

Notes

**A Pilot Analysis of the Role of Learning Styles
in Online Learning Environments:
The Case of an American Pacific Island University**

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Abstract

Students generally learn by reading, hearing, and experiencing. Which of the learning styles are likely to be most compatible with online learning? Keeping this question in mind, the author conducted a study using a two-step procedure. Students in an educational psychology course offered during summer 2010 took a learning style inventory first and then completed a questionnaire about online learning. Students in this sample exhibited the homogeneity of learning styles common among today's college students, and yet, also demonstrated in common the characteristics for successful online learning or distance education. The results from this study are one indication of the influence of learning-style preferences in today's online learning environments, but only a beginning.

Key words: higher education, learning styles, learning style inventory, online learning styles

Introduction

Because there is generally no one looking over your shoulder in a distance learning class, students need to be motivated and self-directed.... Another important element is a comfort level with computers. Although current online learning systems are made to be user-friendly, it helps to have a basic comfort level with using a computer to search the web, send email and perform other basic functions. (SUCCESSDEGREES.COM 2010)

Online learning or distance education is becoming an important long-term strategy for many institutions of higher education around the world. It is evidenced by the fact that over 80% of educational institutions in the United States offer some form of online education;

nevertheless, “attrition from these programs is reaching epidemic proportions, and if educational institutions are to fulfill their commitment to offer courses equivalent to their traditional counterparts, they must investigate ways to address the learning needs and the styles of different types of learners” (TERRELL 2005: 5). Furthermore, by examining the learning styles (approaches or ways of learning) of online students and the corresponding levels of students’ engagement, an instructor can include in the online course the components necessary to support student learning (GARLAND and MARTIN 2005).

Even at an American Pacific island university, where I have been teaching since 1997, online courses are increasing every year. Because of its multiple visual and audio elements, online learning environments have become more and more popular for teachers and learners (HSIEH and DWYER 2009). It is also believed that, in comparison with traditional classroom instruction, online learning allows for more flexibility in adapting to any learning situation or style. This belief strongly motivated me, as a teacher education faculty member, to conduct an analysis of the role of learning styles in students’ responses to online learning environments. This paper thus reports the analysis: a case study of students in the School of Education at the University of Guam enrolling about 3,500 students, with approximately 200 faculty members, who represent diverse Pacific and Asian ethnicities.

Review of the Literature

An overview of learning styles

As college professors or school teachers, we educators are very much interested in students’ learning styles. The term “learning styles,” which has been popularly used in educational psychology, “refers to the concept that individuals differ in regard to what mode of instruction or study is most effective for them.... The learning-styles view has acquired great influence within the education field, and is frequently encountered at levels ranging from kindergarten to graduate school” (PASHLER *et al.* 2009: 105). Most simply conceived, in SMITH and DALTON’s (2005) words, learning style is the typical way an individual likes to go about learning. Although there are characteristics of learning style that are quite stable in an individual across different learning tasks and contexts, there can still be variation in the same learner. Most learning styles taxonomies are ‘type’ theories: “they classify people into supposedly distinct groups, rather than assigning people graded scores on different dimensions” (PASHLER *et al.* 2009:107).

Educators investigate styles to devise complementary learning environments and to teach students more adaptive styles in order to enhance learning and motivation (SCHUNK 2008: 306). Learning styles involve individual variations in ways of perceiving, organizing, processing, and remembering information. The terms “learning styles” and “cognitive styles” are “often used interchangeably: “both operate without the individual’s awareness and are assumed to be less amenable to change and conscious control” (HOWLES 2009: 4). HOWLES provides definitions of several different terms: *cognitive style* (an innate habitual approach to processing information when engaging in cognitive tasks such as problem

solving, thinking, and remembering); *learning style* (an innate pattern of thinking, problem solving, and remembering when approaching a learning task); *learning strategy* (a chosen plan of action in how to approach a given learning task; individuals are usually conscious of strategies); *learning preference* (an expressed personal preference favoring one type of learning environment, method of teaching or instruction over another); and *learner aptitude* (innate capacities that give rise to competencies in dealing with specific types of content: musical sounds, interpersonal relations, and body movement).

