significance of achievements, attitudes, evaluation and understanding of the usefulness of grammar with learning styles instructional compared with traditional teaching.

Norway has a national evaluation, which shows that education based on learning styles affects teachers' perceptions of action competence. The teachers who taught with learning styles as a basis adapted themselves more often to students' learning preferences, cooperated and reflected more with colleagues, were more development-oriented and more open to change (Waerness, Lindvig, Andresen, & Nissen-Lie, 2005) compared with those who did not use learning styles as a pedagogical basis. With these positive results, the researchers conclude the following, speaking of learning styles; "*... more awareness about learning styles from teachers gives more opportunity for addressing students individual learning*". (p.79)

Research on Teachers in upper secondary schools

Teachers learning styles preferences are little explored. Dunn and Griggs (2007) find that 65% of teachers in high school are analytic, while at least 55% of the students are the opposite, global. In Brunei 185 teachers' teaching styles in secondary school was compared with students' learning styles. The teachers turned out to be "fairly traditional", ie. they taught with visual and auditory methods, while their students' preferences were in the range extremely "low" or "high" in terms of sensory modalities, ie. many learned best in completely different ways than through the teacher's teaching methods (Pengiran-Jadid, 2007). Some of these students may not be successful unless they are taught through "hands-on" - methods or by being practically involved in learning. The researcher concludes the following; "*This findings suggest the need for widely diverse teaching approaches*" (p. 139). In Scandinavia there is no research on teachers' preferences in comparison with students.

Learning Styles and Teacher Students

From United States there are many studies about learning styles pedagogy in teacher training education or in in-service training for teachers. One concrete example is the teacher education program at St Joseph's College, NY, where courses in different subjects, math methods for example, are taught through the individual's perceptual preferences (Burke, 2000). Burke points out that it is particularly important to pay attention to the emotional elements and the need to give each student individual study strategies after taking the learning styles assessment. She also points out the need to adjust instructional methods for the different groups.

Teacher education at the University of Texas offers the following recommendations for the integration of learning styles pedagogy (Whitley & Littleton, 2000):

- Identify the individual profiles and group profiles and see the group trends. A concrete example of methodological consequence is that for a group-oriented student a cooperative learning class can be used.
- Interpret the profiles so that each student becomes aware of his / her best way to learn.
- Encourage students to study according to their strengths.
- Propose individual study strategies rather than one type of study skills.

For teachers and also prospective teachers, learning styles requires pedagogy to be taught according to their preferences, as emphasized by Dunn and Burke (2007). These students will then get personal insights in how to successfully work with the children who fail in school. These researchers argue that teachers are aware that many students fail in school, but they do not know how to teach "non-traditional" children and this is a direct result of the teacher education program which has not given them the didactic skills. Burke and Dunn highlight that teaching students with different learning styles is not difficult, but it is very different from how teachers in general do.

Stensmo (2006) points to the importance of differentiating instructions. He compares a group of student teachers in the practical and aesthetic subjects with regard to the perceptual preferences with a normally distributed group of teachers. Prospective teachers in practical and aesthetic subjects seem to learn more kinesthetically (whole body involved) compared with "normal" prospective student teachers. Stensmo concludes the following:

When encountering teachers and students with a common academic learning profile the former are underdogs. To meet their needs a greater variation in teaching, learning and examination at the university must be implemented. (s. 12)

Purpose and Questions

The purpose of this study is twofold: to compare teachers' and student groups' (academic and vocational) learning styles in secondary high school in Sweden. The data that will be used is their assessments at group level. The intention is to examine whether and to what extent, there are differences and similarities and then analyze the reasons for the results. Another intention is to reflect on the possible consequences for learning, leadership and educational planning. The study sought to answer the following questions:

Q1. The extent to which there are significant differences between teachers and students learning styles profiles in upper secondary school?

Q2. The extent to which there are significant differences between academic and vocational classes?

Method and Procedure

The study included 53 high school teachers (15 men and 38 women) and 102 secondary school students (36 from academicⁱⁱ and 66 from vocational programsⁱⁱⁱ) randomly selected. There were 52 women and 50 men. The data was collected in 2008 -2010.

