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A QUASI-EXPERIMENTAL COMPARISON OF A TRADITIONAL LECTURE/DEMONSTRATION
AND A SELF-PACED INDIVIDUALIZED METHOD OF TEACHING
A MANIPULATIVE SKILL IN GRAPHIC ARTS

by

TIMOTHY LANE MARTIN

A professional paper submitted in partial fulfillment
of the requirements of the degree

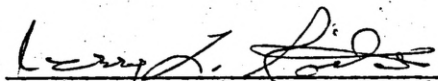
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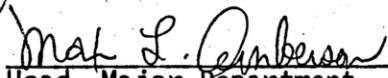
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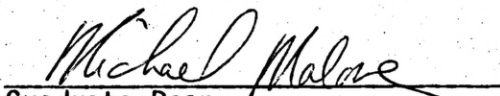
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ABSTRACT

The principal problem in this study was to compare a quasi-experimental, traditional lecture/demonstration method with a self-paced individualized method in teaching a manipulative skill in graphic arts. The population for this study consisted of 72 Industrial Arts 204 Material and Processes students at Montana State University, Winter Quarter 1982.

The data indicated there was no significant difference between the two teaching methods at the .05 level using a t-test. Upon completion of instruction the data also revealed no significant difference existed between student performance on the pre-test compared to performance on the post-test between the two groups.

It is recommended that if a researcher develops his/her own self-paced individualized instructional program the directions be concise and the procedures be well defined and in proper sequence. Students commented that the instructional manual used in this study for the self-paced individualized group was helpful because each step was easy to follow and understand.

It is also recommended that an individualized program be used to supplement and reinforce a lecture/demonstration. Media are available for most subject areas and teachers should consider these tools.

Chapter I

Introduction

Graphic arts is first of all a communicative art, and therefore is logically placed under the broad area of communication. It might be noted that communication is the sole underlying purpose of graphic arts. Graphic communications deals with all industries, arts and processes which produce a visual image on a multitude of surfaces.

Graphic arts is a term widely used in industry, as well as in education, to describe printing and allied crafts. "Printing" has a restrictive connotation; graphic arts is a broader term, generally interpreted to include all activities closely allied to the printing and publishing field. Graphic arts activities are closely allied to the printing and publishing field. Graphic arts activities in industrial arts classes are being broadened to give a better cross-section of the industry as well as providing experiences for popular and worthwhile leisure-time activities. (Carlsen, 1970, p.7)

Graphic arts activities provide unlimited opportunities to integrate other school subjects with a laboratory experience. English, mathematics, art, and science are all important in one or more phases of graphics.

Need for Study

Educators have discovered that students possess unique and individual learning styles. Some students learn better by listening, some by interaction, others by working on their own. Like individual differences among students, the possible variations in learning styles are infinite.

Learning style describes a student in terms of those educational conditions under which he is most likely to learn. To say that a student differs in learning style means that certain educational approaches are more effective than others for him or her.

Learning styles emerge from inborn, natural inclinations which include preferred ways of learning (e.g., visual, auditory, tactile, etc.) and descriptions of personality characteristics that relate to learning. (Phi Delta Kappa, 1980)

For this reason it seems beneficial to look at alternative teaching methods that help reach these differences in learning styles. One of these alternatives is individualized instruction.

Individualized instruction is not the same thing as "teaching students individually." An instructional system is individualized when the characteristics of each student play a major part in the selection of objectives, materials, procedures, and time scheduling. It is individualized when decisions about objectives and how to achieve them are based on the individual student. One does not simply say that a system is or is not individualized, however, for it is not a black or white matter. Rather one tries to identify the nature and degree of individualization. (Esbensen, 1968, p.7)

The program of individualized instruction that was used in this study was developed, photographed, printed and administered by the researcher (see Appendix A). Every attempt was made to eliminate any biases on the part of the researcher toward the two groups in the study.

Objectives of the Study

The objectives which have given direction to this study are as follows.

1. To compare the cognitive achievement of students (control group) taught by the lecture/demonstration method with students

(experimental group) taught by a self-paced individualized instructional system.

2. To determine what effect the lecture/demonstration method of instruction has on psychomotor skill development as compared with an individualized method of instruction.

Statement of Problem

This study will compare a quasi-experimental, traditional lecture/demonstration method with a self-paced individualized method in teaching a manipulative skill in graphic arts.

Assumptions

1. Experimental and control groups are similar.
2. The pre-test and post-test will provide a valid and reliable indication of achievement in cognitive development.
3. The respondents will accurately respond to the pre-test and post-test.
4. The researcher's evaluation of student project work will accurately measure the student's manipulative skill.
5. The information provided in the individualized learning program, developed by the researcher, will accurately parallel the lecture/demonstration method.
6. The researcher will be consistent in delivery of instruction to all lecture/demonstration groups.

Hypotheses

To facilitate the analysis of data, the following research hypotheses were formulated:

1. There will be no significant difference in cognitive development between students taught by the individualized instruction method versus those taught by the traditional method.
2. There will be no significant difference in manipulative skills developed between students taught by the individualized instruction method versus those taught by the group lecture method.

Limitations

The researcher has no previous experience in teaching graphic arts using the individualized instruction method.

Delimitations

The study will be delimited to only those students enrolled in industrial arts classes at Montana State University.

Chapter II

Review of Related Research and Literature

Evidence of man's first attempt at visual communication can be traced back through history to cave existence. As people became more advanced they developed a few letters and symbols. It was essential for these letters and symbols to be recorded in print form for a civilization to advance and develop a lasting form of communication.

A culture's existence also depends on the extent to which they have educated their young with respect to retaining learned skills; therefore, it is important that people be educated by means which most directly and effectively reflect the technological advancement of the society they live in.

One of the advancements that has helped to promote the growth of the American society is the emergence and rise of electronic media. Media that are available in the field of education and the many new avenues that will open up to educators are areas that need to be continually studied. Through further study, data may indicate that students are able to learn and retain information more effectively and efficiently than traditional methods.

There is much cultural change taking place today that is shaping the direction of people's growth. How vast and far-reaching are the changes that societies are experiencing? What is happening? Is it possible to predict what the future will look like?

A useful tool for exploring answers to all of these questions is media analysis. The first step in media analysis is to determine what is meant by media. Webster's New World Dictionary of the American Language defines media as "a means of communication that reaches the general public." This definition does little to clarify understanding. Therefore, the researcher would like to submit an additional definition by Marshal McLuhan (1967). McLuhan defines media as "any extension of man's faculties or senses."

McLuhan continues by saying that media,

...extends or stretches the power of man beyond his purely natural abilities. A telescope extends the eye as does a microscope. A hearing aid extends the ability of the ear as do radio, telephone, and telegraph. Eyeglasses, television, and print likewise extend the power of man, and are therefore eligible to be studied by the media analyst.

Schrank (1970, p.8) states that "one of the first tenets of media analysis is that any medium which is widely accepted by a culture changes the entire culture--physically and psychically." In other words, when there is a shift in media, people and whole cultures also change, sometimes drastically. Schrank adds (1970, p.8), "When there is a major shift in media, the change has the scope of a revolution, one usually led by the young who are the first to be affected."

An ironic fact about such a revolution is that its real causes are seldom known to the people involved. Schrank continues, "Media change

is a sort of Trojan horse whose real effect is seldom discovered until it is too late." The reason people never quite realize one of the effects of new media is simply that humans are caught in an environmental trap; they are never really able to understand their present environment or surroundings. Media manipulate people's behavior without their being aware of the subtle and powerful changes. In school, students learn how to interpret the content of many media, but most often they do not understand the media themselves. Schrank (1970) states:

We, in the last third of the twentieth century, stand with one foot in the age of print and the other in the age of electronics; we are desperately trying to maintain our balance in the midst of a violent clash between media which threatens to revolutionize the social order. (p. 8)

As pointed out in this statement, people are changing from a world of print domination to one of electronic extension. This emergence of media dominance accounts for vast new learning habits in people. The young are especially affected because they have had more exposure to the new electronic media.

The single medium that has most shaped the world in the last three centuries has been the invention of Johann Gutenberg's mass produced print in the 1400's. Print turned the alphabet into a medium which could reach millions of people. It is print and the ability to read which has had its greatest impact on civilization. Few people have been able to read at any given time during the past few thousand years since writing was developed.

It has only been since Gutenberg that literacy has become the general environment for even a small part of the world.

Electronic media are clashing with the old print medium, thus causing at least part of the turmoil in the United States today. Electronic media are all-at-once instead of one-at-a-time. Print is for private consumption, electronic media are for large groups. Print technology created the mass public, electronic technology is creating the involved community. Students in a classroom and school curriculum are changing due to this new electronic media because they are being moved from the classroom to the outside world, via media. (Schrack, 1970, p.11)

Today's young people have been brought up on television and films. They are constantly exposed to electronic and non-print media. This makes them different from the youth of the pre-electronic media era. It is not only the content of the electronic input but the media themselves that make the difference.