Criticisms of learning styles

Although more than 30 different learning styles have been identified by various researchers, it is generally agreed upon that none of them have been empirically validated: learners' characteristics (e.g., prior knowledge, motivation, confidence, and innate talents) may not be as appealing as global learner traits such as styles (HOWE *et al.* 1998). Kolb's model, for instance, explains that the ideal learning process engages four stages: concrete experience; abstract conceptualization; reflective observation; and active experimentation. Like many other models, Kolb's model has been also criticized, as some argue that this model does not adequately address the process of reflection (HOWE *et al.* 1998). The relationship between the learning process and knowledge acquisition seems to be more complex than Kolb has theorized. Speaking of reflection, it is true indeed that: "everybody is active sometimes and is reflective sometimes: a balance of the two is desirable. If you always act before reflecting you can jump into things prematurely and get into trouble, while if you spend too much time reflecting you may never get anything done" (FELDER and SOLOMAN n. d.: 1). Moreover, FELDER and SOLOMAN's words:

In most college classes very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts. Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class. (p. 2)

The above observation seems to be exaggerated, even though traditional classrooms rely on book-based teaching. Educational technologies—such as multimedia, PowerPoint slides, and Web sites—are commonly used in contemporary college classes. Many textbooks are accompanied with a CD that contains video segments of chapters in the textbook. Instructional methods using multimedia and technology create "visual" learning environments, enabling student-centered approaches to teaching and learning. At their best, these methods permit students to utilize visual materials in whichever way works best for them.

In any case, the concept of learning styles may be among the most frequently misunderstood in today's educational communities; and, one of the reasons for this misunderstanding "is the complexity of how the human brain functions as it relates to one's modalities in receiving information (visual, aural, kinesthetic) and how the brain processes

that information (cognition)” (HOLDEN and WESTFALL 2010: 3).

Predominant learning styles

Visual (reading, seeing), auditory (listening, speaking), and tactile (doing) are considered to be the three predominant learning styles: reading, seeing, and listening are the passive modes; and speaking and doing are the active modes. There are thus *listening* learners, *seeing* learners, and *experience-based* learners. Most people perhaps learn best through a combination of these three styles. Yet, SHIRLEY’s (n. d.) description, as follows, is intriguing: Listening learners heard their mother, believed the information, and never touched a stove; seeing learners watched their brother touch the stove, and never touched it; and experience learners touched the stove, but only once. In online classes, all are so related as to perform effectively: “There is a lot of passive learning done through reading textbooks, listening to audio clips, and seeing graphics, but the active speaking mode is done very much through writing, emailing, and chatting... they learn more in online classes than traditional settings” (LEARNING STYLES n. d.: 2).

“Online” learning styles

Online learning has at least five benefits: 1) enhancing student-to-student and faculty-to-student communication (students experience a sense of equality, and instructors are more acceptable); 2) enabling student-centered teaching approaches (accommodate different learning styles, and providing opportunities for exploration); 3) providing 24/7 (24 hours a day, 7 days a week) accessibility to course materials (continual access to materials, and removing reliance on physical attendance); 4) providing just-in-time methods to assess and evaluate student progress (online assessment tools provide instructors with many ways to compile information quickly and easily); and 5) reducing the amount of faculty time spent on “administrative” tasks (use time effectively, and maximize the classroom experience) (BLACKBOARD INC. 2000).

Graf *et al.* (2010) investigated the navigational behavior of 127 students in an online course within a learning management system, finding that active learners went more frequently to the discussion forum but checked only a few pages there, while reflective learners seem to go less frequently to the forum, but if they are there they read many postings. Resubmitting exercises and jumping from content objects to conclusions are typical navigation patterns for active learners, but not for reflective learners. HSIEH and DWYER (2009) focused on the effects of online reading strategies and learning styles on students’ academic achievements.

Their findings include: not all types of reading strategies are equally effective in facilitating different learning objectives; and even though different reading strategies may be structurally different, they are functionally identical in terms of the cost and amount of time required for student interaction. TERRELL’s (2005) study using Kolb’s model and its learning styles have indicated that there was no significant difference in learning styles between graduates and non-graduates from their doctoral program, and that the average learner balanced their preferred learning styles with the skills needed to succeed in the

online environment.

