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A correlation study of learning preferences and attitudes towards computers in fourth grade students

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A CORRELATION STUDY OF LEARNING PREFERENCES

AND ATTITUDES TOWARDS COMPUTERS

IN FOURTH GRADE STUDENTS

by
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A Thesis

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ABSTRACT

Laura C. Garofalo. A correlation study of learning preferences and attitudes towards computers in fourth grade students. 1999. Dr. Randall Robinson, Thesis Advisor, Master of Science in Teaching , Rowan University.

The purpose of this study was to determine if specific learning style preferences were related to fourth grade elementary students' attitudes towards computers in the classroom. Subjects were twenty-six students in a fourth grade class in an affluent suburban district. Subjects were given two self-report instruments to measure their learning style preferences and attitudes towards computers. The Learning Combination Inventory (LCI), developed by Dr. Christine Johnston of Rowan University, was used to determine learning style preferences. The Technology Attitude Assessment Survey (TAAS), developed for the University of the State of New York, measured attitudes towards computer usage in the classroom.

A Pearson r analysis of the correlation between scores for each learning style and scores on the computer attitude survey was performed. The results supported the null hypothesis and suggested there was no significant relationship between learning style and computer attitudes.

The study was limited by the characteristics of the sample. First, the convenience sample was small (n=26). Secondly, the sample was drawn from an affluent suburban school district that did not accurately reflect the larger target population of fourth grade students in United States public schools. Thirdly, the district promoted extensive computer use, so there was little computer anxiety.

MINI-ABSTRACT

Laura C. Garofalo. A correlation study of learning preferences and attitudes towards computers in fourth grade students. 1999. Dr. Randall Robinson, Thesis Advisor, Master of Science in Teaching , Rowan University.

The study explored the relationship between learning style preferences and computer attitudes in fourth grade students. Twenty-six fourth-graders in a suburban district were given two self-report instruments to measure learning styles and attitudes toward computers. The study showed no significant correlation between learning preferences and attitudes towards computers in the classroom.

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Introduction

Scope of the Study

> *"Just as we look different from one another and have different kinds of personalities, we also have different kinds of minds. This premise has very serious educational implications. " (Howard Gardner in a 1997 interview with Kathy Checkley) (Checkley, 1997)*

Students approach the same tasks through different modalities, or combinations of learning styles. (Dunn, Griggs, Olson, Beasley, Gorman, 1995). There are many definitions of learning style, but most major theorists agree that one's learning style is composed of "consistent patterns of how an individual begins to concentrate on, process, internalize and remember new and difficult information" (Dunn et al., 1995, p. 353). Messick, 1994 defines cognitive styles as "characteristic modes of perceiving, remembering, thinking, problem solving and decision making." (Jonassen, 1996). In the past 25 years educational researchers have proposed at least eleven different systems to identify and classify cognitive styles and learning preferences (DeBello, 1990). They share a common contention that the diversified cognitive styles of learners can have a critical affect on educational outcomes, especially when the learning style of a particular student is met with a divergent teaching style (Kolb, 1984; Gardner, 1997; Dunn, 1995; Johnston, 1996).

Statement of the Problem

Dizzard (1982) and Toffler (1990) described the "Information Age" or the "Third Wave" of societal development, respectively in their visions of the future of our technology-driven society (Carver, 1994). "Computer technologies are changing the practice of research and business, and . . . the content and practice of education are beginning to follow suit," according to McArthur, Lewis, and Bishay. Can all students adapt to and enjoy a new way of learning focused on computer technology? Are students who prefer sequential learning modes more apt to enjoy working with computers in the classroom?

Statement of Hypothesis

This study tested the null hypothesis: No significant relationship exists between learning combination preference and attitudes towards computer usage in the classroom.

The purpose of the study was to determine whether a significant correlation exists between learners who demonstrate a high preference for sequential learning and highly positive attitudes about computers in the classroom.

Limitations of the Study

The study was limited by the unusually high socio-economic status (SES) and low diversity of the convenience sample. The most recently reported (1989) median family income in the town was $66,917, well above national levels. The higher SES could have skewed computer attitude results, because every student had already been exposed to a home computer. Exposure to a home computer may result in reduced anxiety as well as reduced excitement about computers in the classroom.

Another factor limiting the study was the fact that the students were accustomed to computer work. They have had at least two hours a week of computer experiences since the first grade. An environment which provided students with less frequent contact with computers in the everyday curriculum might have yielded much different results.

Operational Definitions

The following operational definitions are used in this thesis.

Confluent Processor -	The confluent pattern relies on intuition, takes risks, and looks for creative alternatives to any task. Confluent processors enjoy using their own ideas and following their imaginations. They enjoy extemporaneous role-playing, art, designing, sculpting.
Learning Combination -	A Learning Combination is the scored results on various learning style preferences derived from the Learning Combination Inventory.
Learning Combination Inventory -	The Learning Combination Inventory is a 28-item self-report learning preference scale with three open-ended questions.
Precise Processor -	The precise learning pattern delights in detail, asks plenty of questions and craves exacting information. Precise processors construct meaning by collecting, analyzing, and questioning information. They like to accumulate their *own* information, find it, verify it and check the accuracy themselves.
Sequential Processor -	The sequential learning pattern involves the need for step-by-step instructions, rules to follow, and the opportunity to finish without interruptions. They develop their own system of information storage and retrieval.
Technical Processor -	The technical learning pattern involves independent reasoning, problem-solving, and learning from real life experiences. Technical processors like to analyze the givens, do trial and error, and just "get the job done". They enjoy using technical equipment or building something.