It stands to reason that if today's student is more a citizen of the age of electronic and non-print media than the age of the printed word, the educational techniques used in education must make allowance for this. Today's young people are aware that their learning experiences come from a vast number of sources. A student is used to and needs more than the classified information which the printed word provides. Therefore, today's educators must equip themselves to meet this challenge head on.

Individualized Instruction

As mentioned earlier individualized instruction is not the same thing as teaching students individually. Ideally, individualized instruction could be thought of as an arrangement that tries to make possible, at all times, for each student to engage in learning those things that are most appropriate for himself/herself as an individual. While this may be the ideal, educators and school systems will need continued encouragement to pursue individualized programs.

Independent study is not the same as individualized instruction. However, independent study is often a part of individualized instruction. Individualized instruction is the larger of the two ideas. "To put the matter in general terms, individualized instruction does not depend for its success upon any given arrangement of persons, materials or environmental conditions." (Ebsensen, 1968, p.4)

The following are statements by experts which provide support for the need for individualized instruction.

1. Children learn through various perceptual structures. They assimilate varying amounts of content at different rates of speed and vary in their retentive abilities. (Dunn, 1973)
2. Learners need to develop a wide variety of learning styles for effective learning outcomes. (Joyce, 1975)
3. The complexity of society necessitates that children should learn on their own. The emphasis should be on the "structure" of knowledge and the modes of acquiring information rather than on the content itself. (Glaser and Cooley, 1973)

4. Learning takes place on an individual basis, and therefore school experiences should be organized around each child. Thus the educational program must be flexible, adaptable and capable of meeting the demands of the individual and those of a complex, dynamic society. (Bishop, 1971)
5. Learning is an active not a passive process. It must involve participation in a task rather than mere absorption of information. (Stahl and Anzalone, 1970)
6. Each individual needs to develop qualities of individuality in order to cope with the complexities, contradictions and uncertainties of mass society. Schools should treat each student as a person of worth and dignity and recognize that the student is the client whose interests are served by the school. (Heathers, 1974)

On the surface individualized instruction may appear very complex and overwhelming, but with some guidance and a willingness to explore this process, a teacher may find individualized instruction very practical.

The Process of Individualized Instruction

The process of individualized instruction is suggested in the following by Nawaz and Tanveer:

1. The final pattern that a teacher or a school adopts will hopefully be the result of sustained and extended try-outs and experimentation. A feedback process is essential to any instructional device.
2. Establish instructional objectives. It is generally agreed that objectives which are specific, observable and measurable make individualized instruction more viable.
3. Determine performance criteria. This includes statements specifying the performance level on the part of

the learner as well as how the performance is to be demonstrated.

4. Suggest learning alternatives. The student is given a list of available learning alternatives from which he selects the one that interests and challenges him.
5. Design evaluative measures. In order to assess the progress of each individual learner through the various learning tasks, a system of pre-post testing is designed. The student may also have opportunities of self-assessment as he progresses through the learning experience.
6. Devise a system to keep track of the progress of each individual learner. This can be done by designing evaluation forms, progress charts, workfolders, etc. (1977, p.25)

These processes indicate that the traditional role of classroom teacher will shift considerably to one of classroom manager.

Why Personalized Instruction Seems to Work

Personalized instruction and individualized instruction are virtually the same. The following is a quote by one of the leading educational theorists, B.F. Skinner.

Individualizing or personalizing education is becoming recognized as one means of dealing with the problems of student-teacher ratios and differential ability levels. (1954)

Hess and Lehman (1976) further associate personalized instruction and individualized instruction as being one and the same, and postulate why personalized instruction seems to work: "After a review of literature, we have indentified the most frequently cited features of individualized and personalized instruction. They are:

1) assessment of entering abilities; 2) individualization of curriculum; 3) learner selected objectives; 4) multi-media presentation; 5) computer usage; 6) explicit behavioral objectives; 7) active responding; 8) explicit regards for defined behaviors; 9) frequent feedback; 10) immediate feedback; 11) sequential presentation of materials; 12) self-pacing; 13) mastery; 14) proctors; and 15) written communication.

The following is a summation of a study titled "Predicting Success In An Individualized Multi-Media Instruction Program Using Variables of Aptitude And Personality" by Jeldon (1971). The study consisted of 193 students in seven classes of electronics operated on an individualized, multi-media basis.

Visual or lecture media were preferred over verbal or written media by most students, although the type of media used first did not have a great deal to do with success or failure.

Approximately 2/3 of the students prefer an individualized, multi-media environment over a traditional teacher dominated, lock-step learning environment.

The anxiety and frustration level of students in the multi-media environment was less than that experienced in a traditional program at the end of the course.

Kulik, Kulik, and Smith (1976) located 39 studies comparing conventional courses with courses taught by the Personalized System of Instruction (PSI). Their compilation included only studies meeting basic experimental requirements. This eliminated from their tabulation of PSI outcome research all studies with nonequivalent comparison groups, differential dropout or prior exposure to examination items by one of the comparison groups.

Their findings are as follows:

In 38 of the cases, performance of PSI students was superior to performance of students in a conventional control course. In 34 of the cases, the difference between the two courses was statistically significant, and in all of these cases the performance of PSI students was higher. When all 39 studies are taken into account, final examination scores in courses taught by PSI were 13 percent higher than scores in comparable courses taught more conventionally.

The differences reported by Kulik, Kulik and Smith were not only great enough to be statistically significant, they were also sizeable enough to be practically significant. In a typical published comparison, PSI and lecture means on final exams are separated by about two-thirds of a standard deviation.

How large a difference is this? Let us take an average student, Mary Smith, who may take her introductory physics course, for example, by either a conventional method or by PSI. If she takes a typical lecture course, her achievement in physics will put her at the 50th percentile on a standardized test. She is an average student in an average course. If she takes the same course in a PSI format, she will achieve at the 75th percentile on the standardized test. This increment is what PSI has to offer the individual student. If you take this effect and multiply it by 100, the number of students a typical teacher has in a term, you have some conception of what PSI has to offer.

Retention and Transfer

As important as examinations are, they have their limitations. They cannot test for long-range retention of facts, principles and concepts, and they seldom test students for ability to make major applications of concepts in new situations.

Kulik, Kulik and Smith located nine studies of long-range retention of PSI course content. These studies reported on retention over intervals ranging from three weeks to 15 months after completion of a course. In each of the studies, the PSI students performed better on a follow-up examination than students from lecture courses, and in each study the difference between groups reached statistical significance. In most of the studies, differences at the time of follow-up are greater than final exam differences. The average retention score for PSI students was 24 percent higher than the average retention score for students in conventional classes. (Kulik and Jaksa, 1970, p.13)

The use of lectures is usually an optional and less emphasized feature of PSI. Attendance at lectures by students tends to be low and decreases further as the semester progresses (Born and Herbert, 1971; Lloyd et al., 1972), and the presence of students at lectures does not affect student exam scores (Phillips and Semb, 1976).

A study of the effects of a slide-series teaching technique upon cognitive learning in graduate classes was performed at West Georgia College. The instructional techniques for teaching social foundations of education courses were redesigned in order to make extensive use of one media technique. Classroom sessions consisted of lecture-discussions centered around the cognitive aspects of the course content. The average size of classes was 40 students. After teaching the course for four years the instructor wished to use an alternative method to present the cognitive aspects of the course. Therefore, a slide series was developed which utilized 850 slides to present the course content.

The 10 sections of the class that had been previously taught using the lecture method were used as a control group. The experimental group was taught by means of the slide series. "The tests themselves, and the individual test items, for the 20 class sections used for the control and experimental groups were similar."

(McTeer, 1977, p.40)

Through the use of a chi-square, an examination was made to see if there was a difference in the grades received by the two groups. A chi-square of 6.16 was computed which showed there was a significant difference at the .05 level. This difference was in the direction of higher grades being received in those classes having been exposed to the slide series.

Many factors, such as different instructors, teaching techniques, evaluation, course material and type of students, may account for this difference. However, the same instructor taught all of the control and the experimental classes. (McTeer, 1977, p.40)

McTeer states that other factors may have accounted for portions of the difference in student test scores. It appears that the major factor causing the difference in cognitive learning, as measured by grades, in the control and the experimental groups was the teaching technique utilizing the slide series.

Summary

The review of literature illustrates that teachers, educators and school systems must no longer ignore the students that fall behind in their studies because they are unable to comprehend the lectures and the materials that are traditionally used in the teaching learning process.