Beyond computer literacy skills, successful online learners have at least five characteristics in common: they 1) do just as well without people looking over their shoulders (self-motivated); 2) never or rarely procrastinates (do not wait until the last moment to write papers); 3) have good reading comprehension skills (can comprehend texts without the direct guidance of a teacher); 4) can resist constant distractions (know how to filter out the constant disturbances that threaten the study progress); and 5) feel alright about missing the social elements of traditional schools and are comfortable with the current social situation (LITTLEFIELD 2010).

Data and Method

Most students learn by listening to lectures and taking notes, but the majority of online students are expected to master the study materials through mostly reading alone. Therefore, the question was: Which of the learning styles are likely to be most compatible with online learning?

Step1: Online learning style inventory

Participants in this study were twenty undergraduate students in an educational psychology course I taught in summer 2010. They participated in a two-step procedure. As stated earlier, visual, auditory, and tactile styles are the three predominant types of learning styles. The participants completed the Online Learning Style Inventory (see Appendix A) developed by researchers at the PENNSYLVANIA STATE UNIVERSITY (n. d.) (This inventory was used with the University's permission.) The 24 self-assessment items in the Inventory were based on three response options (seldom, sometimes, and often). The items include: "I can remember more about a subject through the lecture method with information, explanation, and discussion"; "I prefer information to be presented with the use of visual aids"; and "I like to write things down or to take notes for visual review." According to the description of the Inventory: visual learners (look at materials and practice visualizing words or concepts in their head); auditory learners (listen and take notes, reviewing notes frequently; and recite materials aloud); and tactile learners (trace words as they are saying them: facts that must be learned should be written several times). Results from this sample indicated that 18 were visual learners (who would like to write everything for frequent and quick visual reviews), and 2 were auditory visual learners (who prefer a combination of auditory and visual learning styles). None of them were tactile learners.

According to SILVERMAN (2003), an *auditory learner* is a step-by-step learner, is an analytical thinker, attends well to details, follows oral directions well, can write quickly and neatly, is well organized, can show the steps of work easily, has good auditory short-term memory, may need some repetition to reinforce learning, learns well from instruction, learns in spite of emotional reactions, and is academically talented. In contrast, a *visual learner* is a whole-part learner, is a good synthesizer, sees the big picture (may miss

details), reads maps well, is much “better at keyboarding” than handwriting, creates unique methods of organization, arrives at correct solutions intuitively, has good long-term visual memory, learns concepts permanently (does not learn by drill and repetition), develops his or her own methods of problem solving, is very sensitive to teachers’ attitudes, and is creatively, technologically, or mechanically gifted.

Step 2: Online learning questionnaire

Now the question was: How do visual learners describe themselves in answers to the online learning questionnaire? Participants completed the Online Learning/Distance Education Questionnaire developed by the Center for Study of Learning and Performance at CONCORDIA UNIVERSITY (2004) (This questionnaire was used with the Center’s permission) in order to investigate learners’ attitudes toward distance education and online courses based on their learning approach preferences including use of computers. Among 26 question items in the Questionnaire, six items (e.g., “I can practice English grammar during Internet activities outside of class”) that did not fit for the present study were eliminated. The original response options (4 = *strongly agree*; 3 = *agree*; 2 = *disagree*; and 1 = *strongly disagree*) were changed to the following response options: 4 = *a lot like me*; 3 = *like me*; 2 = *a little like me*; and 1 = *very little like me*. The reliability coefficient alpha across the 20 items was .840, suggesting that all the items were measuring the same thing. Regarding demographic information, 17 were female and 3 were male; and 11 were traditional aged (18-22): 6 (23-27); 1 (28-32); and 2 (33 or more).

Results and Discussion

As seen in Table 1, overall, the item with “a lot like me” responses was Q1 (85%) followed by Q10 (75%), Q12 (70%), Q2 (65%), and Q7 (55%). The item with “like me” responses was Q3 (60%) followed by Q9 (60%), Q15 (60%), and Q14 (55%). The standard deviations (SDs) for the items with “a lot like me” responses were relatively small, indicating the consistency of responses; but the SDs for the items with “like me” responses were larger (see Table 2). The students of this sample:

- are able to *easily access the Internet* as needed for their studies (M = 3.85; SD = .366)
- possess sufficient *computer keyboarding skills* (M = 3.75; SD = .444)
- feel comfortable *communicating online in English* (M = 3.70; SD = .470)
- are *comfortable communicating electronically* (M = 3.65; SD = .489)
- enjoy *working independently* as students (M = 3.30; SD = .865)
- actively communicate with classmates/instructors *electronically* (M = 2.90; SD = .640)
- like interaction with their instructors and/or teaching assistants (M = 3.05; SD = .759)
- can discuss with classmates during *Internet activities* (M = 3.05; SD = .759)
- are motivated by the material in an *Internet activity* outside of class (M = 2.75; SD = .851)

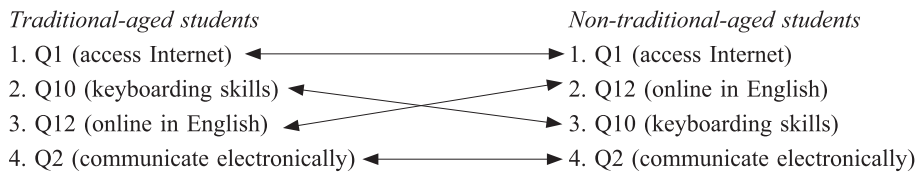
Table 1. Descriptive statistics for students' responses to the online learning/distance education questionnaire.

Self-Descriptive Items	A lot like me	Like me	A little like me	Very little like me
Q1. I am able to easily access the Internet as needed for my studies	17(85%)	3(15%)	—	—
Q2. I am comfortable communicating electronically	13(65%)	7(35%)	—	—
Q3. I actively communicate with my classmates and instructors electronically	3(15%)	12(60%)	5(25%)	—
Q4. I am comfortable with written communication	9(45%)	8(40%)	3(15%)	—
Q5. I am self-disciplined and find it easy to set aside reading and homework time	9(45%)	8(40%)	2(10%)	1(5%)
Q6. I am able to manage my study time effectively and easily complete assignments on time	8(40%)	10(50%)	1(5%)	1(5%)
Q7. As a student, I enjoy working independently	11(55%)	4 (20%)	5 (25%)	—
Q8. As a student, I enjoy working with other students in groups	6(30%)	7(35%)	6(30%)	1(5%)
Q9. I like a lot of interaction with my instructors and/or teaching assistants	5(25%)	12(60%)	2(10%)	1(5%)
Q10. I possess sufficient computer keyboarding skills for doing online work	15(75%)	5(25%)	—	—
Q11. I feel comfortable composing text on a computer in online environments	9(45%)	10(50%)	1(5%)	—
Q12. I feel comfortable communicating online in English	14(70%)	6 (30%)	—	—
Q13. I feel that face-to-face contact with my instructor is necessary to learn	6(40%)	8(40%)	6(30%)	—
Q14. I am motivated by the material in an Internet activity outside of class	3(15%)	11(55%)	4(20%)	2(10%)
Q15. I can discuss with other students during Internet activities outside of class	5(25%)	12(60%)	2(10%)	1(5%)
Q16. I can work in a group during Internet activities outside of class	5(25%)	9(45%)	5(25%)	1(5%)
Q17. I can collaborate with other students during Internet activities outside of class	7(35%)	9(45%)	4(20%)	—
Q18. Learning is the same in class and at home on the Internet	5(25%)	2(10%)	10(50%)	3(15%)
Q19. I believe that learning on the Internet outside of class is more motivating than a regular course	3(15%)	3(15%)	10(50%)	4(20%)
Q20. I could pass a course on the Internet without any teacher assistance	6(30%)	6(30%)	7(35%)	1(5%)

Table 2. Mean/Standard Deviation for students' preparedness for and attitudes toward online learning.

Items	N	Minimum	Maximum	Mean	Std. Deviation
Q1	25	3.00	4.00	3.8500	.36635
Q10	25	3.00	4.00	3.7500	.44426
Q12	25	3.00	4.00	3.7000	.47016
Q2	25	3.00	4.00	3.6500	.48936
Q11	25	2.00	4.00	3.4000	.59824
Q7	25	2.00	4.00	3.3000	.86450
Q4	25	2.00	4.00	3.3000	.73270
Q6	25	1.00	4.00	3.2500	.78640
Q5	25	1.00	4.00	3.2500	.85070
Q17	25	2.00	4.00	3.1500	.74516
Q15	25	1.00	4.00	3.0500	.75915
Q9	25	1.00	4.00	3.0500	.75915
Q13	25	2.00	4.00	3.0000	.79472
Q16	25	1.00	4.00	2.9000	.85224
Q8	25	1.00	4.00	2.9000	.91191
Q3	25	2.00	4.00	2.9000	.64072
Q20	25	1.00	4.00	2.8500	.93330
Q14	25	1.00	4.00	2.7500	.85070
Q18	25	1.00	4.00	2.4500	1.05006
Q19	25	1.00	4.00	2.2500	.96655