Chapter II

Review of Related Literature

Introduction

This study examines the relationship between learning style preferences and attitudes toward the use of computers in the classroom. Do students with strong preferences for specific learning schemas (sequential, precise, technical or confluent) fell differently about using computers to complete school assignments? Is there a relationship between specific learning style preferences/combinations and whether students find computers useful or threatening in the classroom?

Technology is becoming an increasingly important focus in the new elementary curriculum. (New Jersey Department of Education, Vision and Benchmarks) Although many children seem eager to learn using computers, there are some students who are still not comfortable using computers (Stallings, Rosen). Some do not understand or agree with the academic benefit of computers in the classroom (Stallings). How can teachers alleviate the fear and confusion that is interfering with the academic progress of children who are uneasy with technology?

According to Shatz, children entering school at age six have already established their learning processes (Shatz, 1997). Schmeck (1988, pp. 344-345) said "Becoming aware of one's own strengths and weaknesses leads to more personal responsibility for choices in the learning situation and more self-regulation." In the past 25 years, educational researchers have proposed at least eleven different theories and systems to identify and classify cognitive styles and learning preferences (DeBello, 1990).

Theories Related to Cognitive Style and Learning Preferences

David Kolb developed a learning styles inventory which describes four categories of individual learning patterns: **diverger** (prefers concrete experiences and process with reflective observations); **assimilator** (abstract experiences and process with reflective observations); **converger** (abstract experiences and process with active experimentation) and **accomodator** (prefers concrete experiences and process with active experimentation). (as cited in Stallings, 1994).

The Dunn and Dunn model classifies learners based on their perceived preferences for **environmental** (sound, light, temperature and design), **emotional** (motivation, persistence, responsibility, and structure), **sociological** (learning alone, in a pair, with peers, with a teacher, and in a variety of social patterns), **psychological** (perception, intake - eating, drinking, or smoking) while learning, chronobiological energy patterns and mobility needs) and **psychological processing characteristics** (Dunn, Griggs, Olson, Beasley, Gorman, 1995).

In his theory of multiple intelligences, Howard Gardner proposes that there are eight intelligences. In a 1997 interview with Cathy Checkley, he describes them as follows:

1) Linguistic intelligence - the capacity to use language.
2) Logical/mathematical intelligence - ability to understand underlying principles of some kind of a causal system, the way a scientist or a logician does.

3) Spatial intelligence - ability to represent the spatial world internally in your mind.

4) Bodily kinesthetic intelligence - the capacity to use your whole body to solve a problem, make something, or put on some kind of a production.

5) Musical intelligence - the capacity to think in music, to be able to hear patterns, recognize them, remember them, and perhaps manipulate them.

6) Interpersonal intelligence - understanding other people.

7) Intrapersonal intelligence -having an understanding of yourself, of knowing who you are, what you can do, what you want to do, how you react to things, which things to avoid, and the things to which you are attracted.

8) Naturalist intelligence - the human ability to discriminate among living things (plants, animals) as well as sensitivity to other features of the natural world (clouds, rock configurations) (Checkley, 1997).

Gardner believed that while people may rely instinctively on their stronger "intelligences", we use all these various intelligences to different degrees to solve problems on a daily basis. Gardner also says:

> "Although they are not necessarily dependent on each other, these intelligences seldom operate in isolation. Every normal individual possesses varying degrees of each of these intelligences, but the ways in which intelligences combine and blend are as varied as the faces and the personalities of individuals." (Howard Gardner, in a 1997 interview with Kathy Checkley, on-line) (Checkly, 1997).

The Learning Combination Inventory

In 1997, Dr. Christine Johnston of Rowan University formally proposed a new model that examines learning pattern combinations, their interaction and implications for the learner. "Everyone approaches learning tasks with varying degrees of sequence, precision, technical reasoning, and confluence (unique ideas). These patterns strongly influence a student's ability to respond to classroom learning activities." (Johnston, 1997, p. 78).

Johnston and Dainton developed and field-tested the first Learning Combination Inventory (LCI) instrument to "measure a learner's characteristic use of these patterns" (Johnston, 1997, p. 79) in 1994. The Learning Combination Inventory considers learning as the interaction of "four discrete patterns of sequence, precision, technical reasoning and confluence each having a strong internal consistency." (Johnston, 1997). Johnston's "*Letmelearn*" process (Johnston, 1996) also focuses on developing and fortifying the less preferred cognitive areas) to help develop a balanced learning combination that maximizes the learner's potential. For example, a child who prefers building a model of the circulatory system would also write a report documenting the process of how they developed the model to show how the blood flows from the heart through the arteries, etc. The LCI has been used with more than 15,000 students and teachers in public and private schools and colleges in the United States and abroad.

Once learners and teachers understand their dominate learning patterns and the cognitive strategies they tend to avoid, they can adapt specific learning situations to capitalize on their strengths and to help develop weaker areas. Geisart studied the past decade's learning style research and found:

> "...students who were introduced to new and difficult material through their primary perceptual strength achieved statistically higher test scores than when they ere introduced through their secondary or tertiary channel. When they were introduced through their primary strength and then were reinforced through their tertiary morality (second learning preference),

> they achieved even high scores than when taught only through a primary strength ($p > .05$) (Kroon 1985; Wheeler 1980))." (Geisart and Dunn, 1991).