Media technology advances provide the field of education an opportunity to design increasingly personalized learning programs. With the emergence of systems such as individualized instruction, it is now possible to accommodate a variety of learning rates and lead students through a successful learning experience.

Chapter III

Methods and Procedures

Overview

This chapter reports the research methods and procedures used to compare two methods of teaching: the traditional lecture/demonstration and the self-paced individualized method of instruction. Chapter III is divided into the following sections:

- (A) Description of the Population
- (B) Development and Delivery of the Lecture/Demonstration Method
- (C) Development and Delivery of the Self-Paced Individualized Method
- (D) Data Collection Procedures
- (E) Analysis of Data Procedures

Description of the Population

The population for the study was composed of students from the Industrial Arts 204 Materials and Processes course, Winter Quarter 1982 at Montana State University. The number of students enrolled in the class totalled 72 with approximately 24 students in each of the three separate laboratory sections. Each of the three sections was randomly divided into a control group and an experimental group with approximately 12 students in each group. Throughout this study the control group will be referred to as lecture/demonstration and the experimental group will be referred to as self-paced individualized.

Development and Delivery of the Lecture/Demonstration Method

The lecture/demonstration group was taught information and operational skills pertaining to the rubber stamp under a traditional lecture-demonstration method. The teacher acted as lecturer, demonstrator, small group discussion leader and laboratory supervisor. A lesson plan was developed and followed by the teacher to maintain consistency among the lecture/demonstration students (see App. B).

The lecture/demonstration method that was presented by the researcher consisted of first, lecturing on the materials and processes needed to make a rubber stamp and then demonstrating the procedures involved in making a rubber stamp. Upon completion of the lecture/demonstration, each student was given the materials necessary to construct a rubber stamp. The researcher was present at all labs to provide assistance to the students.

Development and Delivery of the Self-Paced Individualized Method

The self-paced individualized method that was used with the experimental groups in the study was developed and prepared by the researcher. This method utilized various educational strategies which consisted of slides, a narrated audio-tape, a self-paced instructional manual and instructor assisted guidance. The program was first tested by members of the faculty, staff and students of

Montana State University's Industrial Arts Department. After the program was revised and validated, the students of the individualized group were required to view the audio-visual presentation which described the materials and processes needed to construct a rubber stamp.

The students were also presented with the instructional manual which directly paralleled the slides and the narration on the audio-tape. The instructional manual served as a self-paced guide to be used in the laboratory and also as a reinforcement for the slide/tape presentation. After viewing the presentation the students were directed to the laboratory and given the materials necessary to construct a rubber stamp.

Data Collection Procedure

1) Pre-test procedure: Every student from each section was given a pre-test which was administered by the researcher (see App. C). The questions for the test were designed by the researcher and validated by a panel of experts (see App. D). The pre-test was comprised of ten questions. Each question had a value of ten points. Each student could obtain a score from 0% to 100%.

2) Rubber stamp procedure: The rubber stamps were evaluated by the researcher and given a score of Superior, Satisfactory or Unsatisfactory. Listed below are the criteria used to evaluate the rubber stamps:

Criteria For Stamp Scores

1. Clean printed impression
 - A. No smudges
 - B. No background pickup
2. Correct spelling and punctuation
3. No inverted letters
4. Stamp trimmed close to raised printing surface
5. Deep counter impressions on the stamp gum
6. Stamp properly adhered to molding
7. Stamp gum properly vulcanized

To obtain a Superior rating a student must meet six of the seven criteria. A Satisfactory rating was given to a student performing five of the seven criteria, while a student achieving four of the seven criteria was given an Unsatisfactory rating for his/her rubber stamp.

3) Post-test procedure: After all of the students had produced a completed rubber stamp, the researcher administered a post-test to every student that was present the day of their scheduled lab section. The post-test was identical to the pre-test.

Analysis of Data Procedure

Each student's scores from the pre-test, post-test and rubber stamp were compiled and analyzed by the Data Entry Service at Montana State University's Computer Center. The data were

verified by the same service as well as by the researcher in order to detect and correct any errors.

A computer program was used by the researcher and Montana State University's Computer Center staff in cooperation with Dr. Jerry Roiter. The program used to analyze the data was the (SPSS), Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1975).

The first objective was to compare the cognitive achievement of students taught by the lecture/demonstration method with students taught by a self-paced individualized instructional method. The data were analyzed by comparing the pre-test and post-test scores of the lecture/demonstration group with the pre-test and post-test scores of the individualized group. The t-test was used to compare the two groups means using the .05 level of significance.

The second objective was to determine what effect the lecture/demonstration method of instruction had on psychomotor skill development compared to self-paced individualized instructional method of teaching. These data were analyzed by comparing the rubber stamp scores of the control group to the rubber stamp scores of the experimental group. The t-test was used to compare the two groups means using the .05 level of significance.

Chapter IV

Analysis of Data

For the purpose of analysis, the pre-test, post-test and the rubber stamp scores were used from the students of the Industrial Arts 204 Materials & Processes class at Montana State University.

Description of Population & Sample

The data in Table 1 report the enrollment figures for students officially enrolled in I.A. 204, according to the registrar's office. It listed 72 students enrolled in the I.A. 204 class, Winter Quarter 1982.

TABLE 1

Descriptive Statistics of Population & Sample

Registrar's Official Enrollment for I.A. 204	72
Total Number of Students Attending Class	57
Students Completing Pre-test	53
Students Completing Post-test	46
Students Completing Both Pre-test and Post-test	42

Data in Table 1 also illustrates that 57 of the 72 students were present either the day of the pre-test or when the post-test was administered. A total of 42 students completed both the pre-test and post-test. Data from only those students that completed both the pre-test and post-test were used in the study.

Displayed in Table 2 are the data from 19 student scores used in the statistical analysis for the lecture-demonstration group and 23 students for the self-paced individualized group.

TABLE 2
Sample of Study According to Group

Lecture/Demonstration	Self-Paced Individualized
19	23

The data in Table 3 exhibits the mean, standard deviation, maximum and minimum results of the pre-test and post-test for the lecture/demonstration and individualized groups.

The lecture/demonstration group resulted in a mean score of 44.74 on the pre-test and a mean score of 71.58 on the post-test. The individualized group had a mean score on the pre-test of 36.96 and a mean score of 76.09 on the post-test.

TABLE 3

Mean, Standard Deviation,
Maximum and Minimum from
Pre-test and Post-test Results

Lecture/Demonstration	Pre-test	Post-test	Post-test Minus Pre-test
Mean	44.74	71.58	26.84
Standard Deviation	19.26	17.40	
Maximum	80.00	100.00	
Minimum	0.00	40.00	
Self-Paced Individualized			
Mean	36.96	76.09	39.13
Standard Deviation	12.22	13.40	
Maximum	70.00	100.00	
Minimum	20.00	50.00	

When the pre-test was subtracted from the post-test, this indicated a cognitive mean gain of 26.84 points for the lecture/demonstration group. When the pre-test was subtracted from the post-test, the individualized had a cognitive mean gain of 39.13. While this is not statistically a significant difference in cognitive mean,

it does show a 12.29 higher gain than the lecture/demonstration method.

Data in Table 4 contains a descriptive listing of the rubber stamp scores obtained from the lecture/demonstration and the individualized groups.

TABLE 4
Rubber Stamp Score for Lecture/Demonstration
and Self-Paced Individualized Groups

	Lecture/Demonstration	Self-Paced Individualized
Superior	13	12
Satisfactory	6	9
Unsatisfactory	0	2

The data show that the lecture/demonstration group had 13 students score superior, six satisfactory and none scored zero. The individualized group had 12 students obtain superior, nine satisfactory and two unsatisfactory scores.

The data illustrated in Table 5 are the mean and standard deviation figures for the rubber stamp scores obtained by the two groups.

TABLE 5

Mean, Standard Deviation,
Maximum and Minimum from
Rubber Stamp Results

Lecture/Demonstration		Self-Paced Individualized
Mean	1.316	1.565
Standard Deviation	.4776	.6624
Maximum	1.000	1.000
Minimum	2.000	3.000

The lecture group had a mean of 1.316 and a standard deviation of .4776. The individualized group had the highest mean score of 1.565 with a standard deviation of .6624. The highest score obtainable by the two groups was 1 (Superior) and the lowest obtainable was 3 (Unsatisfactory).

The data in Table 6 was analyzed using a "Pearson's r Correlation Coefficient". The purpose of the correlation coefficient is to express in mathematical terms the degree of linear relationship between any two variables. Thus, the correlation coefficient is a precise way of stating the extent to which one variable is related to another and also permits carrying out prediction studies and making estimates of the probable accuracy of the predictions.