The students were tested with Productivity Environmental Preference Survey (PEPS) (Dunn, Dunn & Price, 1984, 1991, 2000). The test consists of 100 claims in five gradations (a sort of Lickert scale) with reversible questions. The responses were processed by computer to obtain an individual average of each preference. The individual profile shows an average for each question on a 60-point scale (see Annex 1). Although group profiles with mean values of each element will be added (see Annex 2A-B). They also marked each student's values in the areas of low (averaging 20-40), flexible (average 40-60) and high (mean 60 - 80). These values were calculated at the individual level for each group and used for the interferiel statistics. The descriptive statistics is thus based on the exact mean of each element, while the interferiel statistics based on averages for each individual classified into main groups, low, flexible or high (mean).

Annex 1 Individual profile

Productivity Environmental Preference Survey

Individual Profile

Name:

Sex: Female

Date of Printing: 2010-05-02

Year of Birth: <<<

Identification: TY

Preference Summary

Scale	Score	20	30	40	50	60	70	80
1	50		Prefers Quiet		NOISE LEVEL		Prefers Sound	
2	46		Prefers Dim		* LIGHT		Prefers Bright	
3	43		Prefers Cool		* TEMPERATURE		Prefers Warm	
4	43		Prefers Informal		* DESIGN		Prefers Formal	
5	31		Low		MOTIVATION		High	
6	50		Low		PERSISTENT		High	
7	44		Low		RESPONSIBLE(CONFORMING)		High	
8	57		Does Not Like		STRUCTURE *		High	
9	72		Prefers Alone		ALONE/PEERS		Prefers With Peers	
10	50		Does Not Want Present		AUTHORITY FIGURES		Wants Present	
11	30		Does Not Learn In		SEVERAL WAYS		Prefers Variety	
12	67		Does Not Prefer		AUDITORY		* Prefers	
13	38		Does Not Prefer *		VISUAL		Prefers	
14	35		Does Not Prefer *		TACTILE		Prefers	
15	50		Does Not Prefer		KINESTHETIC		Prefers	
16	45		Does Not Prefer		* INTAKE		Prefers	
17	55		Prefers Evening		TIME OF DAY *		Prefers Morning	
18	55		Does Not Prefer		LATE MORNING		Prefers	
19	53		Does Not Prefer		AFTERNOON		Prefers	
20	51		Does Not Prefer		NEEDS MOBILITY		Prefers	

Annex 2A Group profile with all individuals (high scores)

Productivity Environmental Preference Survey

SUMMARY FOR STUDENTS: Score ≥ 60

Date: 2010-05-02

Group Identification: Price Systems, Inc.

Identification: Ty

Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	*				*			*		*		*		*		*		*		*
2				*		*								*				*		
3		*		*			*	*										*		
4				*	*							*						*		
5				*	*				*								*	*		*
6				*	*			*	*	*		*			*	*		*	*	
7				*				*	*	*				*		*		*	*	
8				*				*	*	*				*	*			*	*	
9				*				*	*	*				*	*			*	*	
10				*				*	*	*				*	*			*	*	
11				*				*	*	*				*	*			*	*	
12				*				*	*	*				*	*			*	*	
13				*				*	*	*				*	*			*	*	
14				*				*	*	*				*	*			*	*	
15				*				*	*	*				*	*			*	*	
16				*				*	*	*				*	*			*	*	
17				*				*	*	*				*	*			*	*	
18				*				*	*	*				*	*			*	*	
19				*				*	*	*				*	*			*	*	
20				*				*	*	*				*	*			*	*	

Annex 2B Group profile percentage distribution (high scores)

Productivity Environmental Preference Survey

SUMMARY FOR STUDENTS: Score ≥ 60

Date: 2010-05-02

Group Identification: Price Systems, Inc.

Identification: TY

PEPS AREA	SUBSCALE	RESPONSES	PERCENTAGE
NOISE LEVEL	1	9	18
LIGHT	2	4	8
TEMPERATURE	3	6	12
DESIGN	4	17	34
MOTIVATION	5	11	22
PERSISTENT	6	7	14
RESPONSIBLE	7	4	8
STRUCTURE	8	28	56
LEARN ALONE/PEER ORIENTED	9	17	34
AUTHORITY FIGURES PRESENT	10	16	32
LEARN IN SEVERAL WAYS	11	2	4
AUDITORY	12	11	22
VISUAL	13	11	22
TACTILE	14	10	20
KINESTHETIC	15	4	8
REQUIRES INTAKE	16	12	24
EVENING-MORNING	17	8	16
LATE MORNING	18	13	26
AFTERNOON	19	15	30
NEEDS MOBILITY	20	7	14

NUMBER OF STUDENTS: 50

Number of Responses: 212

This study compared four groups and the material was analyzed by using F-test and analysis of variance, ANOVA (Analysis of Variance). The main hypothesis of this study is that differences in learning styles preferences exist both between teachers and students and between the two study areas. For the descriptive statistics means and standard deviations were calculated.

