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Learning and Teaching Crossroads

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Abstract

This paper is a qualitative and quantitative research study which investigated the learning styles of students and teacher's and whether the teacher's style matched the student's learning styles. The focus group comprised 254 learners and 9 teachers in public and private institutions in Cordoba, Sucre, Atlantico and Bolivar, Colombia. From the information collected, it was found that the kinesthetic style was the most prevalent followed by the tactile and then the auditory style. It was also observed that there was no match between students´ and teachers´ learning styles.

Resumen

El propósito de esta investigación cualitativa y cuantitativa fue investigar los estilos de aprendizaje de 254 estudiantes y sus 9 profesores y determinar si había o no coincidencia entre el estilo de aprendizaje de los aprendices con el estilo de enseñanza de sus docentes. Los estudiantes fueron seleccionados de instituciones públicas y privadas en los departamentos de Cordoba, Sucre, Atlántico y Bolívar en Colombia. La información fue recolectada de diferentes fuentes. Se encontró que el estilo kinestésico sobresalió seguido por el táctil y el auditivo y que no había coincidencia entre el estilo de aprendizaje de los estudiantes y el estilo de enseñanza de los docentes.

Introduction

The way individuals learn or understand new information and their preferred learning methods have been a popular subject in the past. It has also been the focus of a number of studies in recent years. Research on learning styles has provided teachers and also students with a different view of learning and how to apply it in classrooms and lives. Among the authors that have views regarding this topic are Aguirre, Cancino, & Neira (2005); Dunn & Dunn (1993); Felder (1995); Felder, Felder, & Dietz (2002); Gardner (1983); Gringerenko & Sternberg (1995); Honey & Mumford (1992); Kinsella (1996); Kolb (1984); Mattews (1991); Murray-Harvey (1994); Oxford & Ehrman (1993); Oxford & Others (1992); Peacock (2001); Rayner & Riding (1997); Reid (1995); Riding & Douglas (1993); Sims & Sims (1995); and, Zhenhui (2001). There has been little learning styles research conducted in Columbia; therefore, publications are limited.

Educators and researchers have developed several instruments to assess students´ learning styles, but literature regarding this topic is full of unresolved issues; both theoretical and practical (Wilson, 1998). On the other hand, these instruments have been a great help in identifying visual, kinesthetic, auditory, tactile, group and individual styles as well as many other classifications of styles in students and also exploring them with the aim of improving the learning and teaching processes.

The purpose of this research study was to identify:

- What are the students' learning styles in different educational institutions located in Cordoba, Sucre, Atlántico and Bolivar?
- What are the major – minor and negligible learning styles of the students and the teachers selected from the different institutions?
- What are the teachers' teaching styles?
- If there is a match between students´ learning styles and the teachers' teaching styles?

It is important for teachers to know what students´ learning styles are in order to create an optimal environment for both learners and teachers in the classroom.

Literature Review

There are numerous studies on learning styles in Europe, Asia and North America but in Colombia there are relatively few. It is relevant to study this topic due to the fact that learning styles affect not only the way individuals acquire and process information but also are used in the teaching processes. Research on learning and teaching styles has provided teachers and students with a different view of learning and teaching within the classrooms. Authors that have done research on this topic are:

Matthew Peacock (2001) studied the correlation between learning and teaching styles based on Reid's hypotheses. He found out that a mismatch between teaching and learning styles causes learning failure, frustration and demotivation. He also found that learners favored kinesthetic and auditory styles and disfavored individual and group styles, while teachers favored kinesthetic, group and auditory styles.

Rao Zhenhui (2001) analyzed matching teaching styles with learning styles in East Asian contexts. He diagnosed learning styles and developed self-aware EFL learners. He mentioned that an effective matching between teaching and learning styles can only be achieved when teachers are aware of their learners´ needs, capacities, potentials, and learning style preferences. He also indicated that it is necessary to alter the styles to create teacher-student style matching.

Rita and Kenneth Dunn (1993) studied how people learn and they noticed that some students achieved knowledge only through selective methods. They mentioned many

elements that influence learning styles: environmental, emotional, sociological and physical elements. They also mentioned elements that influence a teaching style and attitudes towards instructional programs.

Joy Reid (1995) indicated that learning styles are internally based. All learners have individual attributes related to the learning processes. Some people may rely on visual presentations, others prefer spoken language; still others may respond better to hands-on activities. People learn differently and these differences in learning are found in ESL/EFL settings. She also indicated that matching teaching styles with learning styles provides all learners an equal chance in the classroom and builds student self-awareness. She also categorizes learning styles into six types: Visual, Auditory, Kinesthetic, Tactile, Group, and Individual.

Felder (1995) indicated that the way in which an individual characteristically acquires, retains, and retrieves information are collectively termed the individuals´ learning styles. He also added that mismatches often occur between learning styles in students in a language class and the teaching style of the instructor with unfortunate effects on the quality of the students´ learning and on their attitudes towards the class and the subject. Felder (2002) revealed that individuals have different learning styles that are reflected in different academic strengths, weaknesses, skills and interests.

Funderstanding (2008) revealed that learning styles are often influenced by heredity, upbringing and current environmental demands. Learners have a tendency to both perceive and process information differently. Tripp and Moore (2007) identified that students tend to focus on facts, data and algorithms. Some respond strongly to visual forms of information and many others preferred to learn actively. Gilbert and Swanier (2008) confirmed that learning preferences facilitate the way individuals learn when the environment provides a variety of learning styles. Aguirre, Cancino, and Neira (2005) found that the auditory learning style was the most representative in a group from the National University in Bogota.

Design of the Study

Participants

This research was carried out at select private and public high schools and Universities in the North Coast of Colombia. They were located in different sections of the Caribbean region where English is compulsory. In order to carry out this research, students and teachers from private and public schools and a university were chosen. The focus group was comprised of 133 males and 121 female participants from high school grades 7th, 8th, and 9th, and a private university classified in an intermediate level, with student ages ranging from 12 to 19. Their socio-economic backgrounds varied from one to four. One and two correspond to low income socio-economic status and

three and four reflect an average income. From this focus group, a target group made up of fifty students and their teachers were selected in order to investigate the major, minor and negligible learning styles, as well as the teacher's teaching styles and the match between them.

Twenty-eight students and four teachers were from public high schools and twenty-seven students and five teachers were from private institutions. Fifty-three students liked English as a subject and two did not like it at all. All teachers were supportive of the English language (the aforementioned information was taken from a written questionnaire answered in class by all the students and teachers). The group of teachers was composed of five females and four males between the ages of 28 and 52 years. They all had undergraduate degrees in teaching English. It is also important to mention that there are more English teaching hours in private institutions than in the public ones.