The Pearson's r correlation was used in this study because the data were expressed in continuous scores and it is subject to a smaller standard error. ρ (Greek letter rho) is equal to the population correlation, which is the "true" correlation between the variables. r is equal to the sample estimate of ρ . To receive a perfect positive correlation between the pre-test, post-test and rubber stamp scores, a factor of +1.000 was needed.

TABLE 6
Correlations Between Pre-test,
Post-test & Rubber Stamp

	Pre-test	Post-test	Rubber Stamp
Pre-test	_____	_____	_____
Post-test	.1327	_____	_____
Rubber Stamp	.309	.1985	_____

A value of 0 would indicate that no linear relationship exists between the two variables. A statistical test of the hypothesis $p=0$ versus the alternate hypothesis $p \neq 0$ was conducted for each of the three sample correlations.

At the .05 level of significance, only the sample correlation between the rubber stamp and pre-test scores, a value of .309, was found to be statistically different from 0. The conclusion was that there is no linear relationship between the pre-test and post-test or the rubber stamp and post-test scores. The correlation value of .309 between the rubber stamp and pre-test scores indicates that, as pre-test scores increase, the rubber stamp scores also tend to increase.

The data in Table 7 display the t-test and P-value (probability) when comparing the post-test minus pre-test means of the two groups. The t-test is used to determine whether the sample means differ significantly from one another.

TABLE 7
Differences in Lecture/Demonstration & Self-Paced Individualized
Group Means for Post-test Minus Pre-test

	Post-test Minus Pre-test
t-test	1.935
P-value	.0614

$$t (.05, 40) = 2.021$$

All the students from the I.A. 204 class were randomly assigned to either the lecture/demonstration or the self-paced individualized group and no pairing technique was involved. The means show a t-value of 1.935 which inferred the groups were essentially equal on the post-test minus pre-test measure at the end of the study. A level of 2.021 at the .05 level was needed to reach significance. r must also be larger than .304 to be statistically different from 0 at the .05 level.

A t-test of independent means was used to compare the achievement of the two groups. This statistical technique was employed because the groups were independent of each other. It was found that the two means did not differ significantly at the .05 level. Therefore, the research hypothesis that "there is no significant difference in cognitive development between students taught by the individualized method versus those taught by the traditional method" was accepted.

The data also reveals a P-value of .0614 which indicates that, if the experiment were repeated, the probability of achieving a test statistic score larger in absolute value is .0614 than the observed t-value of 1.935. This observation was made under the assumption that there was no "true" difference between the group means.

The data in Table 8 report the differences between the lecture/demonstration groups and individualized group means for the rubber stamp scores.

TABLE 8
Differences in Lecture/Demonstration & Self-Paced Individualized
Group Means for Rubber Stamp

	Rubber Stamp
t-test	1.372
P-value	.1777

$$t (.05, 40) = 2.021$$

Examination of means show a t-value of 1.372 which indicated the groups were essentially equal on the rubber stamp scores at the end of the study. A value of 2.021 or larger at the .05 level was needed to reach significance.

It was found that the two means did not differ significantly. Therefore, the research hypothesis that "there is no significant difference in manipulative skills developed between students taught by the individualized instruction method versus those taught by the group lecture method" was accepted.

The data also show a P-value of .1777 which indicates that, if the experiment were repeated, the probability of achieving a test statistic score larger in absolute value is .1777 than the observed t-value of 1.935. This observation was made under the assumption that there was no "true" difference between the group means.

Chapter V

Summary, Conclusions, and Recommendations

Summary

The purpose of this study was to identify the most effective method of teaching an introductory level graphic arts process by testing and comparing two groups of students. The study compared the traditional lecture/demonstration method of instruction with the self-paced individualized method, by testing both cognitive and psychomotor skills in two groups of students.

The profession and the environment of education has taken on many changes, from a one-room school with chalk board instruction to multi-level, environmentally controlled classrooms and computer-assisted instruction. The students of today are greatly influenced by and have access to electronic media that did not exist a generation ago. This emergence of media is not only changing our society but is also having a major effect on our educational system.

Students are now being exposed to computers at the elementary level, while ten years ago many colleges did not have a computer. Students can now enroll in a class where the majority of the instruction is taught by slide/tape, video or other strategies involving electronic media.

It is intended that this study will provide useful data for teachers, administrators and school systems that are working toward

integrating a form of media-assisted, self-paced, individualized system of instruction. Educators must become aware that each student is unique and has an individual learning style. Self-paced individualized instruction is not intended for all students, but it should be made available to those students whose learning style will benefit from this method.

The sample for this study was 42 students from the Industrial Arts 204 Materials and Processes class at Montana State University. The students were randomly assigned to either the lecture/demonstration group or the self-paced individualized group. Each student completed a pre-test before receiving any instruction. Upon completion of the rubber stamp the post-test was administered. The pre-test, post-test and stamps were scored and a computer analysis was made from the scores. Only those students that completed both the pre-test and post-test were used in the study.

Control Group Methodology

The control group was taught information and operational skills pertaining to the rubber stamp under a traditional lecture-demonstration method. The teacher acted as lecturer, demonstrator, small group discussion leader and laboratory supervisor. The control group (lecture/demonstration) maintained a uniform pace and completed the same assignments according to the time allotted for each section of laboratory time.

The teacher maintained a traditional lecture/demonstration teaching environment by centering the instruction around a lecture, discussion, question-and-answer and operational demonstrations.

Experimental Group Methodology

The experimental group (self-paced individualized) was taught information and operational skills pertaining to the making of a rubber stamp utilizing a slide/tape program and instructional manual developed by the researcher (see App. A). Under the individualized system, each student was allowed to progress at his/her own pace within the restrictions of laboratory time. Each student was given as much teacher assistance as required to complete the rubber stamp.

Summary of Findings

The specific findings of this study as derived from testing the two hypotheses were as follows:

Hypothesis 1. There will be no significant difference in cognitive development between students taught by the individualized method versus those taught by the traditional lecture/demonstration method.

From the testing of this hypothesis, it was determined that the P-value of .0614 was not significant at the .05 level, thus, the hypothesis was accepted.

Upon completion of instruction the data revealed that no significant difference existed between student performance on the pre-test compared to performance on the post-test between the experimental and control groups.

Hypothesis 2. There will be no significant difference in manipulative skills developed between students taught by the individualized instruction method versus those taught by the group lecture method.

From the testing of this hypothesis, it was determined that the P-value of .1777 is not significant at the .05 level, thus, the hypothesis was accepted.

Conclusions

Within the limitations of this study and to the extent that the measurement of the selected variables were accurate and valid, the following conclusions may be drawn:

1. In comparing the two instructional methods for cognitive development it can be concluded that there was no significant difference in student achievement of related information between the two instructional delivery methods.
2. In comparing the two instructional methods for psychomotor development it can be concluded that there was no significant difference in psychomotor skill development among students between the two groups.

Recommendations

The following recommendations are made using the results of this study. The study was a comparison between an individualized instructional method and a traditional lecture/demonstration method for teaching a manipulative skill in graphic arts.

1. It is recommended that if a researcher develops his/her own self-paced individualized instructional program that the directions be concise and the procedures be well defined and in proper sequence. Students commented that the instructional manual used in this study for the self-paced individualized group was helpful because each step was easy to follow and understand.

2. It is recommended that further research be conducted to determine if variations in teaching methods, size and organization of classes and laboratory facilities make a difference in students' overall achievement.

3. Since this experiment was conducted in a teacher training institution it is recommended that prospective teachers be prepared to participate in individualized instructional programs and that they be exposed to individualized instruction during their own training.

4. It is recommended that an individualized program be used to supplement and reinforce a lecture/demonstration. Media is available for most subject areas and teachers should consider these tools.

Bibliography

- Bishop, L.K. Individualizing Educational Systems. New York: Harper and Row, 1971.
- Born, D.G. and Herbert, W.A. A Further Study of Personalized Instruction in Large University Classes. Journal of Experimental Education, 1971, 40, 6-11.
- Dunn, R.S. Individualizing Instruction: The Rationale and Five Alternative Methods. The Delta Kappa Gamma Bulletin, 1973, 60, 9-16.
- Esbensen, T. Working with Individualized Instruction. Belmont, California: Fearon Publishers, 1968.
- Finn, D. The Teacher and Technology. Columbus, Ohio: Color Motion Picture Division, The Ohio State University, 1967.
- Gallup, G. The Miracle Ahead. New York: Harper & Row Publisher, 1964.
- Haney, J.B. Educational Communications and Technology An Introduction for Teachers. Dubuque, Iowa: Wm.C. Brown Company Publishers., 1975.
- Heathers, G. Education to Meet Psychological Requirements for Living in the Future. Journal of Teacher Education, 1974, 108-112.
- Hess, J.H. and Lehman, G.R. PSI Among the Acronyms. In R.S. Ruskin (Ed.), An Evaluative Review of the Personalized System of Instruction. Center for Personalized Instruction, Washington D.C., 1976.
- Hess, J.H. Jr. Large-Scale Individualized Instructional Systems: A Comparison of Three Working Models. Educational Technology, Sept. 77, Vol. XVII, No.9.
- Hird, Kenneth F. A Comparison of an Individualized and Traditional Method of Teaching Introductory Graphic Arts at the University Level, Utah State University, 1977.
- Hoban, C.F., Hoban, C.F.Jr., Zisman, S.B. Visualizing The Curriculum. New York: The Cordon Co., 1937.