Benefits of Computer Technology in Elementary Education

Technology has been shown to have positive effects on the instructional process, on basic and advanced skills. (Birman, 1997). John Kosakowski (1998) summarized research on the benefits of computer technology in education in a recent ERIC Digest article:

> "Using educational technology for drill and practice of basic skills can be highly effective according to a large body of data and a long history of use (Kulik, 1994). Students usually learn more, and learn more rapidly, in courses that use computer assisted instruction (CAI). This has been shown to be the case across all subject areas, from preschool to higher education, and in both regular and special education classes. Drill and practice is the most common application of CAI in elementary education, the military, and in adult educational settings. Fletcher, et al (1990) reports that in the military, where emphasis is on short and efficient training time, the use of CAI can cut training time by one third. In the military, CAI can also be more cost-effective than additional tutoring, reduced class size, or increased instruction time to attain equivalent educational gains..."
>
> "Today, students use multimedia to learn interactively and work on class projects. They use the Internet to do research, engage in projects, and to communicate. The new technologies allow students to have more control over their own learning, to think analytically and critically, and to work collaboratively. This "constructivist" approach is one effort at educational reform made easier by technology, and perhaps even driven by it." (Kosakowski, 1998, on-line)

The Trend toward Computers in the Elementary Classroom

Studies show that kids who use computers in class come out ahead.(Halpert, 1999). Many potential benefits of computer-aided instruction have been suggested including privacy, objectivity, timeliness of feedback, individuation of learning, flexibility, convenience, and a non-threatening learning environment for students

(Wilson, 1992). Jay (1998) found that when students have the opportunity to learn computer literacy skills in a *lab setting*, with each student having hands-on experience, mastery is achieved more quickly.

Parents and communities are highly supportive of computers in the classroom. A Milken Foundation study reported "...61 percent of voters would support a federal tax increase of $100 to speed the introduction of technology into the schools; 90 percent are convinced that schools with computers can do a better job of preparing students for jobs." (Sava, 1997, p.56).

In a speech presented at the National Association of Elementary School Principals (NAESP), Samuel Sava made the following remarks:

> "Electronic technology has nearly infinite potential for enabling our students to access and manipulate information whether in the form of numbers, historical research, animated situations, or paintings in a museum. **There is no question that computers can enliven learning, and that any youngster who enters the global workplace without computer literacy is handicapped."** (Sava, 1994, p.57).

The State of New Jersey agrees with this position. The New Jersey Department of Education has made a formal commitment to infusing technology in the elementary classrooms. Standard Two of the Core Curriculum Content Standards for Cross-Content Workplace Readiness requires that **"All students will use information, technology, and other tools"** (New Jersey State Department of Education. Guide to New Jersey's Core Curriculum Content Standards. PTM #1400.29).

According to the NJ DOE Technology web site, Cumulative Progress Indicators for the Standard Two of the NJ Workplace Readiness Standards require that all students will be able to:

- Understand how technological systems function.
- Select appropriate tools and technology for specific activities.
- Demonstrate skills needed to effectively access and use technology-based materials through keyboarding, troubleshooting, and retrieving and managing information.
- Develop, search, and manipulate databases.
- Access technology-based communication and information systems.
- Assess information on specific topics using both technological (e.g., computer, telephone, satellite) and print resources available in libraries or media centers.
- Use technology and other tools to solve problems, collect data, and make decisions.
- Use technology and other tools, including word-processing, spreadsheet and presentation programs, and print or graphic utilities, to produce products.
- Use technology to present designs and results of investigations.
- Discuss problems related to the increasing use of technologies.

(New Jersey State Department of Education. Cross-Content Workplace Readiness Standards And Progress Indicators. Available on-line at http://www.state.nj.us/njded/cccs/05ccwrstan2.html).

The following are some of the technology benchmarks expected to be implemented by the Year 2002, according to the NJ State Department of Education:

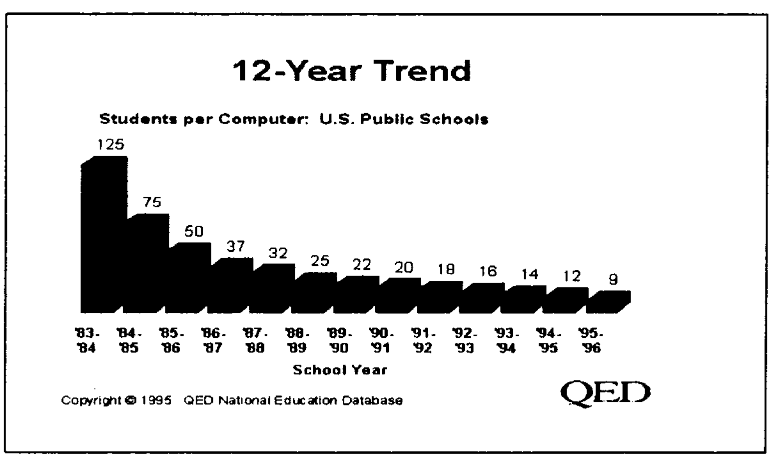
- Educational technology will be "fully infused into the schools' curriculum and instruction" .
- All schools will have fast and reliable Internet access; high-speed voice video and data networks; and access to "effective and engaging" software, CD ROMs, and online resources as an integral part of every school curriculum.
- All school districts will have "high quality, highly informative, user-friendly websites".
- All schools will have a ratio of one multi-media computer to every five students.

(New Jersey Department of Education. Educational Technology in NJ: Vision and Benchmarks by 2002. Available on-line at http://www.state.nj.us/njded/techno/edtechvision.htm.)