Results

Descriptive results

Table 1 shows the percentage breakdown for each learning styles preference. The majority of teachers' and students' preferences are in the range between 40 and 60, which means flexibility. This means that as long as they are interested in the content they learn, but when they are not interested, they learn superficially and receive short-term memory (Dunn & Griggs, 2007). Notable is that teachers in higher degrees are flexible compared with students. Table 1 also shows the percentage split below 40 and above 60 for each preference. Markers in these fields indicate the students' strengths and needs, ie. what is important for them to be able to learn effectively.

Table 1
Percentage of Learning Styles Preferences for Secondary Teachers

Elements	< 40				40 - 60				> 60			
	Teacher	EC	H R	SP	Teacher	EC	HR	SP	Teacher	EC	H R	SP
Sound	0	0	0	0	93	75	76	89		25	24	11
Light	17	58	39	40	70	42	59	60	12	0	3	0
Temperature	14	14	10	3	74	64	69	80,1	12	26	21	17
Design	3	25	34	31	79	58	66	57	18	17	0	11
Motivation	0	25	24	6	80	72	76	80	20	2	0	14
Persistence	2	3	3	0	74	86	97	86	24	11	0	14
Conformity	9	44	28	26	75	50	55	69	16	6	17	6
Structure	2	0	0	0	73	36	34	23	25	64	66	77
Self vs group	5	17	3	17	63	39	34	49	32	44	62	34
Authorities	9	8	0	11	84	53	76	66	7	39	24	23
Routine vs	14	28	28	17	86	72	72	74	0	0	0	8

variation												
Auditory	0	8	10	6	70	70	62	72	30	22	28	23
Visual	4	14	24	6	90	81	66	86	7	6	10	9
Tactile	9	8	10	17	84	81	69	74	7	14	21	9
Kinestheatic	4	6	10	3	91	83	83	92	5	11	7	6
Intake	16	16	0	6	70	58	69	72	14	25	31	23
E. Mor -Eve	8	36	28	43	72	58	72	57	20	6	0	0
Morning	24	47	28	34	63	39	45	57	12	14	28	9
Afternoon	8	0	4	3	62	33	48	37	30	67	48	60
Mobility	8	3	0	0	84	84	72	86	7	14	28	14

($n = 53$), EC- students ($n = 36$), HR- students ($n = 30$) and SP-students ($n = 36$).

Environmental preferences

No individual in any of the groups want it to be completely silent. 25% of the students in HR and EC need sound in the background. The majority of teachers are flexible in terms of sound. The preference light indicates that students need much more dim lights than the teachers, and almost no one prefers to work in clear light. With regard to temperature students seem to a higher extent prefer warm rooms. The element design (furniture) clearly differs in outcome; to a much greater extent student want informal settings.

Emotional Preferences

The emotional elements can be interpreted as follows: teachers in this study are not low motivated in contrast to students: 25% of vocational students and 6% of SP students are low motivated. Almost none of the vocational students are highly motivated in contrast to 19% of teachers and 14% of SP students. Teachers have high persistence, but no one in the HR class has. The element conformity shows significant differences in outcome. EC-students have the highest proportion of non-conformity learners, 44%, while for HR and SP-students 27.5%. Most persons with the opposite, high conformity, we find among teachers and HR students, approximately 17%. The need for high structure is evident for all three classes, 64 -

77%, in contrast to the teachers 25%. Almost none of the informants learn best with internal structure.

Sociological Preferences

More students in EC-and SP-classes are "*mavericks*", approximately 17% compared with the other two groups, 3-5%. The spread between the groups is significant with regard to learning in groups. As many as 62% in the HR class prefer learning in groups, while the percentages in the EC-and SP-classes are 44% and 34%. 32% of the teachers prefer groups. The need for authority is much higher for students than teachers, between 24 and 39% while the teachers are at 7%. Students in vocational programs are experiencing a slightly higher need of routine in work methods, compared with SP-students and teachers.

