Teaching and Assessing Graduate Students' Research Skills in English for Art Education Purposes

Prof. Reima Al-Jarf,
King Saud University, Riyadh, Saudi Arabia

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Abstract

A research training module was designed to help graduate students locate, read and comprehend art abstracts and full-text articles that they need for their assignments, term papers and theses. At the end of the training module, the students were posttested. They were given individual research projects for which they had to select the search terms, define the searching strategy, go online, log into the electronic database, conduct simple and advanced searches, print and save the actual records obtained. The posttest required the students to locate art dissertation abstracts and journal articles. They were asked to skim through sample art abstracts and journal articles and locate the aim of the study, type of instrument used in collecting the data, the subjects, and results and give a summary translation in Arabic. A detailed description of content and research skills tested are given.

Keywords: *ESP, English for art education, research skills, searching skills, electronic searching, search terms, graduate students, technology integration art education websites, art education abstracts, art education articles, training module, art education instruction.*

1. Introduction

Due to latest advancements in computer technology, online dictionaries, encyclopedias, e-books and journals are now being integrated in EFL and ESP classrooms, in addition to online resources that modern libraries host such as OPACS and specialized electronic databases. To be considered literate in the information age, students must develop functional, academic, critical, and technological skills (Kasper, 2002). Nasir (1996: 37-55) reported that only 58.3% of Malaysian students studying in the UK used CD-ROM databases and found them useful for thesis preparation, writing research papers, articles, and books. He recommended that non-users be made aware of the availability of databases on CD-ROM and other information sources. In another study, Dodge (2001: 1) outlined the development of basic computer literacy skills courses at the San Jose City College, California. Six technology skills courses, referred to as the Getting Started courses, were developed to promote ESL students' basic skills information. Various groups of at-risk students piloted the Getting Started program. The courses proved successful in introducing ESL students to computers.

Developing students' searching skills was found to be effective in enhancing students' Web searching skills and attitudes. In this respect, Abowitz (1994, 58-64) indicated that integrating library instruction into undergraduate sociology courses helped develop the students' awareness of and ability to use library resources and promoted active learning. In addition, training undergraduate students to search online databases, to construct search strategies, and locate library research guides from the World Wide Web helped enhance the students' attitudes, emotional experiences, and search performance (Ren, 2000: 323-328). Web-based instruction provided a learning environment in which participants could develop electronic literacy skills and share their ideas and projects (Hindes, 2000: 88-101).

As to course design, Eisenberg, and Johnson (2002:1) described an integrated approach to teaching computer skills in K-12 schools. They developed a Curriculum Based on the Big6 Skills Approach that focused on the following: task definition; information seeking strategies; location and access; using information; synthesis; and evaluation.

Although Arabic is the medium of instruction at the Department of Art Education (DAE) in Riyadh, Saudi Arabia, doctoral students majoring in art education need to be proficient in English to be able to locate specialized information in English art resources such as journal articles, reports, dissertations and reference books for their assignments, term papers and theses. They also need to be able to read and comprehend research articles and abstracts in their art area of study and translate the required information into Arabic.

A review of the ESP literature showed that studies that integrate searching skills in ESP courses offered to doctoral students majoring in art education are lacking. Hence, this study describes how the students' internet searching and English language needs were identified, and what their computer and internet searching skill levels were. It also describes what internet searching skills were integrated in the ESP course to meet students' pragmatic needs, and how those skills were developed and evaluated. This description will enable instructors to replicate the procedures in teaching library and electronic searching skills to other groups of graduate students. This study has both theoretical and practical implications for ESP instructors. It identifies the searching skills and training steps to be followed.

2. Participants

Ten female doctoral students participated in the study. They were all art education major with a focus on sculpture, textile, ceramics, painting and photography, metalwork, handicrafts, and tie and dye. They were in their first semester of the doctoral program and were concurrently enrolled in three art courses. They were all lecturers teaching art courses to undergraduate students. They all had excellent practical and theoretical knowledge in their major art area and were all familiar with the components of a research paper and research methods in art education as they studied those topics at the master's level. All of the students took art courses and wrote a master's thesis in Arabic.