- Jelden, D.L. Predicting Success In An Individualized Multi-Media Instructional Program Using Variables of Aptitude and Personality. University of Northern Colorado, 1971.
- Joyce, B.R. Learning Strategies for Learning Centers. Educational Leadership, 1975, 32, 388-391.
- Kulik, J.A. and Jaksa, P. PSI and Other Educational Technologies in College Teaching. Educational Technology, Sept. 77, Vol. XVII, No.9.
- Kulik, J.A. & Kulik, C.L.C. and Smith, B.B. Research on the Personalized System of Instruction. Programmed Learning and Educational Technology, 1976, 13, 23-30.
- Lloyd, L.E., Garlington, W.K., Lowry, D., Burgess, H.A., Euler, H. and Knowlton, W.R. A Note on Some Reinforcing Properties of University Lectures. Journal of Applied Behavior Analysis, 1972, 5, 151-155.
- McLuhan, M. and Fiore, Q. The Medium Is the Message: An Inventory of Effects. New York: Bantam Books, Inc., 1967.
- McTeer, H.J. Effects of a Slide-Series Teaching Technique Upon Cognitive Learning in Graduate Classes. Educational Technology, Aug. 1977, Vol. XVII, No.8.
- Nawaz, M. and Tanveer, S.A. Individualized Instruction: The Promise, Requisites and Alternatives. Educational Technology. 1977, Vol. XVII, No.2.
- Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., and Bent, D.H. Statistical Package for the Social Sciences. New York: McGraw-Hill, 1975.
- Phi Delta Kappa, On Mixing and Matching of Teaching and Learning Styles. Practical Applications of Research. 1980, Vol.3 No.2.
- Phillips, T.W. and Semb, G. Quizzes, Lecture Attendance and Remediation Procedures in a Contingency Managed University Course. Gainesville: Society for Behavioral Technology and Engineering, University of Florida, 1976.
- Pica Foundation. Graphic Communications Education Program. Clemson University, South Carolina.

Ruskin, R.S. Personalized Instruction and Its Relation to Other Instructional Systems. Educational Technology, Sept. 77, Vol. XVII, No.9.

Schrank, J. Media in Value Education a Critical Guide. Chicago, Ill: Argus Communications, 1970.

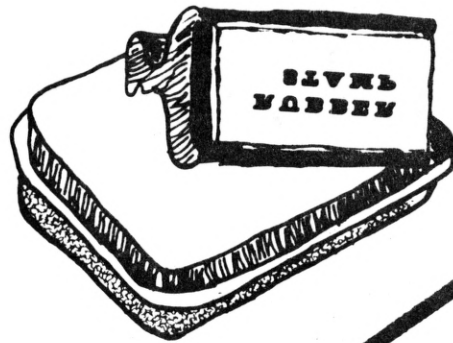
Skinner, B.F. The Science of Learning and the Art of Teaching. Harvard Educational Review, 1954, Vol. 24, No.2, pp-86-97.

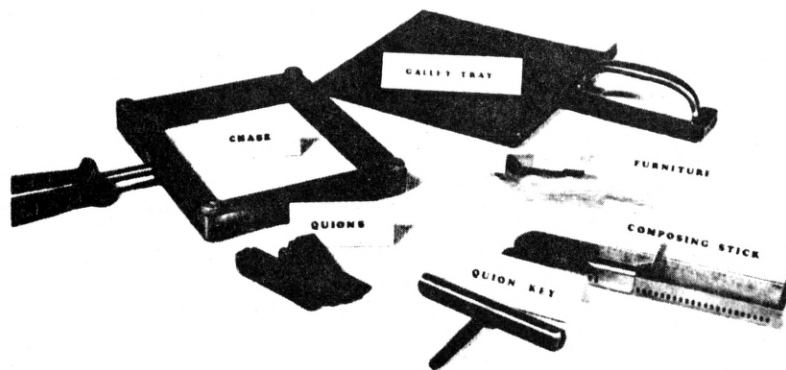
Webster's New World Dictionary. William Collin & World Publishing Co. Inc. 1977.

APPENDIX A
Individualized Instruction Manual

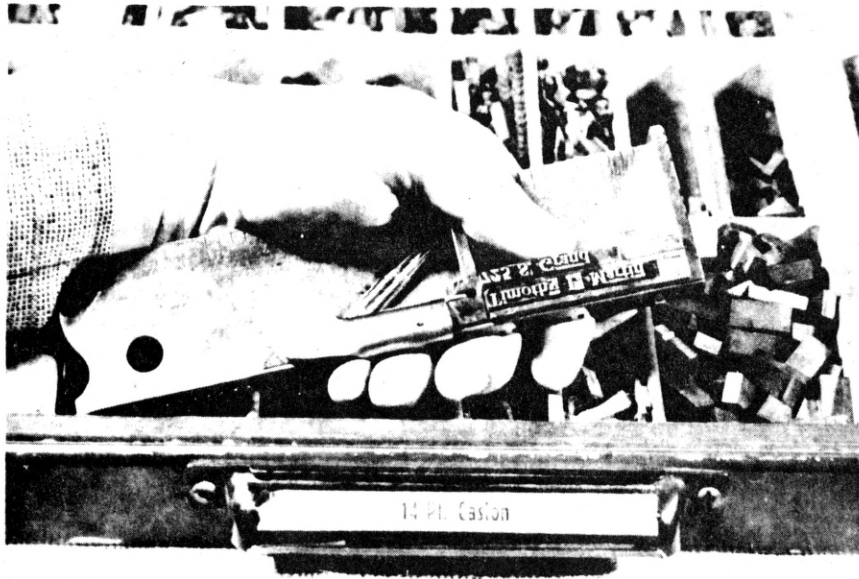


**RUBBER
STAMP**



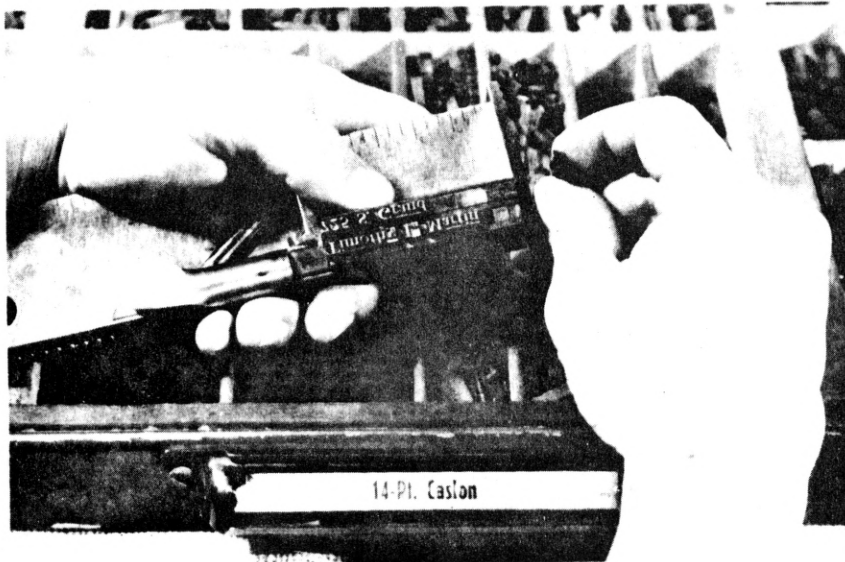


The purpose of this program is to introduce you to rubber stamp printing. This process is a form of relief printing. Rubber stamp printing is also known as flexography.