Perceptual Preferences

Regarding the senses, we find the following differences: none of the teachers is low auditory, ie. everyone can learn by listening. In contrast, 6-10% of students are low-auditory. Teachers are also the most auditory of all four groups (30%) closely followed by the HR students. Low visual preferences show large differences between the groups, ie. they do not learn best visually; 24% of HR students, while 14% EC-students and 6% SP-students. On the opposite side, ie. learning best visually, reflected no major discrepancies. As for tactile preferences the HR-class shows the highest need for so-called "hands-on learning", about 21%, while the corresponding percentage is 13-7% for the other groups. Low preferences for tactile learning occur for SP-students, 17%, which differs from the other three groups (80-10%). The need to learn with the whole body involved, kinesthetic, shows no marked differences between the four groups.

Other

Concerning intake, students have a greater need for this than the teachers. No one in the HR class has non-preference for this preference. The major difference regarding time of day appears to differ between the groups as follows: Teachers are much more morning people than students, who in turn prefer afternoon, far more than teachers. Need for differ between the groups as follows: the HR students most in need (27%), followed by the EC - and SP-students 14% and at least needs, teachers (7%).

Conclusion

There are differences and similarities between the groups, but teachers and students in the SP program are more similar in their learning styles compared with the SP students and the vocational students. This applies to 18 of the 20 style features. A clear distinction is also higher teachers' preferences for flexibility in their profiles.

To clarify the results between the two groups' comparisons for each preference is shown in bar graphs below. These are divided into areas of high (Figure 1) and low average value (Figure 2), which illustrate the groups' tendencies of strengths and needs.

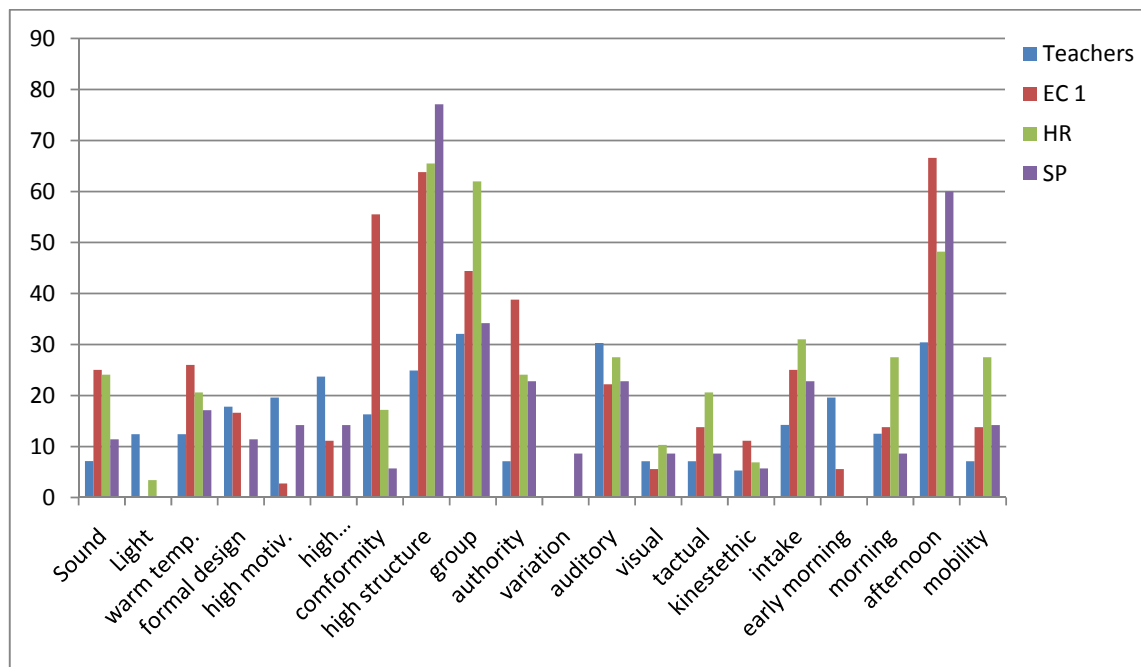


Figure 1. Percentage Distribution of Learning Styles Preferences with High Averages