Methods

In this study, a quantitative and qualitative descriptive methodology was used. In addition, a heuristic orientation was used because it was important to know the structure and essence of the students' experiences, feelings, thoughts and how they interpret them. Data about learning styles, students' motivation, and experiences with English as a foreign language and matching learning styles with teaching styles were gathered from the following instruments:

- Reid's perceptual learning style preference questionnaire (Reid, 1995)
- Field notes from in-class observations
- A written survey
- Tape–recorded interviews related to learning styles

Data Analysis

Before collecting the data, students were invited to participate in this research and were included in the study if they granted permission. First, quantitative scores were calculated for all questionnaire data (the written survey and the tape recorded interviews) in order to find out the students' and teachers' learning styles. With these instruments learners identified the way they learn best and how they prefer to learn. The questionnaire was composed of thirty statements that covered Reid's six learning style preferences, with a rating scale from one to five for each one of them. Students answered them, as applied to their study of English, using a five point scale (5 – Strongly agree; 4 – Agree; 3 – Undecided; 2 – Disagree; and 1 – Strongly Disagree).

Reid (1995) classified learning styles as Major, Minor or Negligible. Major is a preferred learning style, Minor is one in which learners can still function well, and negligible is the one that makes the learning process more difficult. When the numerical value was assigned to the corresponding learning style, the numbers were added to obtain a total score and then it was multiplied by 2 determining the major, minor or negligible learning style.

All the results were then analyzed by categorizing them into according to the aforementioned learning style preferences and presented in tables and figures shown in the findings. The researchers' proposed to find out learning styles information. They also wanted to determine if there was a match or mismatch between teaching and learning styles.

Qualitative data as field notes were used to find out information related to learning styles and if there was a match or mismatch between teaching and learning styles. After collecting the data, patterns or coincidences were categorized according to the findings.

Results

Focus Group Students' Learning Styles

In Figure 1, it can be observed the overall findings of all participants included in this study, as well as their preferences and performance in each learning style. It demonstrates that one of the least popular styles was the individual style, though it was not negative. Some of the learners enjoyed working with individuals whereas others preferred groups. The remaining learners had a negligible learning style. They had difficulty when learning alone. It was also confirmed, using in-class observations, when students were asked by their teachers to work individually the students said that they preferred to work in groups rather than individually.

Figure 1 also indicates that the most representative and popular style was the kinesthetic. This means that individuals preferred learning by rehearsing role plays and presenting activities related to movement like mimics, guessing games, touching and expressing their feelings physically in which they performed well. That was corroborated through in-class observations, in the written survey, and in the recorded interview. This finding confirms what other studies have found (Peacock, 2001; Reid, 1995). However, in a study conducted in the Andina area of Colombia, the auditory style was the most prevalent (Aguirre, Cancino, & Neira, 2005).

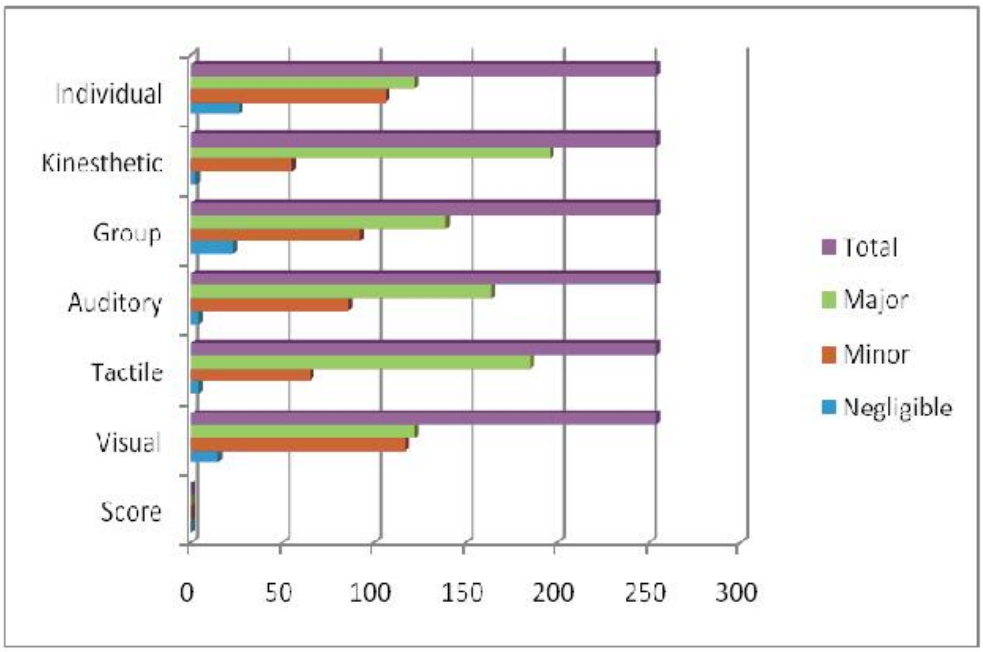

Figure 1
Focus Group: Students' Learning Styles

It was also observed that the majority of learners preferred the group learning style. Some others did not have difficulties when using this style and a few did not prefer it. It was noticed during in-class observations that most teachers asked their students to work individually and forgot to use Group styles in class.

Also it can be seen that the auditory style was the third style preferred by the focus group. There were some who did not have problems with this style and just a few indicated some difficulty when working with this style. Figure 1 also reveals that the tactile was the second learning style that most preferred (major). They had no trouble when using it (minor). This means that individuals learn by doing projects and by using their hands. This is a different finding from other studies done in this field, in which students disfavored the tactile style. Almost half of the group performed well in the Visual style and almost the same quantity of individuals can still function well in that style (minor) and the rest may have difficulty when learning with this style (negligible). The learning styles and the percentages according to major, minor and negligible categorization are presented in Figures 2, 3, 4, 5, 6 and 7.