3. Identifying graduate students' technological needs

According to Dudley-Evans (1998: 1), Jureckov (1998: 2), Flowerdew (1995: 19-35), Cruickshank (1983: 1), needs analysis is the basis of ESP course design. Therefore, the subjects' technological and searching skills were assessed by a computer-literacy questionnaire. The questionnaire consisted of the following questions: *(1) Which computer software do you use? (2) How would you rate your internet searching skills (excellent 5 4 3 2 1 poor)? (3) Which search engines can you use? (4) Do you have an e-mail (5) What do you use it for (6) Have you had any prior training in searching the internet for websites in your major area of specialization?*

To assess the students' proficiency level in English, they were pre-tested using a teacher-made English proficiency test consisting of a reading comprehension, a vocabulary, a paragraph-writing and translation subtests.

4. Data analysis

The students' responses were tallied and percentages of those who gave the same response were computed regardless of the students' area of specialization. The students' language and internet searching needs were identified.

5. Students' Needs

Results of the computer literacy questionnaire showed that all the students had basic word-processing skills. Only 30% had basic internet searching skills and can search Google. 70% had little experience searching the internet. Responses to the needs assessment questions showed that all the students never had any training in searching for information and websites in their area of specialization. The students showed an interest in acquiring advanced internet searching skills such as locating art materials, tools, journals, magazines, professional organizations, conventions, journal and dissertation abstracts, journal articles, ordering books, art materials and tools, subscribing to e-journals, and joining professional organizations.

6. The Research Training Module

Based on the students' searching needs, and their proficiency and internet searching skill levels, an ESP course was designed to meet their pragmatic needs. The course had a research component. This study will focus on describing the research training component only and how subjects' research skills were assessed at the end of the training period. The aim of the research component was to develop the students' ability to search the internet for art and art education websites. The training module focused on the following skills:

- Selecting, narrowing and widening search terms.
- Introducing Yahoo and Google.
- Searching for and locating art materials, art tools, art education professional organizations and conventions, and art education e-journals using Google or Yahoo.
- Searching for, locating and ordering art education books and magazines online using www.mazon.com.
- Searching for art education abstracts and full text articles in specialized electronic databases such as *ERIC, Wilson Art Abstracts Full Text, Wilson Art Abstracts, Wilson Art Index, and Dissertation Abstracts* databases.
- Browsing the search results and selecting the required records.
- Filling out order forms and membership application forms.
- Subscribing to e-journals.
- Reading an abstract and identifying the following: questions of the study, subjects, instrument, methodology, data collection and data analysis procedures and results.
- Skimming a research article and locating the following components: questions of the study, subjects, instrument, method, data collection and data analysis procedures and results and writing a summary translation of those components in Arabic.
- Locating references and making a list of English references on a particular art topic.

7. Training Method

The ESP class met once a week for 3 hours. The first hour was devoted to internet searching training. Each week, the students practiced one task. The order in which searching skills were developed and practiced was as follows:

Week 1: search terms

The students were asked to write down a research topic in their area of specialization. They were shown how to identify related search terms, narrow them by using two- and three-

word compounds and by combining them with other search terms using Boolean operators *(and, but, or)*. They were also shown how to widen them by using a single term.

Week 2: Google and Yahoo

The students were shown how to connect to the internet, what the components of the Internet Explorer main page (*home, refresh, favorites, back, front, etc.*) are, where to type the search term, how to save URL's in Favorites and how to retrieve them, how to save webpages, finding the number of search results, browsing through the search results and selecting a particular link.

Week 3: Amazon.com

Major components of the Amazon main page, selecting the search terms for the required books, entering the search term in the search box, selecting the field to be searched from the list, browsing through the search results, marking the selected items, adding selected items to the shopping cart, filling out order forms *(name, address, country, phone #, payment method, credit card info, sending/submitting order).*

Week 4: Electronic journals

Entering "e-journal & art education" in the search box in Google, selecting an e-journal from the search results, components of the journal's main page, browsing the table of contents, browsing current and back issues, searching for articles, subscribing to the journal.

Week 5: professional organizations

Entering "associations & art education" in Google, selecting an association such as National Art Education Association (NAEA) as an example, components of the association's main page such as *publications, forms, news, evens, publication, resources,* and filling out membership application.