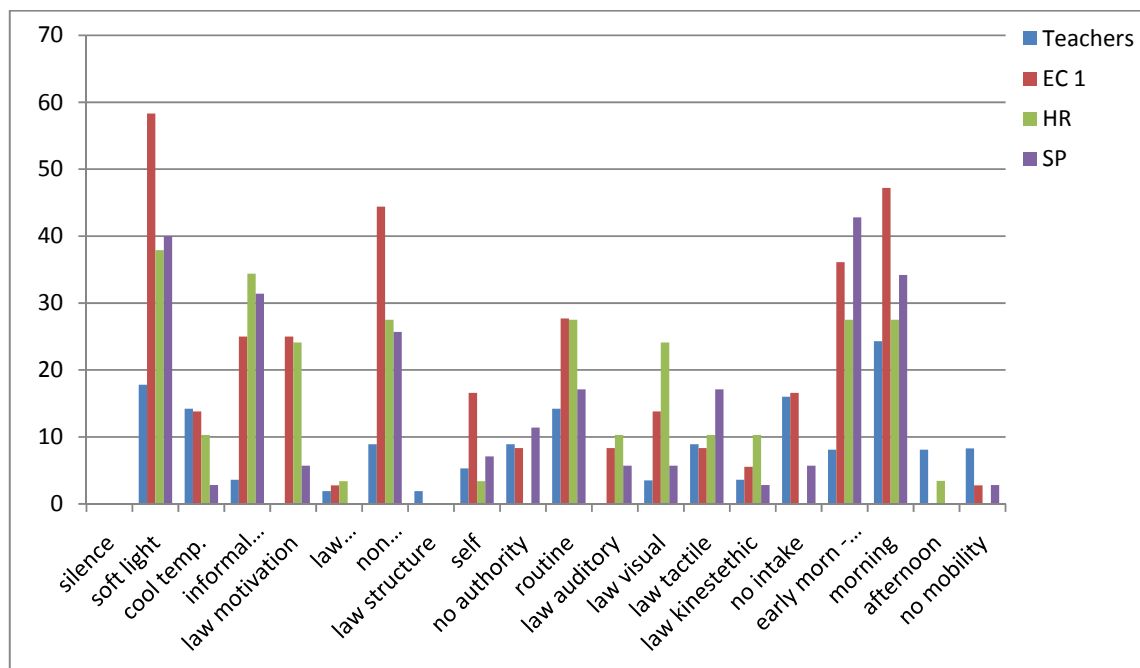


Figure 2. Percentage Distribution of Learning Styles Preferences with Law Averages

Statistical Significance

A series of one-way analysis-of-variance (ANOVA) test were conducted to assess learning styles among the four achievement groups. This ANOVA s revealed significant F-values for five learning styles elements and follow-up tests identified seven pair wise differences. Significant means, standard derivations, and F-value are reported in Table 2 and in pairs differences are described in narrative format.

Table 2

Teachers ' and Students' Learning Styles Preferences: Mean, Standard Deviation, and Significant F-value

Elements	Teachers (n= 53)		EC- students (n = 36)		HR- students (n = 30)		SP- students (n = 35)		F
	M	SD	M	SD	M	SD	M	SD	
Light	1,98	0,604	1,42	0,500	1,67	0,547	1,60	0,497	8,328 **
Temperature	2,15	0,456	1,91	0,658	1,67	0,479	1,83	0,618	5,537*
Motivation	2,13	0,440	1,78	0,485	1,77	0,430	2,06	0,482	6,682**

Conformity	2,08	0,513	1,61	0,599	1,70	0,466	1,83	0,568	6,222**
Structure	2,28	0,495	2,64	0,487	2,60	0,563	2,71	0,458	6,675**
Authorities	1.98	0,366	2,28	0,615	2,17	0,461	2,14	0,550	2,728*
Early morn.	2,09	0,597	1,69	0,624	1,73	0,450	1,60	0,497	6,973**
Aftersoon	2,13	0,612	2,58	0,500	2,40	0,563	2,63	0,490	7,405**
Mobility	1,96	0,437	2,14	0,424	2,23	0,430	2,11	0,404	2,925*

*= sig<.05, **= sig <.001

Comparisons in pairs showed the following statistically significant results:

Teachers Compared with Students

Teachers a) need more light as compared with EC and SP students, b) have a stronger need for warm environments compared to HR students, c) have higher intrinsic motivation than HR and EC students, d) have a higher degree of persistence than EC and HR students, e) have less need for structure than all three classes, f) have less need for authority figures, compared with EC students, g) are more alert in the morning compared to all three student groups, and h) are less alert the afternoon than EC and SP students. The study shows that teachers' style characteristics differ most from EC students with seven preferences and the other two groups with four preferences.

Students: Between students in academic classes, compared with vocational students there are no statistical differences in the survey, or between the two vocational classes.