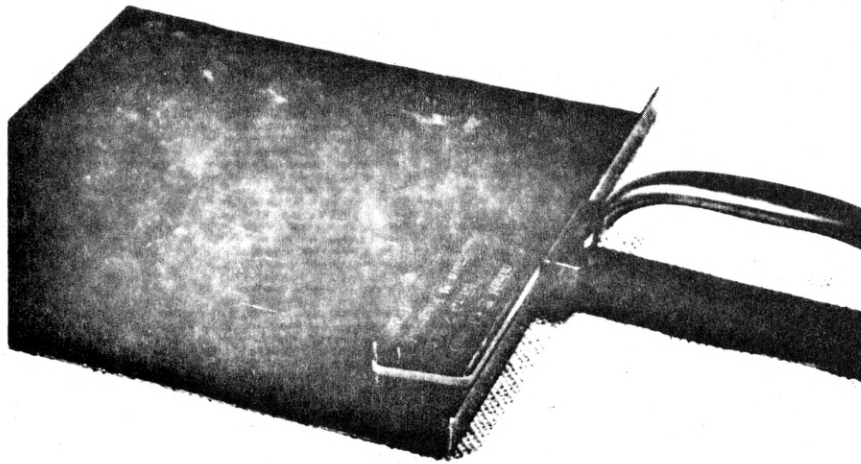


Arranging the type, one character and one line at a time, is called composing. The entire job is set up in this manner.

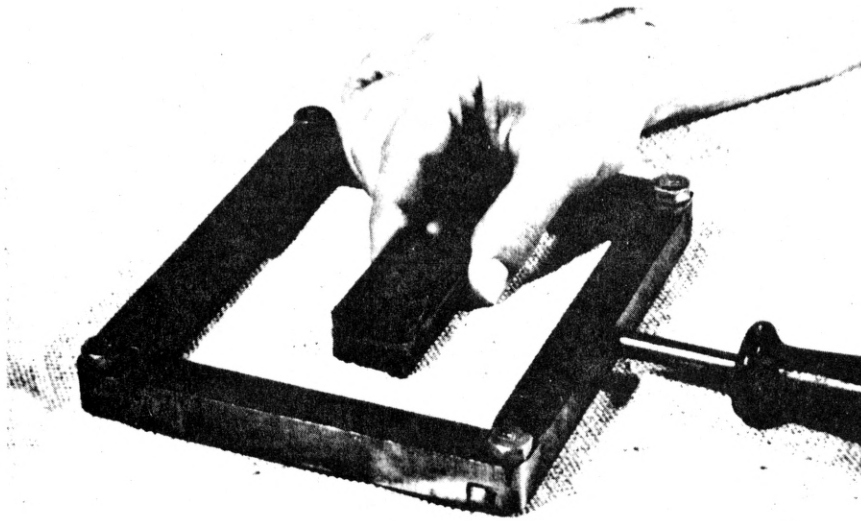
Take a composing stick and set the job. The letters should be upside down and read left to right. A thin strip of lead, called a slug, is used to provide spacing between sentences.



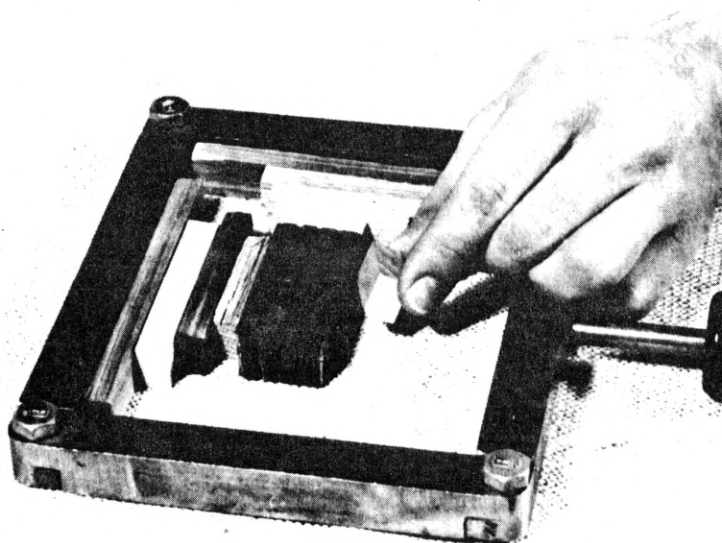
You will notice as you set the type that each character has a small nick on one side. If the nick on each piece of type is facing up, the type is properly set.



When the type is set, border the top and bottom with a slug. Carefully transfer it from the composing stick to the galley tray and secure it. You may use either string or a rubber band for this procedure.



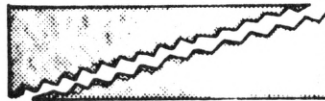
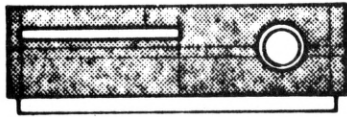
Before the rubber stamp can be made it must be locked up in a metal frame called a chase. The type should be near the center of the chase.



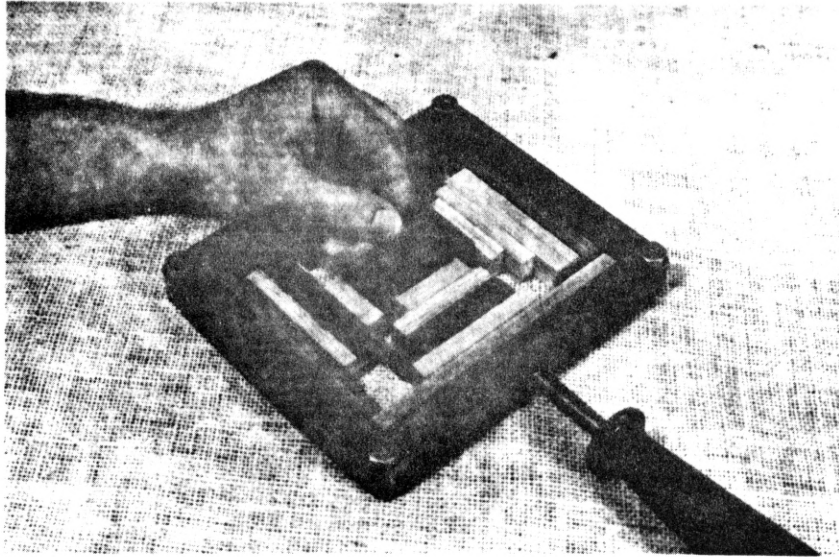
Remove the string or band and lock up the type. Begin by placing a small piece of furniture on both the top and right sides of the type. Furniture used on the ends should fit flush or extend slightly passed the type.

Next select another piece of furniture slightly longer and place it behind the previous piece. Fill the chase in this manner. When the chase is full it should resemble a pyramid, with the longest stick of furniture against the metal chase.

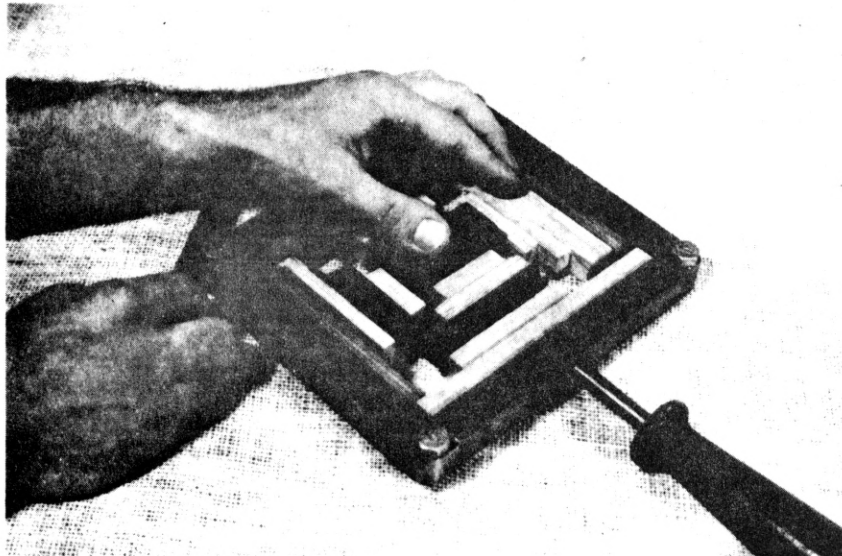
Quoins



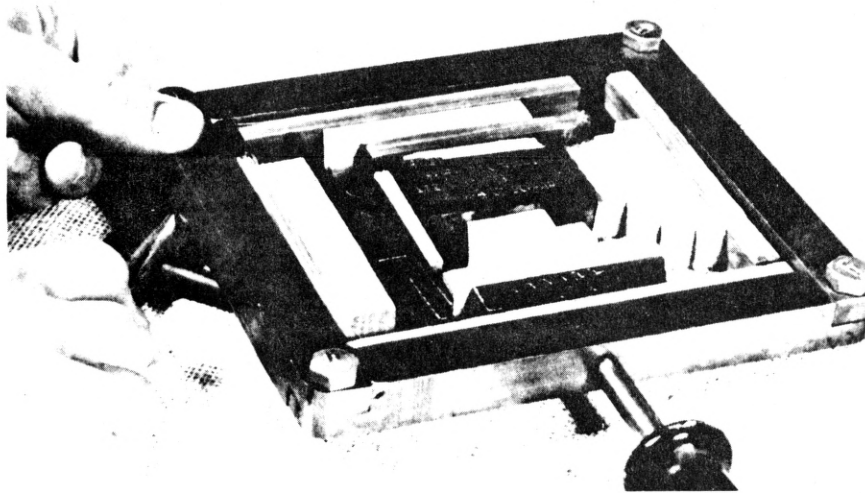
In order to hold the type form in the chase, a device called a quoin is used. Here you see two different types of quoins.