In the past 15 years, school districts have dramatically increased their investments in technology labs and classroom computers, as shown in figure 1 by QED (1995). In 1984, school districts averaged one computer for every 125 students. In 1996, the average was one computer for every nine students, a thirteen-fold increase over twelve years! (QED, National Education Database, 1996.)

figure 1

Twelve-year trend in the number of students per computer in public schools



U.S. school districts will spend an estimated $5.4 billion on educational technology during the 1998-99 school year, up from $4.8 billion in 1997-98, according to the Technology Purchasing Forecast, 1998-99, 4th edition from QED.

Despite the often touted educational advantages and quick access to information technology offers, **some** students are still uncomfortable with the use of computers (Stallings, 1994).

Computer-Based Instruction Related to Cognitive Styles

Current practice in technology training focuses on considering learning preferences as part of the instructional delivery design. Riding and Cheema (1991) developed Cognitive Assessment Software (CSA) and researched the relationship between cognitive style, type of instructional material presented and learning performance. Riding and Mathais (1991) found an association between instruction based on cognitive styles and enhanced performance on learning tasks in reading.

Adult distance learning is another area where information on learning preferences is being used to make computer-based training more effective. Goldstein (1998) examined the trend toward assessing the learning preferences of a user before Web-based asynchronous learning begins. She concluded, "Our experience has taught us that adults come to work with different learning styles, and training simply won't take hold unless individual learning styles are first addressed and respected." (Goldstein, 1998, p.36)

Efforts to match instructional presentation and materials with the student's preferences and needs have produced a number of different learning styles theories.

Pask (1976, 1988) identified two learning styles: (a) "a **holist**, who prefers a global task approach, a wide range of attention, reliance on analogies and illustrations, and construction of an overall concept before filling in details," (Jonassen, p.639) and (b) a **serialist**, who prefers a linear task approach focusing on operational details and sequential procedures. Students who are flexible employ both strategies are called **versatile learners** (Messick, 1994).

Geisart and Dunn (1991) found that most computer programs are designed for analytic processors who think in a step-by step sequential pattern. Some students prefer to approach learning in a more holistic, global pattern, referred to as a ***confluent learning pattern*** by Dr. Christine Johnston (Johnston, 1996). These learners need to understand the big picture -- the main idea for the concept -- before they can attend to the details. Other students are most engaged in the learning process when they are actively building or taking something apart (Johnston calls this a ***technical learning pattern,*** p.49).

Chapter III

Procedures and Design of the Study

Introduction

The purpose of this study was to determine whether a significant relationship exists between learners who demonstrate a high preference for a particular learning combination and highly positive attitudes about computers in the classroom.

Subjects and Setting

The study was conducted in a mid-sized suburban school district in an upper-income municipality in southern New Jersey. The subjects were 26 fourth grade students in an elementary school. The population sample included 14 boys and 12 girls, aged nine, ten, and eleven. The school was predominately white (96%), with an upper income-level ($67,000 median family income as of the last census data available, 1989). Characteristics of the sample are shown in the following chart (see table 1). The sample was 54% male and 64% female. One hundred percent of the students owned a home computer of some kind.

table 1

Sample characteristics

Gender		Own Home Computer	
male	female	yes	no
54%	46%	100%	0%

Research and Design Procedure

This research was designed as a correlational study of perceived learning preferences and attitudes towards the use of computers in the classroom. Learning preferences were measured using the Johnston Learning Combination Inventory (LCI) developed by Dr. Christine Johnston of Rowan University (see appendix A). The LCI is a 28-question self-report instrument using a Likert-type scale. There are three open-ended questions at the end of the instrument. McLaughlin & Angilletta, 1995 performed a test-retest study on the LCI which confirms the reliability and the construct validity of the test, wherein "significance at .01 was achieved" (Johnston & Daiton,1997).

Attitudes toward computer use in the classroom will be measured using the student questionnaire of the Technology Attitude Assessment Survey developed by IBM and the New York State Education Department and the University of the State of New York Education Department (1993). This instrument contains 39 questions requiring a rating of 1 (never ever) through 5 (always), and three open-ended questions. It was designed to explore attitudes of students toward "computers", "school", and "me/myself" in the evaluative, activity and potent domains. (see appendix B).

Procedure

The Learning Combination Inventory (LCI) was administered to all students in April of 1999. The students were shown how to “unlock their learning combination” by adding scores for each category based on the scoring sheet provided with the test. The author then recalculated the scores to ensure accuracy. A copy of LCI is provided in appendix A.

The Technology Attitude Assessment Survey (TASS) was administered the following day. The TAAS is a self-report instrument comprised of questions such as "I like to use the computer", and "My grades are better since I began using the computer to learn". It also asks questions about the students themselves: "Which is your hardest/easiest subject?" and their general attitude toward school.

TAAS surveys were scored by the author. One point was assigned for each "yes" response, two points for "not sure" answers and three points for "no" responses. Reverse scoring was used for negative questions. For example, if a student responded "yes" to a questions such as "Using computers is a waste of time", a score of 3 would be given. Scores for two dimensions – 1) computer attitude and 2)attitude about school were tabulated. A copy of the TAAS is provided in Appendix B.

The results of the Technology Attitude Assessment Survey (TAAS) were tabulated and analyzed to identify three basic categories of computer attitudes – 1) extremely receptive to computers in the classroom; 2) neutral about having computers in the classroom; or 3) dislike or uncomfortable with computers in the classroom. General attitude toward school and gender were examined was dependent variables using a t-test.