Week 6: conventions

Entering "conference & art education" in the search box in Google; selecting a conference such as NAEA Convention as an example; identifying the components of the conference main page: *Call for proposals, submitting a proposal, registration, participation, sessions, dates and deadlines and location.*

Weeks 7-10: Goolge Scholar, Wilson art index, ERIC, Wilson art abstracts, dissertation abstracts, Wilson art abstracts full text databases

Accessing a database by using the required URL, username and password; components of the database main page; selecting, broadening and narrowing of the search terms; selecting a Boolean operator *(and, or, not)*; selecting the type of field *(author, descriptor, keyword)*; marking the relevant records; selecting what to be displayed *(citation only, citation and abstract, full text);* viewing the search results; evaluating the search results; saving, printing or e-mailing the search results; returning to the list of records (citations) to select a new record to view, save, print, or e-mail; returning to the main page to conduct a new search; locating and filling out document order forms. The basic electronic searching

terms and commands that are encountered in most electronic databases were identified on the screen, explained and listed. Examples are: *Advanced search, basic search, author, title, abstract, descriptor, keyword, search results, records, citation, full text, publication date, display, save, print, view, search, submit, browse, continue, connect to, proceed, login, clear, mark, unmark, select, request, obtain, order, previous, next, main, return to.* The students were also given a list of common abbreviations used in the citation, abstract and full-text articles such as: *AU= Author, TI=Title, SO=Source, AB= Abstract, DE= Descriptor, KW= Keyword* together with their full form.

Weeks 11-12: *skimming abstracts and research articles* and identifying the following components: questions of the study, subjects, instrument, Method, results and writing a summary translation of those components in Arabic. Each class session, the author stated the focus of the session, logged into the internet, then Yahoo or Google. The presentation phase consisted of entering a search term in the search box and looking at the search results with the students. The students took turns to read out loud the search results, select certain items to be translated together. The students always saved the URL in Favorites and saved the webpage to help the students remember the searching steps when they practice on their own at home. The students took notes and wrote down the new technical terms. Then hands-on guided practice was conducted in pairs under the author's supervision. For consolidation, a post-session hands-on independent practice at home was conducted. Every session, a homework-assignment focusing on a task similar to the one practiced in class was given. The assignment required identification of a search term, using it to locate websites, to browse the website and identify its components. The students printed the pages, filled out forms, translated certain parts of the webpages and submitted them to the author for feedback.

8. Training Evaluation

At the end of the module, training was assessed in a three-hour session as follows:

8.1 Searching Skills Tested

- Selecting an art topic.
- Selecting, narrowing, and widening search terms.
- Searching Online bookstores *(e.g.: Amazon),* Google Scholar, Specialized electronic databases *(e.g.: ERIC, Wilson Art Abstracts Full Text, Wilson Art Abstracts, Wilson Art Index, Dissertation Abstracts* databases), Online Associations and conventions.
- Locating art materials, tools, books, magazines, e-journals, abstracts, full text articles, professional organizations and conventions online.
- Recognizing parts of an abstract or research paper.
- Browsing the search results (records) and selecting the required records.

8.2 Language Skills Tested

- Reading an **abstract** and identifying the questions of the study, subjects, instrument, method, results.
- Skimming an abstract or a research article and locating the following components: questions of the study, subjects, instrument, Method, results.
- Writing a summary translation of an article that consists of questions of the study, subjects, instrument, Method, results.
- Making a list of references in English on a particular art topic.

- Filling out order and membership application forms and subscribing to e-journals.

Table 1. Test specification Table

	Language Skills						Searching Skills			
	skim	**Identify**	**Make a list**	**Summarize**	**Fill out**	**translate**	**enter**	**locate**	**Browse**	**Select**
Yahoo & Google										
Amazon										
Google Scholar										
Databases										
Organizations										
Conventions										
Research topics			1							
search terms							1			
Citations /titles/records			1							X
Abstracts	3	3						3		
Full articles	1	1		1		1		3		
Abbreviations						1				
components										
order forms					1					

8.3 Content Covered by the Test

The test items cover the following: Search commands, Amazon, Google Scholar, journal abstracts, dissertation abstracts, online art organizations and conventions, online forms, citations, and abbreviations.

8.4 Test Items

The test items and marks allocated to each question and each task and response are shown in Table 2 below.