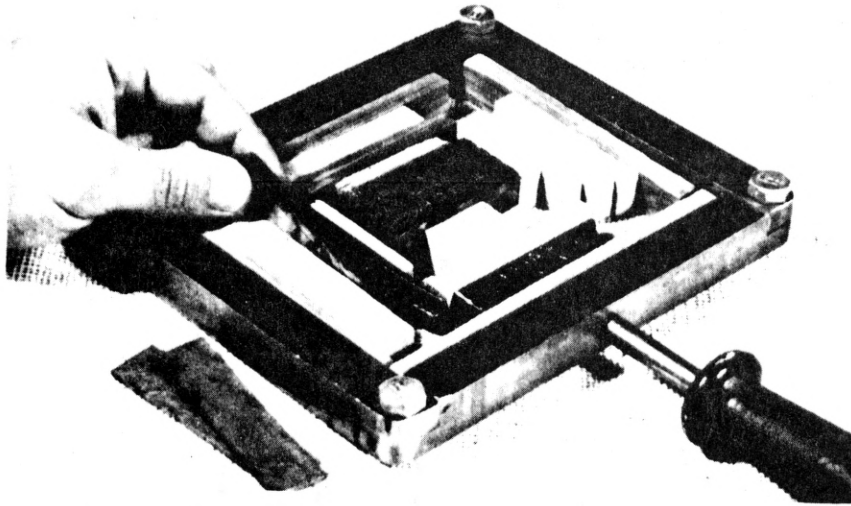
Small amounts of spacing should be added to this line to tighten it. To correct this, loosen the quoins and then add the spacing needed to tighten the line.



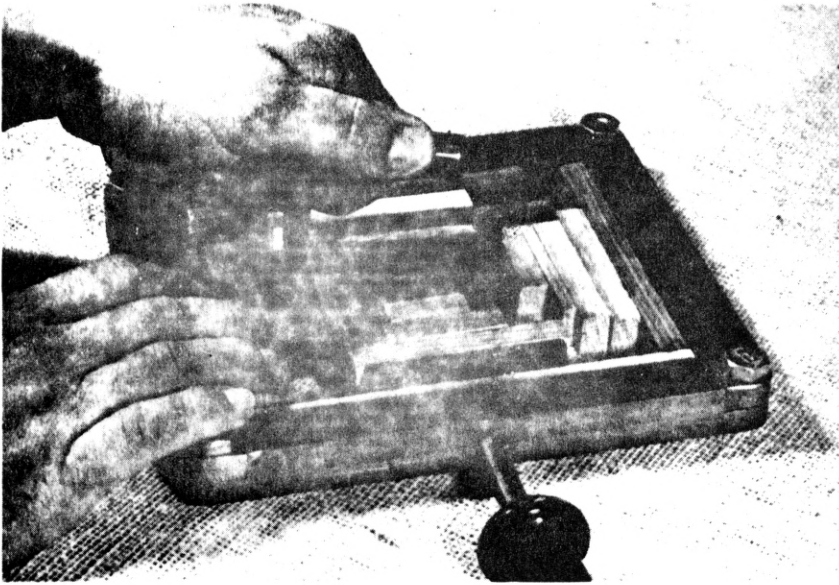
Press lightly on the type with your fingers. Loose type will fall, but it will not drop far enough to fall out. This is an indication that the line was not tight.



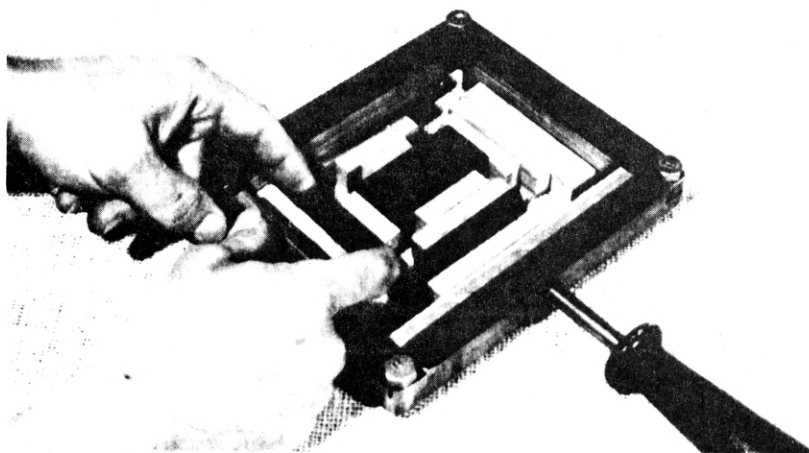
Lift the chase and place the quoin key under one side.



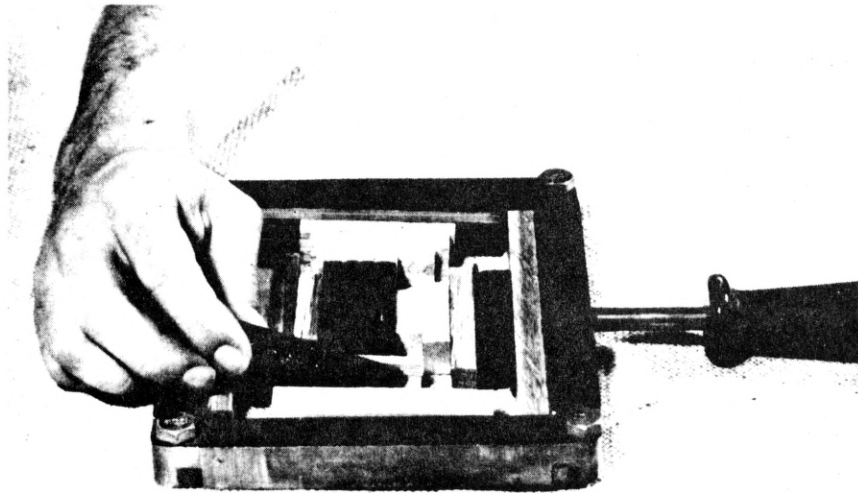
If there is too much space for the quoin to apply force against the type, insert a metal slug to fill up the gap.



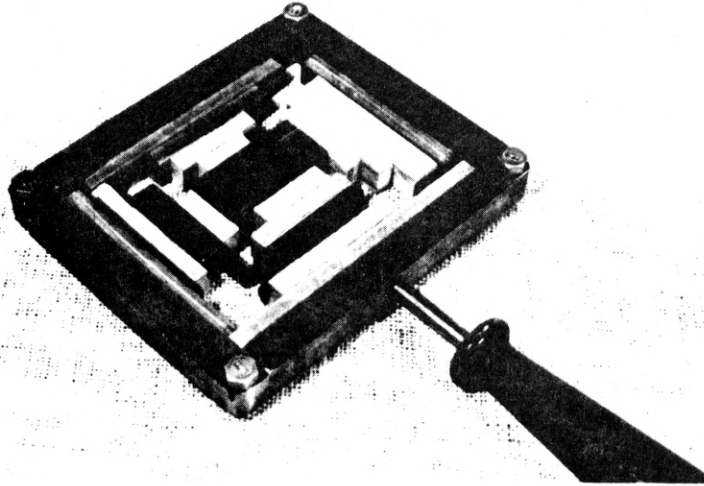
If not, use a quoin key to apply enough pressure.



Quite often the quoin can be tightened enough by using your fingers.



Next fill in the bottom and left sides of the chase with furniture. Room should be allowed to insert a quoin.



This is what your type form and chase should look like in the completed form.