Discussion and Conclusions

The focus of this study was to find out how different and similar teachers and students are at programs with different orientation in secondary schools in Sweden in terms of learning styles preferences. The research questions were to ascertain the extent to which significant differences exist between teachers and students. The study compared learning styles profiles between secondary school teachers (n = 53) with students (n = 101), and to compare the two groups (vocational, n = 66 and academic classes, n = 35) between each other. The study included students at the Social Science Program (SP-students), students at the Electricity Program (EC-students) and at the Hotel and Restaurant program (HR students).

The assessment Productivity Environmental Preference Survey (PEPS) was used to determine students' preferences. The descriptive statistics illustrate large differences between the four groups, and the statistical analysis shows significant differences for seven of the twenty traits between teachers and students, but not between the various student categories. Teachers prefer stronger light, they have more need of warm surroundings, they are more motivated, more persistent, have less need for authority and structure, and have other best times (morning and not afternoon), compared with students ($p < .05$). Between the three groups of students, there is no statistically significant difference comparing academic and vocational classes.

Overall Differences

The statistical differences between teachers and students can be attributed to three reasons:

- a). The learning styles traits are not static but change over time and with life situations (Thies, 1999 - 2000). Teachers are of course the older population and many have had positive experiences in school and theoretical studies
- b). Teachers have succeeded through high education and have probably had a preference for, for example, intrinsic motivation, and persistence. Many have chosen the profession because they were successful as students at school (Steinberg, 2004).
- c). Students, particularly those in vocational programs, have selected a focus for an important purpose, probably because they are more interested in practical work. They are not primarily interested in theory and may have negative experiences in school.

One reason that there are no statistical differences between academic and vocational students can be found in the admissions statistics. Some vocational programs have higher admission mean than the SP program^{iv}. These students (SP) probably do not really know what to study, and thereby select the SP program. It is "moderately" difficult and provides a broad jurisdiction. A general view is that the other two academic programs (NV^v and T^{vi}) are more difficult in theory than the SP program. There might be other results including these two programs.

Direct connection between the differences could also be due to age differences, maturity and surrounding structures in the community for different populations. The generation which young people belong to, has more choices in life compared with the teachers. Many choices lead to a greater need for structure (Grinder, 2000).

Specific Differences

The differences in terms of light and temperature can be understood in international research, which shows that these preferences change with age, ie. the older we get, the greater the need we seem to have for bright light (Dunn & Griggs, 2007).

Regarding motivation and persistence there are differences between teachers and vocational students. Teachers have statistically higher motivation and are more adaptable than the students. This is quite natural since students who choose vocational programs generally are not as interested in theoretical studies. Many of these students are governed by external motivation, ie. they want to get instant feedback and are motivated by external stimuli, which can also be attributed to their choice of study orientation. In theoretical studies it would require more of intrinsic motivation and it takes time before they see the results of what they learned. The students having significant differences for persistence could possibly be because they feel uncomfortable in teaching situations. They can feel stressful and thus they protest, provoke and feel they want to solve problems in their own way. This applies in particular to teaching situations in the core subjects, not in specific subjects (Gidlund, 2010).

Students' higher need for structure compared with teachers' can be brought back to just learning difficult and new knowledge. Teachers already know how to study, many have probably done well in school and they have cracked the school's codes (Dunn & Griggs, 2007, Steinberg, 2004), which does not match the students' experiences. Students feel secure in the know how, where and why the information should be solved with role models and examples, because they then feel more comfortable in the learning process (Bostrom, 2004b), and this is confirmed in this study.

The discrepancy between students' and teachers' best time of day, can be caused by the fact that they belong to different generations. Adolescents may have a lifestyle where they want to sleep in the mornings and get started later in the day. They are more "desire children" who act according to their emotions and impulses, and many teachers belong to the generation "child duty", and were brought up to follow the path of duty (Steinberg, 2004).

A reason for EC-students in great need of authority figures compared with the teachers may be found in their future profession. Most of them will have a job where you have to do "the right thing", otherwise there could be unforeseen consequences. Therefore, one could imagine that the authorities are important to them. A practical example is electrical safety, if they make errors, they could receive

a dangerous shock, ie. a tactile response. Teachers on the contrary, are used to be working on their own regardless of others' guiding directives. The other two student groups, SP and HR, will probably not be working in occupations that have dire consequences if they do work-related errors.