Table 2. Test Questions and Distribution of Marks

Test Questions	Task	Marks
1. The students were given individual research projects in sculpture, textile, ceramics, painting, photography, metalwork, handicrafts, and tie and dye, for which they had to select search terms. The test required the students to locate the following: • at least 1 book title from Amazon • at least 1 abstract from Google Scholar • at least 1 abstract from dissertation abstracts • at least 1 abstract from ERIC Database Abstracts • at least 1 full text journal article from Wilson Art Abstracts • Fill out a UMI online order form • Choose one reference from each database (5 references) and make a list of bibliography following APA style.	**Hands-on**	- - - - 5 5 5 5 5 - 10 20
2. Screen shots of association websites, search results from Amazon	Screen	15

and an abstract with abbreviations were printed and handed out to the students together with questions that required the students to define, explain and translate the marked parts in a search screen, search commands or abbreviations.	shots	
3. The students were asked to skim through screen shots of 2 abstracts (from ERIC, Google Scholar and/or Dissertation Abstracts) and locate the aim of the study, type of instrument used in collecting the data, the subjects, data collection procedures, methodology, statistical analysis procedures and results.	Screen shots	20
4. The students were asked to skim through an article, then give a summary translation of the aim of the study, instrument used in collecting the data, the subjects, data collection procedures, methodology, statistical analysis, and results in 500 words.	Skimming & translation	10
Total marks		100

8.4 Scoring the Test

The pre- and posttests were blindly graded by the author. An answer key was used. 100 points were allocated to the test. Marks allocated to each question are shown in Table (2).

- **Question I:** For citations looked up in Amazon, Google Scholar, Dissertation Abstracts, Wilson Abstracts, ERIC (5 marks for each source). 10 marks are given for filing out the order form, 20 for making the bibliography (4 marks for each reference).
- **Question II & III:** 10 marks are allocated for locating the components of each abstract. Title, Author, Journal, Subjects, Instrument, Research Method (1 mark each), Aim of study, question or hypothesis & Results (2 marks each).
- **Question IV**: 10 marks are given for the summary translation. Title, Author, Journal, Subjects, Instrument, Research Method (1 mark each), Aim of study, question or hypothesis & Results (2 marks each).

8.5 Test Validity and Reliability

The posttest is believed to have content validity, as it aimed at assessing the students' ability to search. The content covered in the test was comparable to that covered in the classroom. The test instructions were phrased clearly, and the examinees' task was defined. All of the students comprehended the questions and responded to them as instructed.

Concurrent validity of the posttest was determined by correlating the students' total score on the posttest and their total score on the midterm test that measured…. The validity coefficient was .62 and it was significant at the .01 level.

Since the author was the instructor and the scorer of the pretest and posttests for both groups, estimates of inter-rater reliability were necessary. A 30% random sample of the posttest answer sheets was selected and double-scored. A colleague who holds a Ph.D. degree scored the pre and posttest answer sheets. In scoring the sample answer sheets, she used the same answer key and followed the same scoring procedures utilized by the author. The marks given by both raters for each subtest in the sample were correlated. Inter-rater correlation was 98%.

Furthermore, examinee reliability shows how consistently examinees perform on the same set of tasks. Examinee reliability was calculated using the Kuder-Richardson 21'

formula as it estimates the internal-consistency of the test items. The reliability coefficient of the posttest was .69.

8.6 Statistical Analysis

The mean, median, standard deviation, standard error and range were computed. To find out whether the students made any progress (gain) as a result of the training, a within group paired T-test was computed using the pre and posttest scores.

8.7 Results

Table (3) shows that the median score on the pretest was 22.5% (range = 15% -48%) and the median score on the posttest was 62.5% (range = 40% - 88 %) with larger variations among the students' posttest scores than the pretest score as revealed by the standard deviation. Results of the paired T-test showed a significant difference between the pre and posttest mean scores at the .01 level, suggesting that the students' achievement significantly improved as a result of exposure to electronic searching training (T = 14.6, Df = 9).