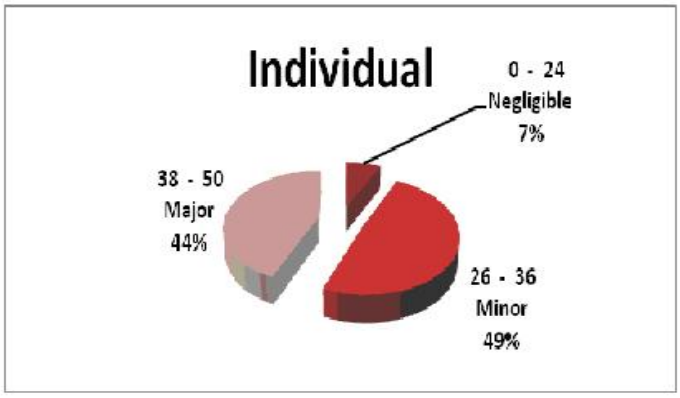

Figure 2
Individual Learning Style: Major, Minor, Negligible

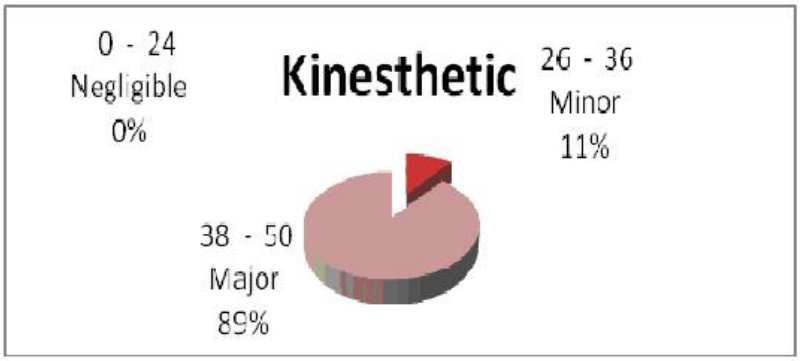

Figure 3
Kinesthetic Learning Style: Major, Minor, Negligible

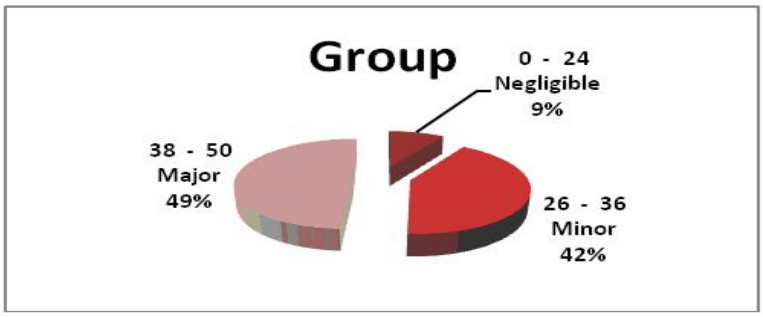

Figure 4
Group Learning Style: Major, Minor, Negligible

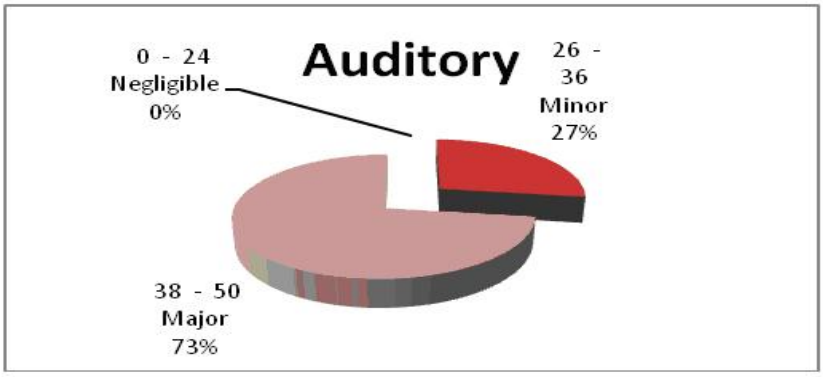

Figure 5
Auditory Learning Style: Major, Minor, Negligible

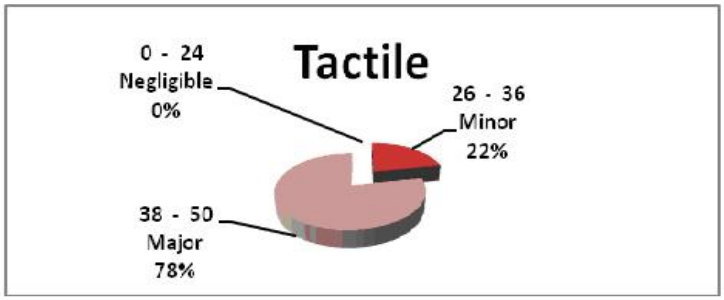

Figure 6
Tactile Learning Style: Major, Minor, Negligible

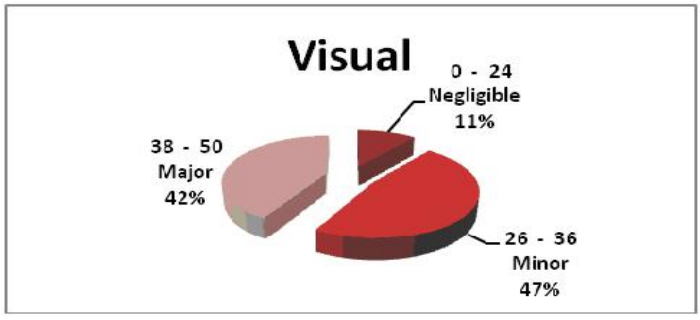

Figure 7
Visual Learning Style: Major, Minor, Negligible

Learning Styles: Negligible, Minor and Major

Negligible. In Figure 8, it is noted that the individual style is the one that students had more difficulty when using it, followed by the group and the visual styles.

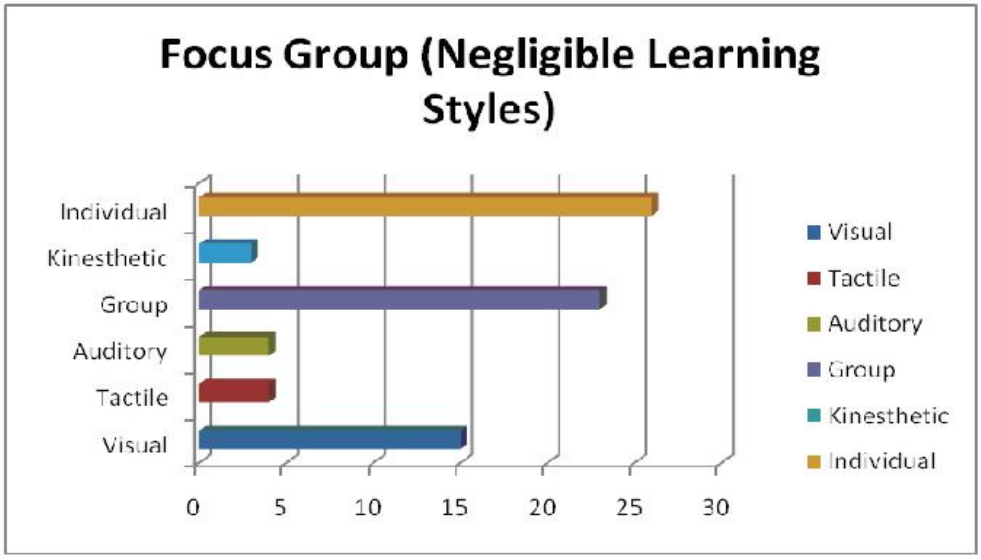

Figure 8
Learning Styles: Negligible

Minor. Figure 9 illustrates that students performed well in the visual style as they did in the individual followed by the group style.

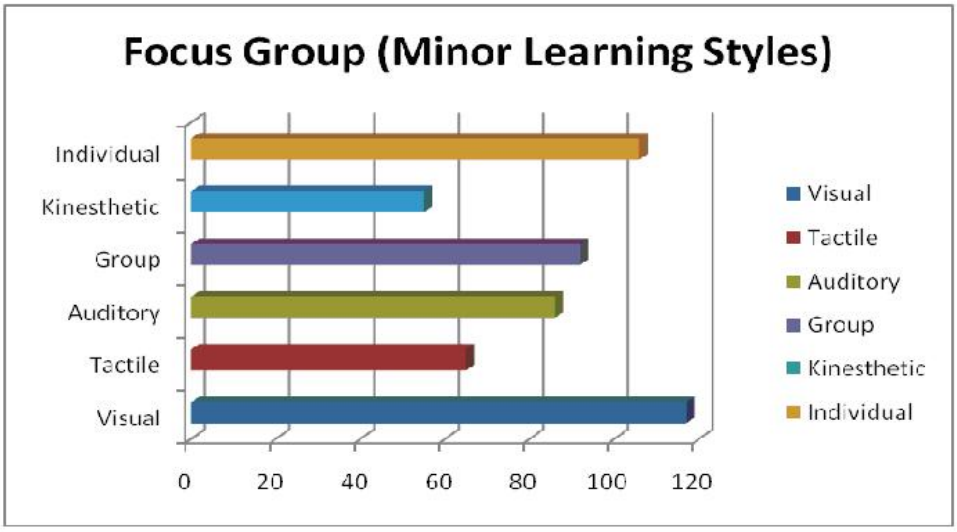

Figure 9
Learning Styles: Minor

Major. It is shown in Figure 10 that the most prevalent learning style in which the students worked without any difficulty was the kinesthetic followed by the tactile and the auditory.