The items with the highest percentages of “a lot like me” responses for the traditional aged (18-22) and non-traditional aged (23 or more) students are illustrated below. The patterns of these two groups indicate very similar responses.



Implications

The results from the Questionnaire in this study were *not* new; however, insights drawn from knowledge of how current students make use of the Internet have clarified these results. For many students, the computer has become an important learning “tool” that enhances their performance in the course. The notion that visual-spatial learners will have difficulty excelling in traditional auditory-sequential tasks because these learners are

disorganized may become obsolete. Personal computers seem to be contributed much to enhancing visual learners' abilities to structure such tasks. A laptop computer may replace the pencil and notebook for visually oriented students who wish to take detailed, organized notes, and to absorb the lecture.

Visual learners trust their own eyes. It does appear that computer literacy skills are a "necessity" for visual learners. This is because they *remember* the study materials best when they *see* what is being taught, and they prefer to read printed materials, or to read information in a text or on PowerPoint slides, rather than listening to lectures. That is why visual learners tend to sit where they can see the instructor and the visual aids—even paying attention to the professor's body language and facial expression. Visual learners tend to trust their own "eyes." In this regard, "many university courses now involve elaborate simulations, digital images (both moving and still), and many other techniques to open up whole new areas of learning" (BLIGH *et al.* 2010: 2), and thus, today's visual approach to higher education is tremendously beneficial for visual learners. It is no wonder that "now researchers conclude that 60% of American students are visual dominant learners, 37% are auditory dominant learners, and 3% are kinesthetic dominant learners" (ROGERS 2000: 20). In this study, almost all the students scored as visual learners. One explanation is that they *have to be* visual learners, simply because learning in the contemporary college classroom has itself become more visual.

English is an Internet language. Students in this study have confidence in their English language abilities. They "feel comfortable communicating online in English" (with 100% endorsing either "a lot like me" or "like me" in their responses): this has important implications for how they learn. English became the official language for the people of this Pacific island in 1898. Students on this island today speak English fluently, which facilitates their use of the Internet, where "some 70% to 80% of the world's Internet home pages are in English, compared with 4.5% in German, and 3.1 percent in Japanese" (MCCRUM 2010: 35). In MCCRUM's words, "English is now used, in some form, by approximately 4 billion people on earth—perhaps two thirds of the planet—including 400 million native English speakers" (33). English is not only an international language, but also an Internet language.

Visual learners, including students in this study, love to access to the Internet. Internet use has contributed enormously to the shift from an old learning paradigm, in which learners *receive* knowledge, to a new paradigm in which learners actively *construct* knowledge. At one time, the wealth of information on the shelves of libraries made the library the major source of information for most college students. Now the Internet is the major source of information.

In this course, about 50% of students brought their laptop computers to class. It is evidenced that their computers offered them more advantages than just a fast way of taking notes. For example, I was talking about *eight* forms of intelligence based on Howard Gardner's theory (EGGEN and KAUCHAK 2010), as discussed in the textbook. Suddenly one student raised her hand and said, "Professor, Gardner's work suggests *nine* intelligences now." I asked, "How do you know?" The student replied, "This Internet document says so." This student was doing multiple things at the same time: taking notes, listening to my

lecture, looking at the textbook, observing other classmates, and accessing the Internet for new information (which is possible because of the wireless network). The Internet is even changing students' learning behavior in the classroom.

In their reflection papers, students in this sample described themselves as visual learners. Some representative descriptions, below, highlight the characteristics of this sample:

- I enjoy visual aids because I can remember actions better than what I hear without them.
- I learn best when information is presented in a written language format or visual format.
- I capture the idea by coupling my thoughts with a picture in my head.
- I prefer to use images, pictures, diagrams, charts or colors to organize information.
- PowerPoint slides and videos supplement the text, giving me a deeper understanding.
- I do better in a class if I can look slides, handouts, or even student-teacher interactions.