Table 3. Distribution of Pre- and Posttest Scores

	Mean	Median	SD	SE	Mode	Range
Pretest	27	22.5	9.49	3	20	15-48
Posttest	62.5	66.5	13.54	4.28	48	40-88

9. Conclusion

To improve graduate students' electronic searching skills, a training module was developed and taught to graduate students majoring in art education in Saudi Arabia as part of the ESP course that they are required to take. At the end of the semester, a test was designed and administered to find out whether the students' ability to search for specialized online material has significantly improved as a result of the training received. Test results showed that the training module was successful in developing the electronic searching skills that the students needed to pursue their graduate courses in art education and to continue to search for English art education materials in specialized electronic databases after graduation. Findings of the present study are consistent with findings of other studies conducted by Abowitz (1994, 58-64) who found that integrating library instruction into undergraduate sociology courses helped develop the students' awareness of and ability to use library resources, and promote active learning and Ren (2000) who found that training undergraduate students to search online databases, to construct search strategies, and locate library research guides from the World Wide Web helped enhance the students' attitudes, emotional experiences and search performance.

Since the study was conducted with a small sample of graduate students, it is recommended that the training module and test be replicated with larger groups of graduate students majoring in art education to get better estimates of validity and reliability. The effectiveness of the training module can be also measured by self–reports at the end of the semester and while taking graduate courses in art education as a follow-up measure of the effectiveness of the electronic searching training received. The study recommends that the electronic searching training module be taught to undergraduate rather than graduate students majoring in art education. The effectiveness of this training module and the transfer of searching skills to graduate-level courses may be subject to further investigation in the future.

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APPENDIX
Art Education Posttest for Graduate Students

[Q1] Answer the following questions:

1) Write a research topic in one of the following areas *(Painting and photography; Textiles & printing; Pottery; Metal work; Sculpture; or Handicrafts).*
2) Make a list of at 5 search terms.
3) Find at least 3 references in each of the websites below.
    - Amazon.com
    - Google Scholar
    - Dissertation abstracts
    - Wilson Art

4) Print your search results.

[Q2] Read the abstract below, then fill the required information:

Title: ----------
Author: ----------
Journal: ----------
Aim of study: ----------
Subjects: ----------
Research Method: ----------
Instrument: ----------
Results: ----------

An Examination of Two Approaches to Ceramic Instruction in Elementary Education
Thomas M. Brewer
Studies in Art Education, Vol. 32, No. 4 (Summer, 1991), pp. 196-206
doi:10.2307/1320872
Teaching strategies in art education have recently shifted from a child-centered approach to a more discipline-based approach. Although this new approach would encourage ceramic instruction coupled with ceramic history and art criticism, research in art education has not yet investigated the effect of discipline-based teaching modes in ceramic education. This study compares the immediate effects of selected aspects of a discipline-based approach to ceramic instruction to those of a child-centered approach. For a discipline-based approach, Greer (1984) suggested the use of exemplary works of adults' art as models for production, while Lowenfeld and Brittain (1964), for a child-centered approach, recommended activating the students' passive knowledge. This study compares the two approaches in relation to fifth-grade students' self-concepts, attitudes toward art, knowledge of art, and the aesthetic quality of modeled human figures and ceramic vessels.

[Q3] Read the abstract below, then fill the required information:

Title: ----------
Author: ----------
Journal: ----------
Aim of study: ----------
Subjects: ----------
Research Method: ----------
Instrument: ----------
Results: ----------

ERIC #:	EJ762779
Title:	Learning Styles of Design Students and the Relationship of Academic Performance and Gender in Design Education
Authors:	Demirbas, O. Osman; Demirkan, Halime
Descriptors:	Experiential Learning; Foreign Countries; Learning Theories; Cognitive Style; Grade Point Average; Academic Achievement; Art Education; Gender Differences; College Freshmen; Design; Information Technology; Art
Source:	Learning and Instruction, v17 n3 p345-359 Jun 2007
Publisher:	Elsevier. 6277 Sea Harbor Drive, Orlando, FL 32887-4800. Tel: 877-839-7126; Tel: 407-345-4020; Fax: 407-363-1354; Web site: http://www.elsevier.com
Publication Date:	2007-06-00
Abstract:	The study focuses on design education using Experiential Learning Theory (ELT) and explores the effects of learning styles and gender on the performance scores of freshman design students in three successive academic years. Findings indicate that the distribution of design students through learning style type preference was more concentrated in assimilating and converging groups. Further study indicates that the first and third groups were more balancing while the second group being mostly a southerner. The learning style preferences did not significantly differ by gender in all three groups. Although there is no consistency in all three groups, results indicate that the performance scores of males were higher in

	technology-based courses, whereas scores of females were higher in artistic and fundamental courses and in the semester academic performance scores (GPA). Also, it was found that the performance scores of converging and diverging students differed significantly in favor of converging students only in design courses. In design education, instructors should provide a strategy that is relevant to each learner's style in design studio process.