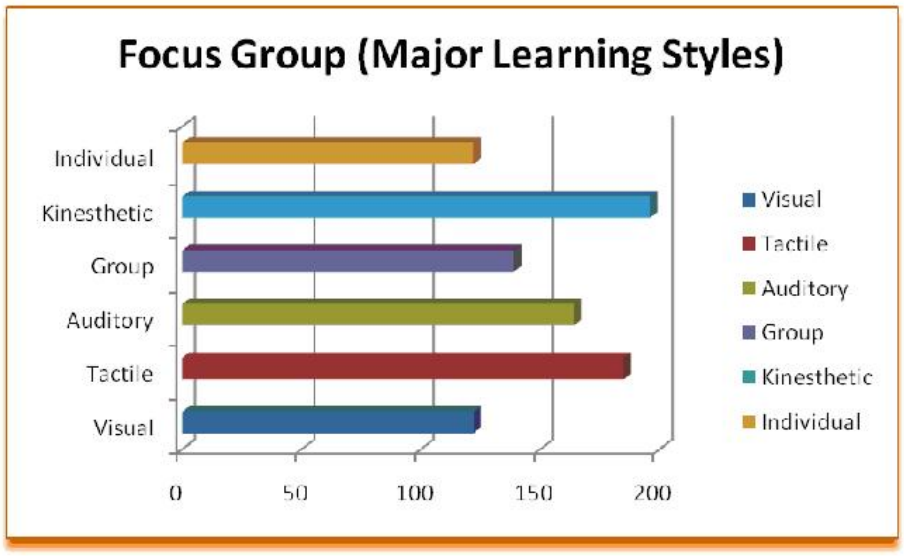

Figure 10
Learning Styles: Major

Students' and Teachers' Learning Styles

As it was mentioned at the beginning of this task, 55 students and 9 teachers were chosen as a target group to study their learning styles. The learning styles of these participants are identified in Figures 11 and 12. Figure 11 presents that the students most representative and popular style was the kinesthetic. Using this style, students can learn by active participation and activities that imply movement. The remaining participants can still manage well in this style. None of the students had difficulties using this style.

It was also noticed that the participants also preferred the tactile style (major) and that none of the students had difficulties when using this style. Learners with this style preference would cut, color, make stick drawings, use photos and pictures, which motivated them since they could use different materials.

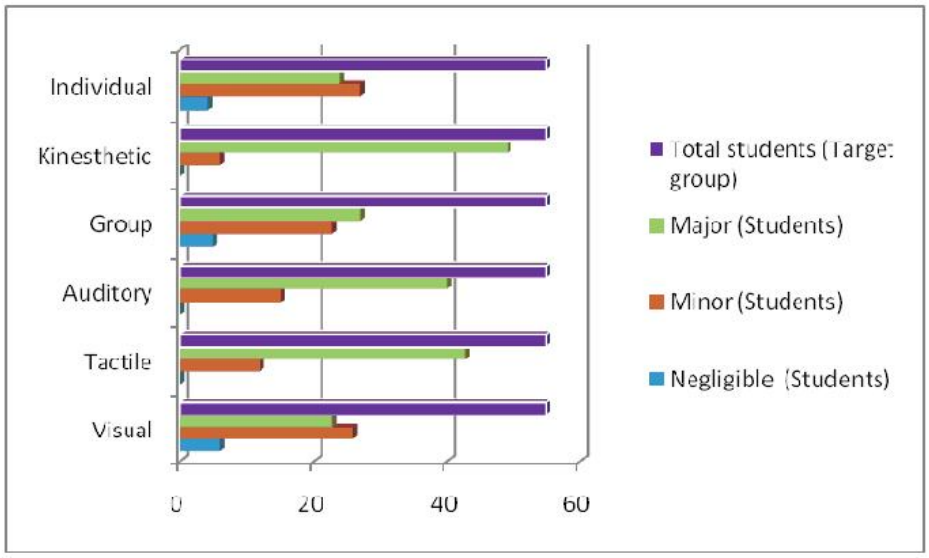

Figure 11
Students' Learning Styles

The auditory style was the third most frequently reported style in both groups (students and teachers). The auditory style means that students enjoy listening activities as well as listening to the teacher and their classmates. Most learners could perform very well in this style. This could be corroborated by class observations when students listened to CDs and activities they video-taped. The others can still function well with this style (minor). No one had difficulty with this style.

Almost the half of the students liked working in groups, sharing ideas, opinions and knowledge (major). While 42% of them can still work well in this learning style (minor), the other 9% had difficulty when learning in groups. Group work was a feature that was not often used by teachers in class observation. Most participants in this research project enjoyed working individually. It was noticed during in class observation that most class activities were developed individually. Although most learners did not have difficulties when learning with this style, there was a smaller percentage that did not learn this way.

Figure 11 also indicates that the least popular learning style was the visual. Some students can still work well in this style (major). Participants are able to learn by seeing things, taking notes, doing projects, translating, writing exercises, oral presentations with posters and reading activities. Some learners had problems when learning this way (negligible). This style was in use and noted during in-class observations when teachers used posters, books, boards, copies and video-taped activities developed by students.

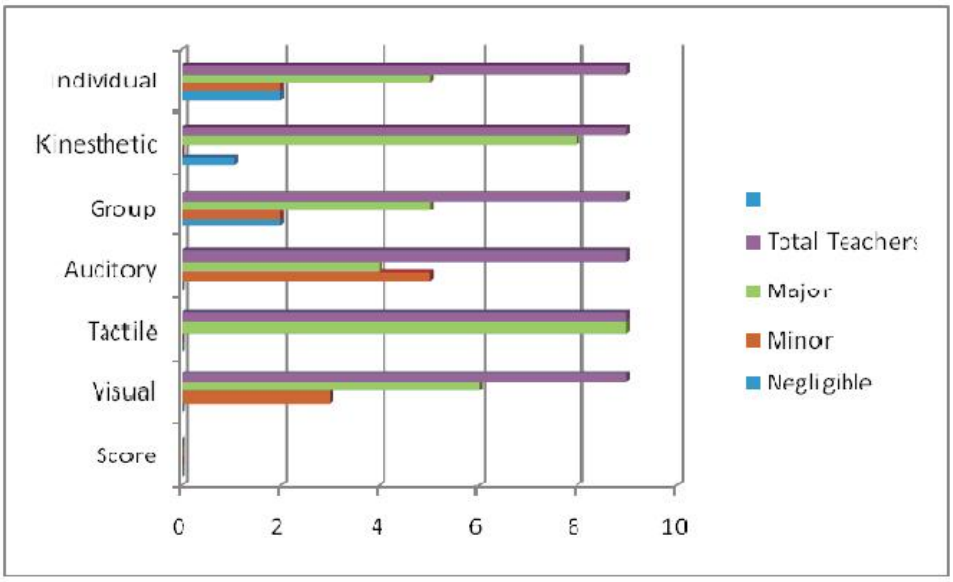

Figure 12
Teachers' Learning Styles

In Figure 12 it is shown that teachers´ most preferred learning styles were the tactile, followed by the kinesthetic and the visual styles. The least representative were the group and the individual learning styles. Although the kinesthetic and tactile styles were the most predominant learning styles among teachers and students, their order is different - Students: kinesthetic and tactile; and, Teachers: tactile and kinesthetic. There was a difference in the third most predominant style. While teachers said they perform well in the visual style, students said the teachers used the auditory style.