A chicken-or-the-egg question

Although a classroom lecture might appeal to auditory learners, visual learners may learn more efficiently by reading text, and tactile learners may prefer to collaborate on a group project. This general perspective on different learning styles is still valuable. Nevertheless, today's college teaching and learning are heavily "visually" oriented, and online computer resources are seen as essential for learning. The fact that almost all students in this study were visual learners suggests a "chicken or the egg" question. Were they visual learners by nature, or did they become visual learners because educational materials they engaged in college were so visual?

In American higher education, people have perceived teachers differently at times: at one time, if a student did not learn, then the instructor had failed as a teacher. Now, the emerging consensus is that teachers should be less directive, and act more as facilitators for a student's learning. Online courses make sense given this perspective, and the fact that so many college students are visually oriented. Self-directed learning is necessary in order for a student to succeed in an online course. Online education complements the preferences of visual learners. They generally do not like to work in study groups. Instead, they "enjoy working independently as students" (with 75% endorsing either "a lot like me" or "like me" in their responses), as indicated in this study. Other characteristics of visual learners, such as being much "better at keyboarding than handwriting" (with 100% endorsing either "a lot like me" or "like me" in their responses), having good long-term visual memory, and being creatively, technologically, mechanically, and emotionally gifted, also provide advantages in online learning environments.

Conclusion

The results from this study support O'CONNOR's (n. d.) conclusion, as follows: When the opportunities offered by new technologies are combined with the new view of the learning process provided by learning style research, the promise to revolutionize the teaching paradigms found in the academy begins to gain some direction. And yet, many things about the different ways in which people learn remain to be discovered. Learning itself is dynamic. Online learning, in particular, is a very active and engaged process. The study reported in this paper compared learning styles in terms of cognitive perspectives. Learning involves simultaneously complex psychological, physiological, and emotional elements. It is important to learn how these elements, as the ways in which they differ across different learning styles, contribute to students' responses to online learning environments. This study revealed useful information about the characteristics of online learners. Future research should be draw on larger samples from a diversity of disciplines, in order to provide a more thorough analysis of the role of learning styles in students' responses to online learning. This study is only a beginning, and it is ongoing.

Finally, this preliminary analysis provides evidence that matching instructional approaches to learning styles does not always work well. The evidence commends instead a focus on cognitive styles. This is because "a learning style or modality describes how information enters the brain: visually, aurally, or tactically, whereas cognitive style refers to how the information is processed once the information gets to the brain" (HOLDEN and WESTFALL 2010: 5). Future research should address interventions both to learning styles and to cognitive styles, with systematic comparisons of effects.

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Appendix A

LEARNING STYLE INVENTORY

Instructions: Mark only one that best describes you. Please answer each question as honestly as you can.

QUESTIONS	Seldom	Some- times	Often
1. Can remember more about a subject through the lecture method with information, explanation and discussion			
2. Prefer information to be presented the use of visual aids			
3. Like to write things down or to take notes for visual review			
4. Prefer to make posters, physical models, or actual practice and some activities in class			
5. Require explanations of diagrams, graphs, or visual directions			
6. Enjoy working with my hands or making things			
7. Am skillful with and enjoy developing and making graphs and charts			
8. Can tell if sounds match when presented with pairs of sounds			
9. Remember best by writing things down several times			
10. Can understand and follow directions on maps			
11. Do better at academic subjects by listening to lectures and tapes as opposed to reading a textbook			
12. Play with coins or keys in pockets			
13. Learn to spell better by repeating the words out loud than by writing the word on papers			
14. Can better understand a news article by reading about it in the paper than by listening to the radio			
15. Chew gum, smoke, or snack during studies			
16. Feel the best way to remember is to picture it in your head			
17. Learn spelling by tracing the letters with my fingers			
18. Would rather listen to a good lecture or speech than read about the same material in a textbook			
19. Am good at working and solving jigsaw puzzles and mazes			
20. Play with objects in hands during learning period			
21. Remember more by listening to the news on the radio rather than reading about it in the newspaper			
22. Obtain information on an interesting subject by reading relevant materials			
23. Feel very comfortable touching others, hugging, handshaking, and so on			
24. Follow oral directions better than written ones			

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