The Pearson r method was used to calculate the correlation coefficient between the LCI results and the TAAS categories. A significance level of <.05 was established to indicate a relationship between perceived learning combination and attitude toward computers. Results were analyzed using the SPSS statistical package and presented in graphic as well as numeric format.

Chapter IV

Analysis of Results

Introduction

The purpose of this study was to explore the relationship between learning style preferences and attitudes toward the use of computers in the classroom. It was designed to determine whether learners who prefer a sequential approach to processing information have a more positive attitude about using computers to learn.

Testing Results

Hypothesis $_0$

The null hypothesis stated that there was no significant relationship between preferred learning style combinations and attitudes toward computer usage in the classroom.

Learning Combination Inventory (LCI) Results

Table 2 reflects the results of the Learning Style Inventory (LCI). The LCI identified how the students prefer to process information. A score of 27 or higher in any category indicated a strong preference for that particular learning style.

table 2

Analysis of learning preferences identified by the LCI instrument

Student	Sequential	Precise	Technical	Confluent	Gender
1	25	26	**33**	26	m
2	27	26	**29**	**29**	f
3	26	24	**35**	21	m
4	25	**30**	**29**	19	f
5	**27**	19	22	23	f
6	18	21	**30**	23	m
7	**27**	19	22	22	m
8	27	19	**35**	26	m
9	19	25	**31**	21	m
10	**27**	**28**	24	26	f
11	25	**27**	26	23	m
12	26	20	**32**	19	m
13	**29**	21	13	18	m
14	22	19	**29**	19	m
15	23	23	**27**	**29**	f
16	16	22	**31**	**29**	m
17	23	**26**	13	23	f
18	**32**	25	19	18	f
19	19	18	18	**24 ***	f
20	24	**27**	**32**	23	m
21	26	26	**33**	24	m
22	**30**	**31**	**27**	24	f
23	24	**27**	**35**	24	m
24	**27**	**28**	19	18	f
25	25	**29**	**28**	18	f
26	**25 ***	**26 ***	21	21	f
summary	***8***	***10***	***16***	***4***	

* Scores were less than expected score to indicate strong learning preferences (27). Highlighted scores were significantly higher than other ratings by that student, so a preference to utilize these learning styles is presumed.

The most prevalent high scores were in the area of technical processing, which involves learning by analyzing information, solving problems by trial and error, and building models to construct meaning. Sixteen of the twenty-six students (almost 62% of the sample) rated technical processing a preferred learning mode. Seven of these students (44%) combined technical processing with either precise or confluent processing. Of the sixteen technical processors, only two were female.

Ten learners (38%) preferred the precise processing method. This involved collecting, analyzing, and questioning, and verifying primary source information to construct a personal meaning. Five of these students combined precise processing with technical, and four combined the precise and sequential learning strategies.

Eight students (almost 31% of the class) preferred the **sequential** learning strategy. Four of these also used the precise method to construct meaning.

Only four students (15%) exhibited a strong preference for the confluent approach, which involves sifting through information to find a unique perspective. Three of the four students used confluent processing in combination with technical processing.

Results of the statistical analysis of the raw learning style scores are presented in table 3. The technical processing dimension showed the highest mean score and the greatest range variability. Confluent processing showed the least amount of variability and lowest mean score overall.

table 3

Descriptive statistics for LCI

	Range Statistic	Minimum Statistic	Maximum Statistic	Mean	Standard of Error	Std Dev	Variance
Precise	13	18	31	24.3077	0.7479	3.8133	15.542
Sequential	16	16	32	24.7692	0.7196	3.6694	13.465
Technical	22	13	35	26.6538	1.2782	6.5173	42.475
Confluent	11	18	29	22.6538	0.677	3.4519	11.915

Technology Attitude Assessment Survey (TAAS) Results

The results of the Technology Attitudes Assessment Survey (TAAS) are presented in table 4. Highlighted areas show high positive attitudes about computers and school. Approximately 19% of students have highly positive attitudes toward computers in the classroom. The remaining 81% are neutral about computers in the classroom. Twenty-seven percent of the students showed highly positive attitudes about school; 23% showed negative attitudes about school. Half of the students responded with neutral attitudes about school.

Analysis of Relationship between Computer Attitudes and Learning Preferences

The objective of the study was to determine whether there was a significant relationship between learning style preferences and computer attitudes. The raw scores for each of the four dimensions of the LCI were compared with the TASS result scores. This data was analyzed using a Pearson r correlation. Tables 5-8 present the correlation statistics for each dimension of the LCI.

table 4

Results of the Technology Attitudes Assessment Survey (TAAS)

Student number	GENDER	* Positive Attitude About Computers	** Positive Attitude About School
1	M	22	7
2	F	13	5
3	M	16	3
4	F	17	6
5	F	15	7
6	M	21	7
7	M	18	5
8	M	13	5
9	M	14	3
10	F	16	5
11	M	14	8
12	M	17	8
13	M	14	6
14	M	14	3
15	F	16	5
16	M	11	3
17	F	17	4
18	F	14	5
19	F	17	3
20	M	14	5
21	M	13	6
22	F	13	4
23	M	18	7
24	F	17	3
25	F	18	6
26	F	14	3

* Attitudes towards computers are rated as follows:
positive=18-27 ; neutral=10-17; negative=1=9.