Learning Styles: Negligible, Minor and Major

Negligible. Figure 13 indicates that the most negligible learning styles for the students were the individual, group, and visual. These results imply that students may have difficulty when learning using these styles. According to this figure, teachers´ most negligible styles were: visual, group, and individual. None of teachers had difficulty when working with the kinesthetic, tactile, and the auditory styles. Thus, it can be concluded that students´ and teachers´ most negligible learning styles were the same.

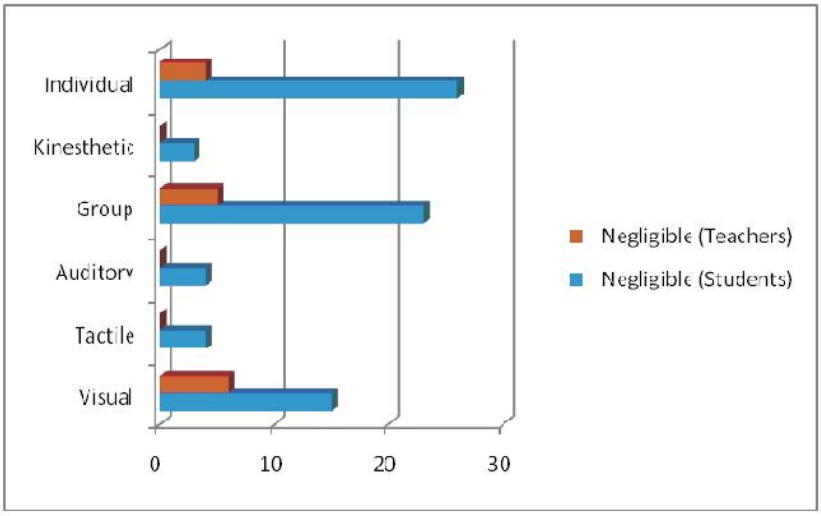

Figure 13
Learning Styles: Negligible

Minor. In Figure 14, the most prevalent learners´ minor learning styles were: individual, visual and group while the teachers´ were: auditory, visual and group.

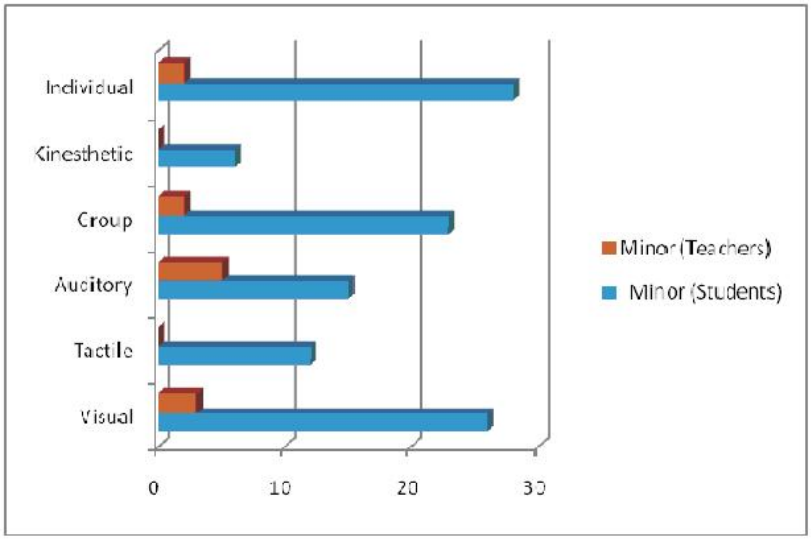

Figure 14
Learning Styles: Major

The major learning styles, the ones students preferred the most, were: the kinesthetic style, the tactile and the auditory styles whereas the teachers preferred the tactile, the kinesthetic and the visual styles (see Figure 15).

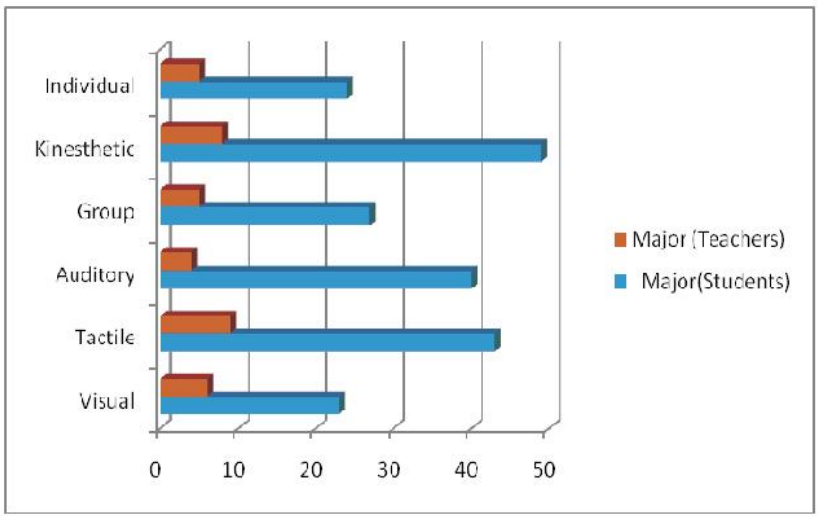

Figure 15
Learning Styles: Major

Although the tactile and the kinesthetic styles had the highest rates, most teachers did not use them enough as was noticed in class observations. This finding was also corroborated by students in the interviews. Figures 16 and 17 reinforce that most teachers barely used activities relating to movement, constructing things, taking notes or doing projects.