The EC-students being different compared with most teachers among the three classes can possibly be attributed to their future profession, but this need further and complementary empirical research.

In a review of international studies on different populations you can observe that there usually exist differences between different groups, but that individual differences are more marked (Honigsfeld, 2007). For the study populations the following can be stated: a) it cannot be compared with similar international studies since such studies do not exist, b) students' sensory preferences are more on the scale extremely "low" or "high" ie. many learn better in completely different ways in comparison with the teacher (Pengiran-Jadid, 2007). This can particularly be applied to students in the vocational programs that need more tactile and kinesthetic methods. Students in the SP program seem to be more like the teachers in terms of percentage distribution of sensory preferences.

Practical Implications

To meet students' diverse needs, insights in learning styles preferences and greater diversity in teaching, learning and assessment at secondary school is evident. Conclusions to draw from this study are students' need for large structures. Many (63-78%) learn better when there are frameworks, assumptions, plans and practices on how to learn difficult and new knowledge. The corresponding figure for teachers is 25%. As a teacher you must be aware not to let your own traits have an effect on educational planning.

Another important conclusion from this and other studies (Bostrom, 2004b, Calissendorff, 2005) is that knowledge of human diversity affects learning at a deeper level, ie. the meta-cognitive skills develop. Students can understand both their own and others persons' learning better. They can also more easily find individual study strategies and therefore do better in their studies. Another important question is what teaching education could do to teach future teachers to take into account students' individual differences and understand the educational implications. Important for new teachers is that they have a strong interest in what they learn, lessons on the topic is relevant to them, emotional touch, and options to cope with studies (cf. Burke, 2000).

With learning styles profiles, both for groups and classes, teachers can become aware of their own and students differences. Then we can get additional tools into the school vision for inclusion, individualization and "a school for all".

For everyone involved, it is crucial to understand that if you have the opportunity to learn through your preferences, it is also easier to develop other traits. In order to do well in life in general and the future, it is important to broaden the learning strategies. A consequence is the possibility of becoming less dependent on authority figures and builds lifelong learning yourself.

Concluding Remarks

Already the ancient Greeks knew the importance of knowing oneself. Today's post-industrial information society makes demands not only on self-knowledge but also knowledge of strategies and tools to manage and organize all the information and process it to the understanding and skills. This is particularly true of all actors in the world of schools. Awareness of oneself as a teacher and of the students' learning processes and to use and reflect on your leadership (Dunn & Dunn, 1999; Kroksmark, 2006; Stensmo, 2000; Hattie, 2009) is of paramount importance to teachers' professional development. Didactic implications will of course occur through this understanding.

To know and use learning style pedagogy supports an environment that supports lifelong learning. When people are involved in the process to discover how they learn, they can better build on their strengths and preferences. Therefore they can overcome barriers to learning and achievement, improve behavior and attitudes to learning and develop motivation for lifelong learning. For student teachers knowledge of learning styles gives new tools to reach all children in the future. When you feel that the pedagogical approach has different consequences for different students, this can lead to a change in outlook on people and knowledge and with that a professional development.

Further studies in the area are to better identify various and several high school programs and various teachers' groups, preferably over time. Other important aspects to consider are gender differences, different teaching styles and effects and consequences of different learning environments.

References

- Boström, L. (2004a). Lärande & Metod. Lärstilsanpassad undervisning jämfört med traditionell undervisning i svensk grammatik. (Avhandling Högskolan för lärande & kommunikation i Jönköping & Helsingfors Universitet).
- Boström, L. (2004b). Lärande och strategier. *Didacta Varia*, 9 (2), 73 – 81
- Boström, L. & Lassen, L. M. (2006). Unreaveling learning, learning styles, learning strategies and meta-cognition. In *Education + Training*, Vol. 48 No. 2/3, 2006, p. 178-189.
- Buli-Holmgren, J., Guldahl, T. & Jensen, R. (2007). Refleksjoner om opplæring; i et læringsstilsperspektiv. Oslo: Cappelen Damm.
- Burke, K. (2000). A Paradigm Shift: Learning-Styles Implementation and Preservice Teachers. I Dunn, & Griggs, (red). *Practical Approaches to Using Learning Styles in Higher Education* (85 – 94). Westport, CT: Bergin & Garvey.
- Calissendorff, M. (2005). *"Om man inte vill spela – då blir det jättesvårt"* En studie av en grupp förskolebarns musikaliska lärande i fiolspel. (Avhandling Örebro universitet).
- Coffield, F., Ecclestone, K., Hall, E. & Moseley, D. (2004). Learning styles and pedagogy. A systematic and critical review. *Learning & Skills research centre*. www.lsrc.ac.uk
- Dunn, R & Burke, K (2007). Higher Education and Teachers Certification Programs: Needed Ethical Changes. *The Journal of Higher Education Management*, Volume 22, (9 – 19).
- Dunn, R. & Dunn, K. (1999). *The complete guide to the Learning Style in Service System*. Boston: Allyn & Bacon.
- Dunn, R. & Griggs, S. A. (2007). *Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What?* NY: St. John's University, Center for the Study of Learning and Teaching Styles.
- Dunn, R., Dunn, K. & Price, G.E. (1984, 1991, 2000). *Productivity Environmental Preference Survey*. Lawrence, KS: Price System
- Gidlund, U. (2010). Muntlig kommunikation om lärstilspedagogik i praktiken. mars 2010.