** Attitudes toward school are rated as follows:
positive=1-3 ; neutral= 4-6; negative- 7-9.

Table 5 presents a descriptive analysis of the Pearson r correlation between computer attitudes and scores on the precise processing dimension. At .004, there is no significant relationship between precise processing and computer attitudes.

table 5

Relationship between precise processing and computer attitudes

		Computer Attitude	Precise
Computer Attitude	Pearson Correlation	1.00	0.004
	Sig. (2-tailed)	.	0.983
	N	26.00	26.00
Precise	Pearson Correlation	0.004	1.00
	Sig. (2-tailed)	0.983	.
	N	26.00	26.00

Table 6 presents the relationship between sequential processing and computer attitudes. There is a negative .125 correlation, which shows there is no significant relationship.

table 6

Relationship between sequential processing and computer attitudes

		Computer Attitude	Sequential
Computer Attitude	Pearson Correlation	1.00	-0.125
	Sig. (2-tailed)	.	0.544
	N	26.00	26.00
Sequential	Pearson Correlation	-0.125	1.00
	Sig. (2-tailed)	0.544	.
	N	26.00	26.00

Table 7 shows the relationship between technical processing scores and computer attitude scores. The correlation coefficient of .011 indicates that no significant relationship exists.

table 7

Relationship between technical processing and computer attitudes

		Computer Attitude	Technical
Computer Attitude	Pearson Correlation	1.00	0.011
	Sig. (2-tailed)	0.00	0.958
	N	26.00	26.00
Technical	Pearson Correlation	0.011	1.00
	Sig. (2-tailed)	0.958	0.00
	N	26.00	26.00

In table 8 the relationship between confluent processing scores and computer attitude scores is shown. The negative correlation coefficient of .151 indicates that there is no significant relationship.

table 8

Relationship between confluent processing and computer attitudes

		Computer Attitude	Confluent
Computer Attitude	Pearson Correlation	1.00	-0.155
	Sig. (2-tailed)	.	0.461
	N	26.00	26.00
Confluent	Pearson Correlation	-0.155	1.00
	Sig. (2-tailed)	0.461	.
	N	26.00	26.00

Based on the correlation coefficients presented through the Pearson r analysis, the null hypothesis is accepted. There is no significant relationship between attitudes towards computers in the classroom and learning preferences identified by the LCI.

Chapter V

Summary and Conclusions

Introduction

Students approach learning tasks through a variety of different modes or learning preferences. This study attempted to determine whether there was a significant relationship between learning style preferences and attitudes toward the use of computers in the classroom. It was conjectured that learners who prefer a sequential approach to learning might have more positive attitudes towards computer use. Sequential processing involves following very structured, step-by step instructions and rules (Johnston, 1997). Computers present and process information in a logical sequence with a predictable, unambiguous format. Therefore, it was hypothesized that a relationship existed between students with sequential learning patterns and highly positive attitudes towards the use of computers in the classroom.

Conclusions

Analysis of the data shows there was no significant correlation between any of the four learning dimensions identified by the LCI and attitudes toward computers as determined by the TAAS. The small sample size (n=26) may have affected the results. (See Limitations of the Study section for other factors that may have affected the results of this study.)

General Observations

Most students employed all four learning approach at a moderate (≧20) or high level (≧27). This shows an integrated approach to learning, the capacity to use different strategies to accomplish different tasks, even though it may not be a preferred strategy.

Mean scores for all dimensions are presented below in table 9. Precise and sequential scores averaged approximately 24.5. Scores for technical processing, which was the most favored learning strategy averaged 26.6. Confluent scores, the least prevalent, averaged 22.6.

table 9

Mean Scores on LCI Learning Style Dimensions

	Mean
PRECISE	24.3077
SEQUENTIAL	24.7692
TECHNICAL	26.6538
CONFLUENT	22.6538

The fact that 62% of the students preferred technical processing (either exclusively or in combination with precise or sequential processing) was an unexpected result. According to Christine Johnston (1997), students who earn the best grades usually employ a step-by-step, sequential strategy as part of their learning combination. Perhaps the constructivist educational approach at this particular school encouraged the development of a technical learning pattern, which involves "independent reasoning, problem-solving, and learning from real life experiences" (Johnston, 1997). Eighty-five percent of the boys indicated a preference for technical processing as part of their learning combination. Thirty-one percent of the girls employed a technical approach as part of their learning strategy.

Implications for Further Study

This study was limited by the small convenience sample located in a suburban district with a very high socio-economic distribution. It would be beneficial to replicate this study with a larger sample in a more diverse district.

The study was also influenced by the fact that all of the students had home computers and had been exposed to a computer curriculum throughout their schooling. This suggests an unusually low degree of computer anxiety compared with less advantaged districts with reduced exposure to computers, both at home and in the classroom. Future studies could compare experimental groups with varying degrees of exposure to computers to analyze how prolonged exposure affects computer attitude. A longitudinal study of subjects from primary school through high school might establish the relationship of prolonged exposure to computer attitude.

Another factor that may have influenced the results of study is the district's focus on a constructivist, project-intensive approach to education. Studying a district with a more traditional approach might yield different LCI results. Studying the relationship between a district's educational approach (traditional vs. constructivist, etc.) and computer attitudes/learning styles is another possibility for future investigations.

The intensive use of the Internet for research also requires a learning approach that is different from traditional sequential software programs like math reviews or word processing. Technical and precise learners would be more amenable to an independent, constructivist learning strategy. A technology attitude survey which segregated attitudes about using the Internet from responses to traditional educational software packages could be beneficial to teachers who employ technology in the classroom.