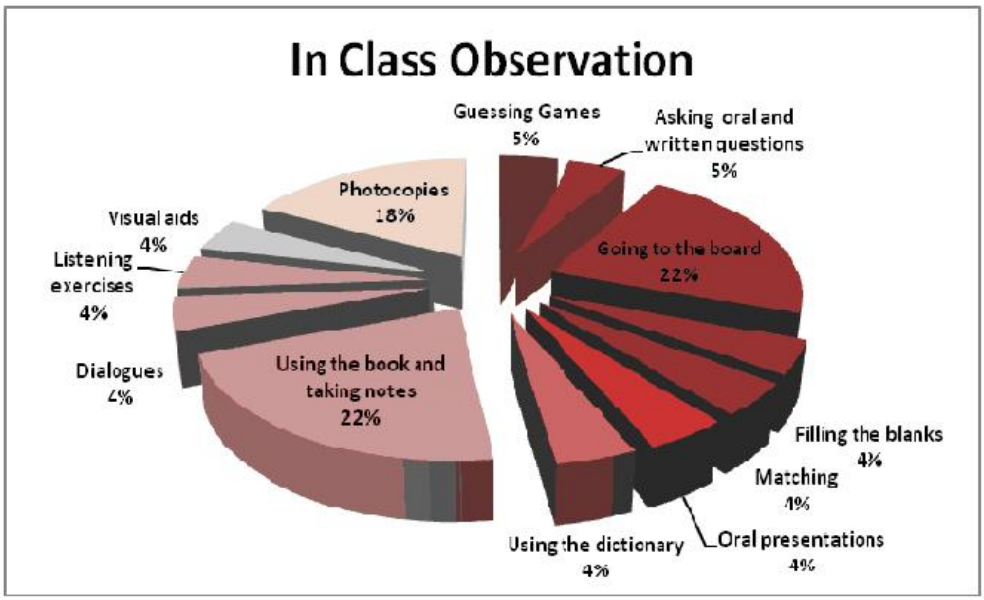

Figure 16
Observations: Tactile and Kinesthetic

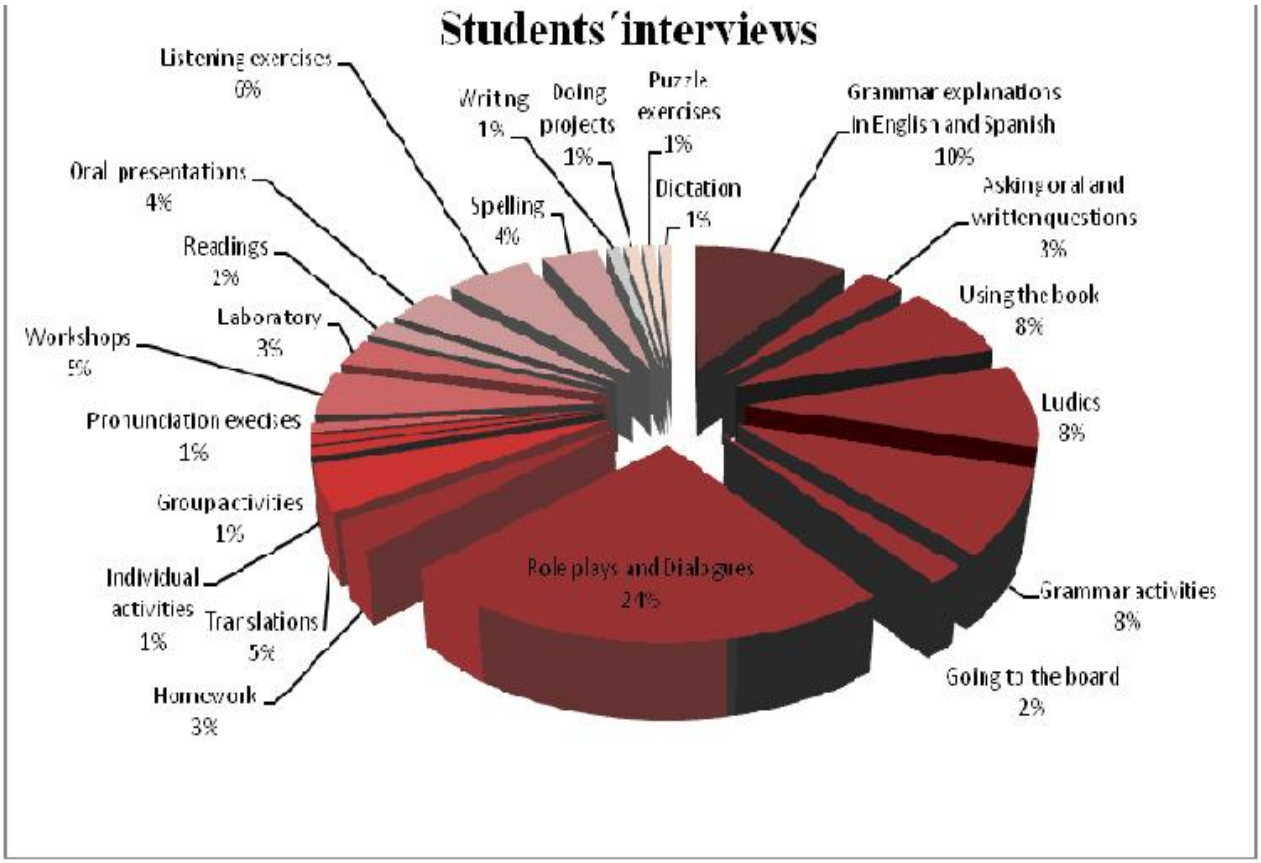

Figure 17
Interviews: Students

Match or Mismatch of Learning Styles

According to the activities developed in class, only three out of fifteen were kinesthetic and tactile. For this reason, it can be concluded that there was no match between learners' learning styles and teachers' teaching styles. It was also observed that teachers used auditory style in most of their classes. Most of the teachers did not apply group work in class; however, this is contrary to student interviews.

Kinesthetic and tactile styles were the most prevalent ones in the group and they were not used by teachers; however, students felt satisfied with the activities carried out inside the classroom as was indicated in the interviews. It was noted that most teachers chosen for this research study did not pay attention to the type of activities they developed in class. Even more, they did not take into account students´ learning styles and they may have selected an activity without considering the students' learning styles.

Pedagogical Implications

Recent studies have shown that a match between teaching and learning styles helps to motivate students in the process of learning. It is recommended that teachers do the following:

- Identify their own teaching styles as well as their learning styles in order to reflect about classroom practices to obtain better results in the classroom.
- Balance the teaching styles and adapt activities to meet students´ style.
- Induce students to adopt a deep approach to learning.
- Assign a variety of learning tasks to address learning goals.
- Encourage tasks variation and creativity to enable learners to challenge the beliefs in the way they learn and acquire knowledge.
- Get involved in this type of research to assure the results found in this research study.

References

Aguirre Linero, E., Cancino, M. & Neira, L. (2005). *Dinamización de los procesos de enseñanza y aprendizaje de las lenguas extranjeras a partir de los estilos de aprendizaje.* http://www.tareas.wikiole.com.

Dunn, R., & Dunn K. (1993). Learning styles/teaching styles: Should they…can they…be matched? *Educational Leadership, 36*, 238-244.

Felder, R., Felder,G., & Dietz, E. J. (2002). The effects of personality type on engineering student performance and attitudes. *Journal of Engineering Education, 21*(1), 103-112.

Felder, R. (1995). Learning and teaching styles in foreign and second language education. *Foreign Language Annals, 28*(1), 21-31.

Funderstanding. (2008). Retrieved on April 11, 2008 from http// www.fundrestanding.com/learning_styles.com.

Gardner, H. (1983). *Frames of minds: The theory of multiple intelligences*. New York: Basic Books, Inc.

Gilbert , J., & Swanier, C. (2008). Learning styles: How do they fluctuate? *Institute for Learning Styles Journal, 1*, 29-40.

Gringerenko, E. L., & Sternberg, R. J. (1995). Thinking styles. In D. H. Saklofske, & M. Zeidner (Eds), *International Handbook of Personality & Intelligence(*pp. 205-230). NY: Plenum Press.