[Q4] Read the abstract below, then fill the required information:

Title: ----------
Author: ----------
Journal: ----------
Aim of study: ----------
Subjects: ----------
Research Method: ----------
Instrument: ----------
Results: ----------

Full Citation & Abstract	
PUBLICATION #	AAT 3214098
TITLE	Classification of Greek pottery shapes and schools using image retrieval techniques
AUTHOR	Bishop, Gulsebnem
DEGREE	DPS
SCHOOL	PACE UNIVERSITY
DATE	2006
ADVISER	Tappert, Charles
ISBN	978-0-542-64055-1
SOURCE	DAI-B 67/04, p. 2072, Oct 2006
SUBJECT	DESIGN AND DECORATIVE ARTS (0389); COMPUTER SCIENCE (0984)
DIGITAL FORMATS	4.94Mb normal PDF

Using image retrieval and computer vision techniques, a pottery shape and school classification system for labeling unknown pottery and pottery fragments was developed to assist archaeologists in identifying and recording objects quickly and accurately. The system can identify twenty pottery shapes and four pottery schools with shape and color-based image retrieval techniques. The system analyzes and compares extracted features to determine the five closest database images, and then presents the results to the user. This is the first pottery study to combine two different techniques---shape and color-based image retrieval---in identifying multiple characteristics of an unknown pottery image or pottery fragment. Experimental verification of system performance utilized two databases---a training database of two hundred digital images of twenty different pottery shapes and four different schools, and a testing database of four hundred images of equally distributed pottery shapes and schools. Four major areas were explored, and the following first-choice accuracies obtained on the four hundred test images: 100% pottery school identification, 97.50% pottery shape identification, 96.25% accuracy of template-matching related to shape, and 69.5% accuracy of template-matching related to decoration. The first two of these accuracies were based on images of intact pots while the other two were on images of portions of pots.

[Q5] Make a list of bibliography for the references below using APA style. Pay attention to alphabetization, capitalization, punctuation, and arrangement of elements in each reference.

(1) Modern Designs Stained Glass Pattern Book by Anna Croyle (**Paperback** - Nov 30, 2005)
Buy new: **$8.95** 27 Used & new from $4.97 In Stock
Eligible for **FREE** Super Saver Shipping.

(2) The politics of commerce: Aztec pottery production and exchange in the Basin of Mexico, A.D. 1200--1650 by **Garraty, Christopher P.**, PhD
ARIZONA STATE UNIVERSITY, 2006, 415 pages
AAT 3220300

(3) Feasting and ceramics: A view from the Palace of Nestor at Pylos (Greece)
by **Hruby, Julie A.**, PhD
UNIVERSITY OF CINCINNATI, 2006, 311 pages
AAT 3231155

(4) The Basics in Pottery: Clay and Tools. (EJ325900)
Author(s): Larson, Joan **Pub Date:** 1985-00-00
Source: School Arts, v85 n4 p13-14 Dec 1985 **Pub Type(s):** Journal Articles; Guides - Classroom
Descriptors:
Art Education; Art Materials; Ceramics; Intermediate Grades; Junior High Schools; Middle Schools
Abstract:
Art teachers at the middle school or junior high school level usually find themselves in a program teaching ceramics. The most essential tools needed for a ceramics class and the different kind of clay are discussed.

[Q6] ***Give the Arabic equivalent of the numbered parts of the website.***

[Q7] ***Skim the article and write a summary translation in Arabic in 500 words about Hopi Pottery Designs.***

ART AS A STRUCTURAL SYSTEM: A STUDY OF HOPI POTTERY DESIGNS[1]

LAURA J. GREENBERG

WORKING HYPOTHESES: THE RESEARCHER

It is Arnheim's (1966) working hypothesis that art reflects not one but two processes of abstraction, namely: (1) the abstraction entailed in visual perception which requires that one order and classify in order to perceive, and (2) the abstraction entailed in devising any visual representations ("realistic" or otherwise). Thus:

> There is no direct transformation of experience into form, but rather a search for equivalents [Arnheim 1966:266].