Another interesting extension of this study would be to investigate whether the instructor's preferred teaching/learning style preferences correlated significantly with the students' preferences and whether closely matched students achieved better grades and teacher evaluations. The instructor's attitude toward computer use could also be compared with student attitudes to determine the degree of teacher influence.

The relationship between learning styles and technology attitudes will gain more importance as schools adopt more technology to prepare students for the next century. Studies using learning style instruments developed by Dunn, Kolb, and others may help determine the influence of the computer environment on learners (auditory vs. visual, sensitivities to light, and related factors). Further investigation into the relationship between learning preferences and computer attitudes may help software developers and teachers find ways to improve student's education through technology.

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APPENDIX A

LEARNING COMBINATION

INVENTORY (LCI) INSTRUMENT

Name________________________ Teacher________________________

Part I.

Reminder: This is not a test. It is a way to find out about how you accomplish learning tasks. Below are 28 statements each followed by five phrases that indicate how the statement might relate to you–"never ever," "almost never," "sometimes," "almost always," and "always." These phrases are numbered from one to five.

Directions: Here is what you are to do. 1) Read each sentence carefully. 2) Decide how well it fits what you do to learn. 3) Circle the numbered phrase that matches your response. 4) Write the number you have circled on the line to the left of the statement. 5) Be sure that you circle only one phrase for each statement.

Let's practice!

Sample Statements:

_____ A. I listen carefully when the teacher is giving directions.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ B. I like to stand in the front of the class and act out skits or plays.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

Words of Encouragement: Remember, this is not a test! So, take all the time you need, and do the very best you can. Have fun, relax, and enjoy learning more about yourself.

_____ 1. I would rather build a project than read or write about a subject.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 2. I need clear directions that tell me what the teacher expects before I begin an assignment.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 3. I just enjoy generating lots of unique or creative ideas.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 4. I memorize lots of facts and details when I study for a test.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 5. I feel better about an assignment when I double-check my answers.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 6. I like to take things apart to see how they work.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 7. I am interested in knowing detailed information about whatever I am studying.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 8. I like to come up with a totally new and different way of doing an assignment instead of doing it the same way as everybody else.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 9. I prefer to take a paper and pencil test to show what I know.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 10. I keep a neat notebook, desk, or work area.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 11. I like to work with hand tools, power tools, and gadgets.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 12. I am willing to risk offering new ideas even in the face of discouragement.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 13. I need to have a complete understanding of the directions before I feel comfortable doing an assignment.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 14. I find that researching information is my favorite way to learn a subject.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 15. I like hands-on assignments where I get to use mechanical/technical instruments.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 16. I become frustrated when I have to wait for the teacher to finish giving directions.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 17. I prefer to build things by myself without anyone's guidance.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 18. I become frustrated if directions are changed while I am working on the assignment.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 19. I keep detailed notes so I have the right answers for tests.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 20. I don't like having to do my work in the way the teacher says, especially when I have a better idea I would like to try.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 21. I clean up my work area and put things back where they belong without being told to do so.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 22. I enjoy the challenge of fixing or building something.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 23. I react quickly to assignments and questions without thinking through my answers.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 24. I enjoy researching and writing factual reports.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 25. I ask more questions than most people because I just enjoy knowing things.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 26. I like to figure out how things work.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 27. I am told by others that I am very organized.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

_____ 28. I like to make up my own way of doing things.

1	2	3	4	5
NEVER EVER	ALMOST NEVER	SOME-TIMES	ALMOST ALWAYS	ALWAYS

Part II: Please answer each of the following questions in your own words.

What makes assignments frustrating for you?

If you could choose, what would you do to show your teacher what you have learned?

If you were the teacher, how would you have students learn?

SCORING SHEET

Name______________________________ Teacher______________________

Write the number of your response in the center of the tumbler under the appropriate question number. Add up the tumbler numbers and write the total in the space at the end of each line. Then transfer your total for each scheme to the bar graph at the bottom of the page.

Schema								TOTAL
Sequential Processor	2	5	10	13	18	21	27	______
Precise Processor	4	7	9	14	19	24	25	______
Technical Processor	1	6	11	15	17	22	26	______
Confluent Processor	3	8	12	16	20	23	28	______

Your Learning Combination

Graph the totals from each of the tumbler lines above on the appropriate bars below.

SCHEMA	I avoid this scheme.	I use this as needed.	I use this scheme first.
	7 — 12 — 17	21 — 25	30 — 35
Sequential Processor			
Precise Processor			
Technical Processor			
Confluent Processor			

The following written expressions are representative of each of the four learning schemas. As you read the written responses on the Learning Combination Inventory, look for similarities in words, meaning, or intent with the learning schema identifiers listed below. Record the classification next to each written response and then see if the respondent's written section matches his or her schema preferences on the Scoring Sheet.

Sequential Processor

Clear Directions

I become frustrated when the directions aren't clear or don't make sense.

I don't work well when I don't have good instructions or the teacher doesn't do a good job of explaining the assignment.

I hate it when the teacher keeps changing the directions in the middle of the assignment.

Practice/Planning

It's hard when the teacher isn't organized or doesn't explain things thoroughly.
I want the teacher to go over and over the assignment until I understand it.

I like the teacher to go slow and make sure everybody is at the same spot.

I always practice my answers by going over and over them.

I like plenty of in-class practice.

Precise Processor

Correct Information

I want to know all the answers; I want to know what will be on the test.