Honey, P., & Mumford, A. (1992). *The manual of learning styles.* Maidenhead: Peter Honey.

Kinsella, K. (1996). Designing group work that supports and enhances diverse classroom work styles. *TESOL Journals, 6*(1), 24-31.

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

Mattews, D. B. (1991). The effects of learning styles on grades of first-year college students. *Research in Higher Education, 32*(3), 253-268.

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

Oxford, R., and Others. (1992). Language learning style & strategies in the multicultural, tertiary L2 classroom. *System*, *20*(4), 439-456.

Oxford, R., & Ehrman, M. (1993). Second language research on individual differences. *Annual Review of Applied Linguistics, 13*, 188-205.

Peacock, M. (2001). Match or mismatch? Learning styles and teaching styles in EFL. *International Journal of Applied Linguistic, 11(*1). 20.

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

Reid, J. (1995). *Learning Styles in the EFL/ESL Classroom.* Heinle & Heinle Publisher.

Riding, R., & Douglas, G. (1993). The effect of cognitive style & mode of presentation on learning performance. *British journal of Educational Psychology, 63*, 297-307.

Sims, R., & Sims, S. (1995). (Eds). *The importance of learning styles: Understanding the implications for learning, course design and education.* Westport, CT: Greenwood Publishing Group, Inc.

Tripp, O., & Moore, S. (2007). Examination of pre-service teachers´ learning styles and temperament styles within an elementary science methods course. *Institute for Learning Styles Journal, 1,* 23-33.

Wilson, V. (1998) *Learning How They Learn: A Review of Literature on Learning Style*. Eric Document.

Zhenhui, R. (2001). Matching teaching styles with learning styles for ESL/EFL instruction. *The Internet TESL Journal, VII*(7).

Computer-Related Stress and Learning Styles among Elementary School Teachers

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Abstract

Ninety-four elementary school teachers from southern Parochial schools were surveyed using a learning style inventory to categorize learning style as visual, auditory or kinesthetic and Hudiburg's updated Computer Technology Hassles Scale. Participation in the study was voluntary and was solicited through school principals. Groups of teachers organized by learning style were formed. Multivariate comparison of these groups based upon five stress variables suggested that computer stress, particularly that related to Computer System Performance Concerns, was associated with the learning style of the teacher's who were visual learners.

Introduction

Technology integration in the classroom is dependent upon the classroom teacher. There are factors, including personal, behavioral and environmental factors, which influence the use of technology by teachers (Dusick, 1998). As more and more virtual schools come into existence (Archambault & Crippen, 2009), so does the need for teachers who are competent and comfortable using and teaching with technology. Is there a relationship between the learning styles of teachers and the level of computer stress that they experience? If a relationship can be identified between learning styles and computer stress then the manner in which teachers learn can be targeted in such a way that computer stress can be minimized.

There are several different theories concerning learning styles. For this study, the Visual, Auditory, and Kinesthetic (VAK) model of learning styles was used. This approach to learning styles includes three basic categorizations: visual, auditory, and kinesthetic. The visual learner's predominate approach to learning is by watching, observing or creating a visual representation. The auditory learner's dominate approach is from listening or speaking. The kinesthetic learner's dominate approach is through the use of the sense of touch and movement (Heaton-Shrestha & Gipps, & Edirisingham, & Linsey, 2007).

Computer anxiety has been defined as emotional fear, apprehension and phobia felt by individuals towards interactions with computers or towards the thought of using

computers (Wang, 2007). Computer anxiety is a barrier to computer use (Christensen, 2002). A study of elementary teachers indicated that computer anxiety prevents teachers from using technology (Clark, 2000).

Identifying the barriers to technology integration in education is an important step in being able to address these barriers. A recent study noted the barriers to technology integration as being availability and access to computers, availability of curriculum materials, teachers beliefs, demographic characteristics of teachers, teachers' technological and content knowledge, and technical, administrative, and peer support (Lowther, Inan, Daniel Strahl, & Ross, 2008). No mention of learning styles or computer stress was made. Perhaps the manner in which one learns can be a barrier to technology integration and thus the need for this study is to see if there is a relationship between learning styles and the amount of stress that is experienced in using a computer.

Method

Sample - The sample for this study was composed of ninety-four elementary school teachers from southern Parochial schools. The teachers who participated in this study did so voluntarily. All of the teachers had participated in some type of professional development related to technology integration during the course of the semester in which they responded to the survey.

Measures – The subjects responded to two instruments: The Computer Technology Hassles Scale and the VAK Learning Styles Self Assessment Questionnaire (Chislett & Chapman, 2005; Hudiburg, 1989, 1992). The Computer Technology Hassles Scale is an index of computer-related stress. Hudiburg (2005) has released a revised and expanded version of this scale which has been updated to incorporate stressors related to recent technologies including the Internet. This revised scale is a 71 item list of potentially irritating instances associated with computers and computer use (e.g. "computer hardware failure", "lack of computer expertise", and "busy website"). Each item requires a response to severity, with potential responses "not at all" (recorded value=0), "somewhat severe"(value=1), "moderately severe"(value=2), and "extremely severe" (value 3). This scale yields two numerical scores. The number of scale items selected beyond the option "not at all" indicates the extent to which a respondent views computer interaction as a hassle and the average value of the responses indicates the severity of the computer hassles. Factor analytic work (principal components, varimax rotation) by Hudiburg (2005) identified three factors. Subscale scores in this study are based upon the 15 highest loading items on each factor. The subscales are Computer system performance concerns, Computer skills and information concerns, and Computer Internet use concerns. Reliabilities (Cronbach's alpha) of .9542, .9413, and .9127 are reported for these factors respectively. Values in this sample were .90, .90 and .92, respectively.

The VAK Learning Styles Self-Assessment Questionnaire (Chislett & Chapman, 2005) is a 30-item survey which permits the assignment of a respondent to one of three learning styles: visual, auditory, or tactile learning style. In this survey, thirty different settings are posed and respondents select a solution which is tied to one of the three learning styles. For the thirty items, the learning style most often selected determines the learning style label assigned to that individual. It is possible for a respondent to mark responses tied to two (or three) learning styles with equal frequency and not be considered to have a single learning style.

Procedure – The ninety-four volunteer participants responded to both the Computer Technology Hassles Scale and the VAK Learning Styles Self Assessment Questionnaire. A group of 14 respondents were labeled auditory learners, identified by marking more responses indicating an auditory learning style to the questionnaire items than any other type of response. Similarly, groups of visual learners (n = 56) and tactile learners (n = 18) were identified. Only respondents who were clearly identified as having a single dominant learning style were used in this study. Six respondents who marked the same number of items indicating two or more learning style indicators were not cast into groups and were not used in the analyses.

Analyses – Multivariate analysis of variance was used to compare the vectors of the five dependent measures (the number of hassles, average intensity of the selected hassles, and the three subscale scores from the Computer Technology Hassles Scale) taken as a group for the three groups of learning styles (auditory, visual, and tactile). A significant multivariate F-ratio (Finn & Bock, 2002) was calculated for the three learning style groups ($F\ 10, 162 = 3.5018$, $p < .05$) which indicates that the sets of dependent measures likely differ for the three groups: auditory learners, visual learners, and tactile learners. Tables 1 and 2 display the means and standard deviations of the five dependent measures taken from the Computer Technology Hassles Scale data. Pearson correlations appear in Table 3. These results suggest that, with regard to the learning style, respondents to the Computer Technology Hassles Scale score differently on measures of computer stress.