- Grinder, M. (2000). A healthy Classroom. Seattle; Michael Grinder & Associates.
- Hattie, 2009). Visible Learning. A synthesis of over 800 meta-analyses relating to achievement. NY: Routledge
- Honigsfeld, A (2007); Learning Styles of International Populations. I Dunn & Griggs (red) Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What? (121 - 123)NY: St. John's University, Center for the Study of Learning and Teaching Styles.
- Hård af Segerstad, H., Klasson, A., & Tebelius, U. (1996). Vuxenpedagogik – att iscensätta vuxnas lärande. Lund: Studentlitteratur
- Krokmark, T. (2006). Dags att lägga ned IKEA-pedagogiken. Pedagogiska Magasinet, (3)
- Lauridsen, Ole (2009). Fokus på läring: om læringsstile i dagligdagen professionelt og privat. Köpenhamn: Akademisk forlag
- Pengrian-Jadid, R. (2007). Learning Styles of Brunei Adolescents. I Dunn & Griggs (red) Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What? (121 - 123)NY: St. John's University, Center for the Study of Learning and Teaching Styles.
- Riding, R. & Rayner, S. (1998). Cognitive Styles and Learning Strategies. Understanding style differences in learning and behavior. London: David Fulton.
- SOU 2009/10:89. Bäst i klassen - en ny lärarutbildning.
- Steinberg, J. (2004): Världens bästa fröken. När modern pedagogik fungerar. Lund; Gleerups.
- Stensmo, C (2006). Perceptual preferences in learning among teacher education students in practical-aesthetical subjects. Paper presenterat på NFPPF-konferens 9-11 mars i Örebro
- Stensmo, Christer. (2000). Ledarstilar i klassrummet. Lund: Studentlitteratur.
- Thies, A. P. (1999- 2000). The neuropsychology of learning styles. National Forum for Applied Educational Research Journal, 13 (1), (50 - 62)

Waerness, J-I, Lindvig, Y. Andresen, R. & Nissen-Lie R.; (2005). Kartlegging av vidaregående opplæring i Østfold 2004/5. Oppfølging av differensieringsprosjektet, F 2/2005

Whitley, J. & Littleton, P. (2000); One Texas University's Approach to Integrating Learning styles in Teacher Education: Talking the Talk and Walking the Walk. I Dunn, & Griggs, (red). Practical Approaches to Using Learning Styles in Higher Education (85 – 94). Westport, CT: Bergin & Garvey.

www.learningstyles.net 2010-01-18

www.mckinsey.com/App_Media/Reports/SSO/Worlds_School_Systems_Final.pdf
2010-01-18

i "Preference" means that this is an individual's strengths or needs for learning difficulties and new material (Dunn & Dunn, 1999). The preference is marked in the analyzes of learningstyles between 20-40 or 60-80 (see Annex 1).

ii This study included students from the social science program (SP), representing the academic orientation.

iii As representatives of the vocational classes were students from the Electricity Programme (EC) and Hotel and Restaurant Program (HR).

iv For X-municipal social programs are among the lowest in the admission points.

^v NV = science program

^{vi} T = technical progra.

Author's Note

Dr. Lena Boström is a Senior Lecturer and Researcher at the Department of Education, Mid Sweden University, Mittuniversitetet, UTV, in Sweden. She has written dozens of books and educational materials in learning styles and pedagogy, as well as dozens of scholarly articles. She can be reached at lena.bostrom@miun.se or www.lenabostrom.se