I like the teacher to see that my work is correct.

I'm frustrated when I don't know all the answers because I like doing the work right so that I get a good grade.

I am frustrated when I don't have enough information or I can't find the information and the answers aren't in the book.

Detailed Information

I become frustrated when the teacher doesn't go into detail and explain things. Confusion!

I would have students take notes and do activities to reinforce the information.

I like trivia. I'm good at that.

I take detailed notes and then go over and over them.

Technical Processor

Technical Reasoning/ Hands On

I want hands-on activities that interest me instead of taking notes, doing book work, or writing about it.

Give me the tools and let me demonstrate what I know hands-on.

Let me build things!

Give me a real challenging project with a point to it and let me figure it out.

Autonomy/Outside

I need to run around outside and get things to make sense in my head.

Let students have more breaks during the day to go outside.

Let me learn by going home and living and experiencing it.

Let students learn however they want.

I don't let the teacher know what I know. I am a very private person.
I keep it inside.

I don't want to show a teacher what I know.
I'm happy the way I am.

Confluent Processor

Use My Own Ideas

I am frustrated when I feel trapped in the teacher's ideas. That's when I don't even feel like doing the assignment.

I am frustrated when I come up with a certain idea and I'm not allowed to use it.

I don't like it when teachers don't let you use your own ideas.

I don't like having to do an assignment in one certain way.

I don't like following lots of rules and regulations.

Use of Imagination

I like to use my imagination.

Let students learn however they want.

I like exploring new things.

I like to work with people who are curious and don't do assignments in just one way.

I like learning in a creative, fun, entertaining way.

I like coming up with artistic and crafty things.

APPENDIX B

TECHNOLOGY ATTITUDE

ASSESSMENT SURVEY (TAAS)

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
DIVISION OF PLANNING AND TECHNOLOGY SERVICES
ALBANY, NEW YORK 12234

STUDENT QUESTIONNAIRE

TECHNOLOGY ATTITUDE ASSESSMENT SURVEY

This is a survey to learn about your feelings and attitudes about school and computers. Please understand that at no time will either your name or you personally be associated with your answers. Please think about your feelings and answer honestly. There are no right or wrong answers.

For each item, circle the answer you choose. Make your mark heavy and dark. If you want to change an answer, you may erase the mark you made and make a new mark.

I appreciate your efforts and cooperation. Thank you.

---

1. What grade are you in? A) Grade 2 B) Grade 3 C) Grade 4 D) Grade 5

2. I am: A) Male B) Female

	Yes	No	Not Sure
3. I enjoy being at school.	A)	B)	C)
4. School is boring.	D)	E)	F)
5. I like to learn new things.	A)	B)	C)
6. I like to use the computer.	D)	E)	F)
7. I tell my parents about the work I do on the computer.	A)	B)	C)
8. I tell my friends about the work I do on the computer.	D)	E)	F)
9. I feel confused when I use the computer.	A)	B)	C)
10. Things I learn on the computer help me with my classwork.	D)	E)	F)
11. A teacher helps me when I do not understand something on the computer.	A)	B)	C)
12. My grades are better since I began using the computer to learn.	D)	E)	F)
13. I am proud of the work I do one the computer.	A)	B)	C)
14. Using computers is a waste of time.	D)	E)	F)

15. I like solving math word problems.	A)	B)	C)
16. Schoolwork is easy for me.	D)	E)	F)
17. Computer work was fun at first, but then it got to be boring.	A)	B)	C)
18. I enjoy reading stories.	D)	E)	F)
19. I enjoy playing word games.	A)	B)	C)
20. The computer tells me if I get the correct answer.	D)	E)	F)
21. When I do not get the correct answer, the computer usually does not give me enough help.	A)	B)	C)
22. Working at a computer makes me feel separated from the other kids.	D)	E)	F)
23. When I do not understand something on the computer, I work until I figure it out.	A)	B)	C)
24. When I do not understand something on the computer, I get help from other students.	D)	E)	F)
25. It is easy for me to do math problems.	A)	B)	C)
26. I did not like using the computer this year.	D)	E)	F)
27. When I do not understand something, the computer helps me out.	A)	B)	C)
28. Schoolwork is hard for me.	D)	E)	F)
29. When I do not understand something on the computer, I like to ask for help.	A)	B)	C)
30. I do not care whether or not I use computers at school.	D)	E)	F)
31. I can type without looking at most of the letters.	A)	B)	C)
32. I use a computer outside of school for fun.	D)	E)	F)
33. When I type, I can find the letters but it takes some time.	A)	B)	C)
34. I am just beginning to learn to type on the computer.	D)	E)	F)
35. I use a computer outside school for learning activities.	A)	B)	C)
36. I like using computers at school.	D)	E)	F)

37. Which is your easiest subject:	A) Reading & Language Arts	b) Science	C) Math	D) Social Studies
38. Which is your hardest subject:	A) Reading & Language Arts	b) Science	C) Math	D) Social Studies

36. What do you like MOST about using computers at school?

37. What do you LEAST like about using computers in school?

38. What WORDS would you use to tell about this school year?

THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY!

VITA

Name:	Laura C. Garofalo
Date and Place or Birth:	May 23, 1957 Atlantic City, New Jersey
Elementary School:	Saint Philip the Apostle Brigantine, New Jersey
High School:	Holy Spirit High School Absecon, New Jersey
College:	Montclair State College Upper Montclair, New Jersey B.A., English, 1980
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