Univariate ANOVA's comparing the three groups (auditory, visual, and tactile) on each of the five dependent variables (the number of hassles, average intensity of the selected hassles, and the three subscale scores from the Computer Technology Hassles Scale) separately, revealed a statistically significant difference on only the CTHS subscale 1: Computer System Performance ($F\ 2, 85 = 5.30$, $p < .01$). Further analysis of the differences among the three groups on this CTHS factor using the Scheffe method of multiple comparisons (Glass & Stanley, 1970) revealed that only the average difference between the visual learning style group and the auditory learning style group was statistically significant at $p < .05$. This result is unlike results reported earlier by Ballance (2008) when the learning style groups were not different. This distinction may be due to

differences between the groups studied. The present study examined responses from a very homogeneous group of elementary teachers from southern Parochial schools, while the earlier work considered current college level students from diverse backgrounds with different college majors.

Results – A small statistically significant difference was detected among the visual, the auditory, and the tactile learners tied to the CTHS subscale measuring concerns about computer performance. This difference did not appear in a similar study conducted earlier by Ballance (2008). It is possible that measurement using these scales should be conducted on homogenous groups to increase the likelihood of detecting differences that may be hidden when subjects have widely differing backgrounds and experiences. Earlier work by Hudiburg (1990), Ballance and Rogers (1991), and Ballance and Ballance (1992; 1993; 1996) affirmed the position that computer-related stress is not a by-product of increased interaction with computers. This study, like recent work by Ballance (2008), suggests that computer stress is not tied to the preferred learning style of the subject and that visual learners, auditory learners, and tactile learners appear to manifest computer-related stress in similar ways. Finding that learning style groups differ, in this study, on one of the subscales of the Computer Technology Hassles Scale, when the groups were composed of students that are more highly similar than those studied in the past suggests that more research in the use of learning style groups to explain behaviors associated with the use of technology may be useful in explaining the variability among the measures indicative of computer related stress.

Table 1
Means and Standard Deviations of Number and Intensity of the Hassles Selected

Learning Style	No. Hassles		Intensity	
	M	SD	M	SD
Auditory	31.1	19.7	1.2	0.4
Tactile	38.2	17.1	1.5	0.5
Visual	35.6	22.8	1.5	0.4

Table 2
Means and Standard Deviations of Three Subscale Scores

Learning Styles	Computer System Performance		Skills/Information Concerns		Internet Concerns	
	M	SD	M	SD	M	SD
Auditory	14.5	5.8	4.6	4.2	4.8	4.6
Tactile	16.7	5.3	6.6	4.0	6.5	4.3
Visual	19.7	5.9	6.4	5.5	6.0	5.3

Table 3
Pearson Correlations among the Study Variables

Concerns	Number	Intensity	System Per.	Skills Concerns	Internet
Number Hassles	1.00000				
Ave Hassle Intensity	0.56407	1.00000			
System Performance	0.84880	0.67262	1.00000		
Skills Concerns	0.90600	0.66166	0.80961	1.00000	
Internet Concerns	0.89848	0.68275	0.82381	0.90744	1.00000

(all correlations significant, $p<.01$)

References

Archambault, L., & Crippen, K. (2009, Summer 2009). K--12 Distance Educators at Work: Who's Teaching Online Across the United States. *Journal of Research on Technology in Education, 41(*4), 363-391. Retrieved July 8, 2009, from Academic Search Premier database.

Ballance, C. T., & Ballance, V. V. (1992). Psychology of computer use: XXVI. Computer related stress and in-class computer usage. *Psychological Reports, 71*, 172-174.

Ballance, C. T., & Ballance, V. V. (1993). Psychology of computer use: XXVII. Relating self-rated computer experience to computer stress. *Psychological Reports*, *72*, 680-682.

Ballance, C. T., & Ballance, V. V. (1996). Psychology of computer use: XXXVII. Computer-related stress and amount of computer experience. *Psychological Reports*, *78*, 968-970.

Ballance, C. T., & Rogers, S. U. (1991). Psychology of computer use: XXIV. Computer related stress among technical college students. *Psychological Reports*, *69*, 539-542.

Ballance, C. (2008, June). Computer-related stress and learning style. *Psychological Reports*, *102*(3), 678-682. Retrieved July 23, 2009, doi:10.2466/PR0.102.3 .678-682

Chislett, V., & Chapman, A. (2005). VAK Learning Styles Self-Assessment Questionnaire. Retrieved June 26, 2006 from http://www.businessballs.com.

Christensen, R. (2002, Summer). Effects of Technology Integration Education on the Attitudes of Teachers and Students. *Journal of Research on Technology in Education*, *34*(4), 411. Retrieved July 13, 2009, from Teacher Reference Center database.

Clark, K. (2000, Winter). Urban Middle School Teachers' Use of Instructional Technology. *Journal of Research on Computing in Education*, *33*(2), 178. Retrieved July 13, 2009, from Academic Search Premier database.

Dusick, D. M. (1998). What Social Cognitive Factors Influence Faculty Members' Use of Computers for Teaching? A Literature Review. *Journal of Research on Computing in Education, 31*(2), 123.

Finn, J., & Bock, D. (2002). MULTIVARIANCE for Windows (Windows Version 8.01) Mooresville, IN: Scientific Software International.

Glass, G. V., & Stanley, J. C. (1970). *Statistical Methods in Education and Psychology.* Englewood Cliffs: Prentice-Hall, Inc.

Heaton-Shrestha, C., Gipps, C., Edirisingha, P., & Linsey, T. (2007, December). Learning and e-learning in HE: the relationship between student learning style and VLE use. *Research Papers in Education*, *22*(4), 443-464. Retrieved July 13, 2009, doi:10.1080/02671520701651797

Hudiburg, R. A. (1989). Psychology of computer use: VII. Measuring technostress: Computer related stress. *Psychological Reports*, *64*, 767-772.

Hudiburg, R. A. (1990). Relating computer-associated stress to computerphobia. *Psychological Reports*, *67*, 311-314.

Hudiburg, R. A. (1992). Factor analysis of the Computer Technology Hassles Scale, *Psychological Reports*, *71*, 739-744.

Hudiburg, R. A. (2005). Scale analysis of a revision of the Computer Hassles Scale, a paper presented at the 82nd Annual Meeting of the Alabama Academy of Sciences, March 31, 2005, Birmingham, Alabama.

Lowther, D., Inan, F., Daniel Strahl, J., & Ross, S. (2008, September). Does technology integration "work" when key barriers are removed?. *Educational Media International*, *45*(3), 195-213. Retrieved July 21, 2009, doi:10.1080/09523980802284317

Wang, Y. (2007, November). Development and validation of a mobile computer anxiety scale. *British Journal of Educational Technology*, *38*(6), 990-1009. Retrieved July 13, 2009, doi:10.1111/j.1467-8535.2006.00687.

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