Also, perhaps, in the realm of "working hypothesis" is the Sapir-Whorf Hypothesis, which speculates on the nature of the relationship between language and thought. Although the specific formulations of this hypothesis vary (Whorf 1940, 1941; Sapir 1929:209), there is a general connection posited between a language's lexation and grammatical structure, and the content of thought. In other words, one's linguistic categories and discriminations presumably influence what one will in fact think, and vice verse.

This paper ultimately derives from my interest in the relationship between these two working hypotheses. Although one evolved in the discipline of linguistics and the other in the context of the psychology of art, they seemed to contain possible congruences. In particular, I was interested in the possible implications of each for the other. It seemed that if Whorf were correct about language affecting the way people classify and order reality, and if Arnheim were right about perception necessarily entailing classification and ordering of "visual" reality, then there ought to be the equivalent of a visual Whorf hypothesis. That is, if perception entails active classification and ordering, and if classifications (lexicon) and rules of ordering (as evidenced in grammatical structure) vary from culture to culture, then one would expect visual perceptions to vary cross-culturally in some patterned way as well. Further, it would be logical to expect that visual discriminations and categories would influence (and be influenced by) art and other "expressive" visual systems (e.g., architectural systems) or systems of spatial terminology, and by language. Secondly, the methodology of linguistics, which so elegantly arrives at system by the ordered and "scientific" study of variation, seemed to have the potential for elucidating these visual systems.

I devised a specific project which attemped to examine and/or verify the above hypothesized connections, choosing the Hopi as a case study, and basing my methodology on linguistic methodology (with some necessary modifications). My choice of the Hopi, specifically Hopi pottery designs, had been motivated by two considerations: (1) that the art system or corpus be relatively abstract or non-representative (thus minimizing semantic meaning as a consideration and maximizing "visual" considerations), and (2) that the people have a relatively well-integrated, coherent, and self-contained philosophy and social structure. As a logical first step in constructing the total design system, I proposed isolating what I called "visual phonemes" in Hopi pottery designs (a term derived from the "new archeologists").

Art is, no doubt, a "language"; however, I realized that the linguistic analogy is a difficult one to translate into visual terms. For one thing, language is, by necessity, a more conventionalized system than art. And for another, whereas the given in linguistics is that humans are physiologically capable of producing only a finite number of mono-syllabic sounds which can be taken as the basic components of any language, such obvious and discrete units are not inherent in the visual realm. And yet, I thought that these and other obstacles could be circumvented by the careful construction of a series of test drawings (based on patterned variations of actual Hopi designs), which could then be used to determine "significant variation" and thus to isolate visual phonemes.

Aside from certain pragmatic considerations, such as having no Hopi contacts when I arrived in Arizona, two factors ultimately caused me to abandon my search for visual phonemes and to reconsider my theoretical model. The first was that it became disconcertingly and progressively more apparent, the more I read and the more I saw of Hopi designs, that my model (which was based on the primacy of units or elements) was antithetical to the nature of Hopi art and to Hopi culture as well (which stresses the primacy of the total). This is, incidentally, an important point, and one which will be further developed in the body of this paper.

The second mitigating factor evolved as I abandoned my quest for visual phonemes, and set about examining the pots in the Museum of Northern Arizona in an effort to study actual variation in pottery designs. As I studied the designs I photographed them as a way of recording them, and in addition, I often drew them. In drawing them, a certain logic or conceptual order began to emerge in what had previously appeared to be fairly chaotic designs. In order to reproduce a design, it is necessary to actively perceive it, i.e., to either discern or create spatial relationships and order in the design, such that it can be recreated. (Reproducing from memory alone would require an even more exacting perception). Thus, it was not surprising that the designs became clearer as I drew them. What was more surprising was that the order in most cases was actually quite simple; it had eluded me so entirely before I was forced to search it out, only because it

Laura Greenberg is a graduate student in anthropology at the University of British Columbia. She is, at the moment, engaged in writing a doctoral dissertation on the structural analysis of the art of the Northern Northwest Coast of America, which focuses on the cognitive operations of inversion and intersection as they are used to generate the art, and on the specific and prolific use of visual punning for social and symbolic ends.