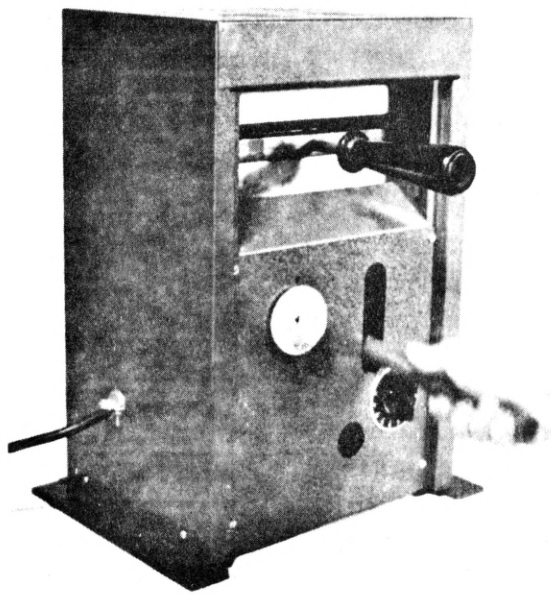
C h e c k T y p e F o r

S p e l l i n g E r r o r s

CAUTION: The following

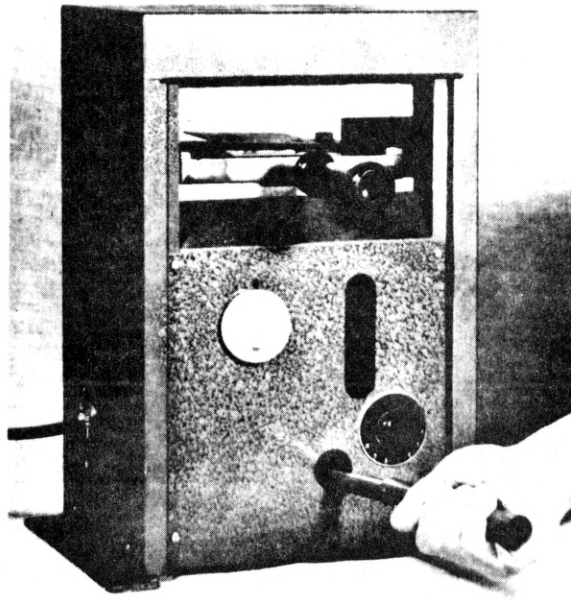
procedures are

HOT!!

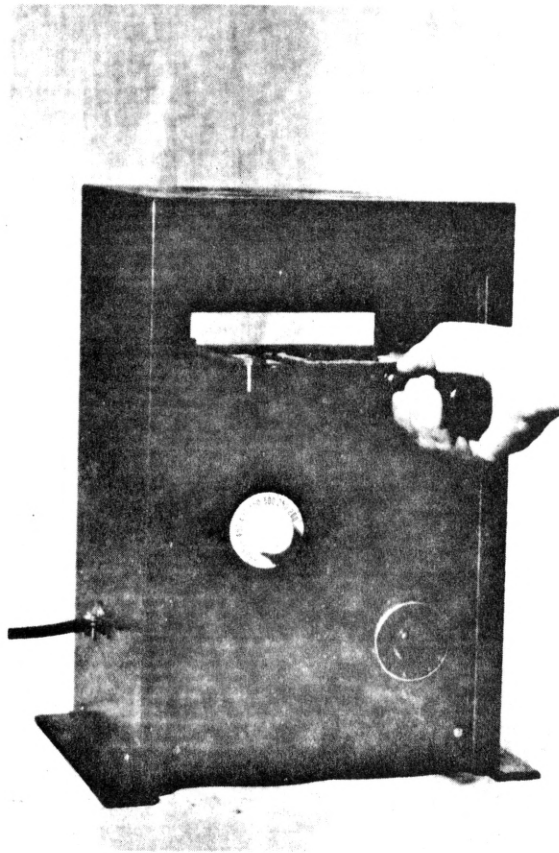


The platen is raised using a hydraulic jack. To raise the platen the jack handle is inserted into the hydraulic jack and moved in an up and down motion.

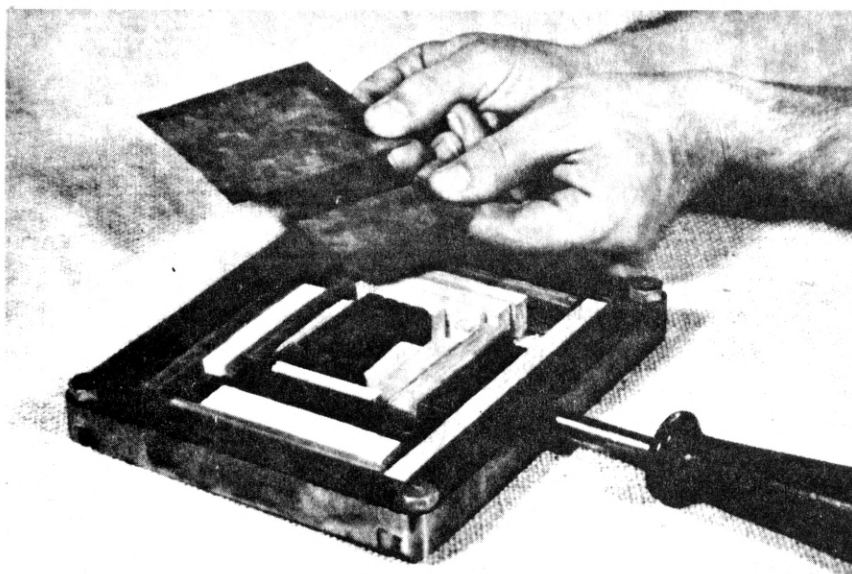
Caution should be taken when applying pressure. Too much force can damage the type.



The platen is lowered by inserting the opposite end of the jack handle into the small round hold and turning the jack release counter-clock-wise.



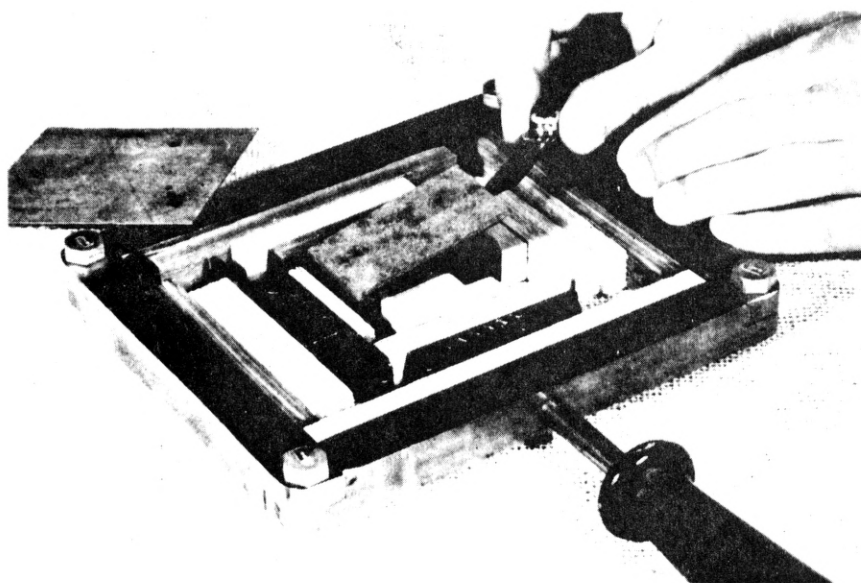
The type is preheated at 300° F. for one minute.



Cut the plastic matrix to overlap 1/8 inch on each side of the type area. Place the red side of the matrix on top of the type and cover the matrix with a piece of paper. Insert the type form with the plastic mold or matrix and paper into the press. Raise the platen until resistance is felt. Resistance indicates that the plastic is in contact with the heated platen.

As previously mentioned, the molding material becomes soft at about 200°F. but, when heated to 300°F. for ten minutes, becomes hard and will remain hard whether heated more or cooled to room temperature.

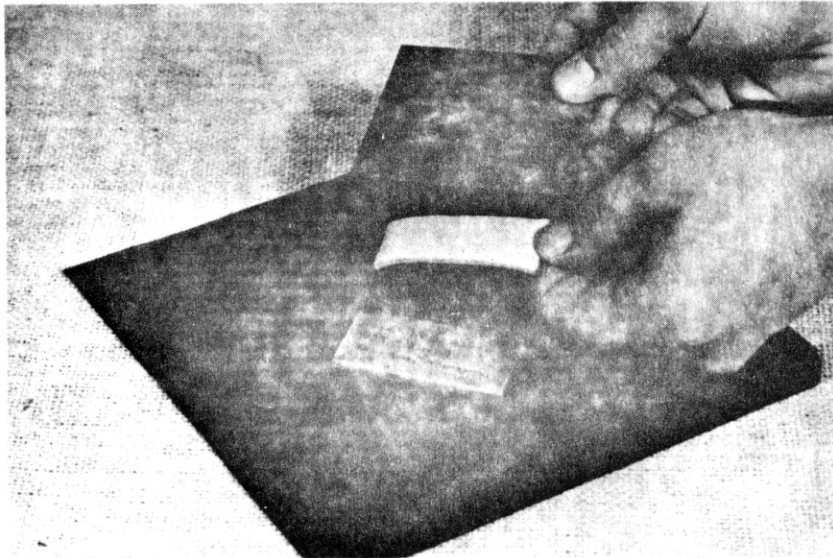
After the plastic matrix has been in contact with the heated platen for one minute, the bed is raised to the maximum height allowed by the limit stops on the chase.



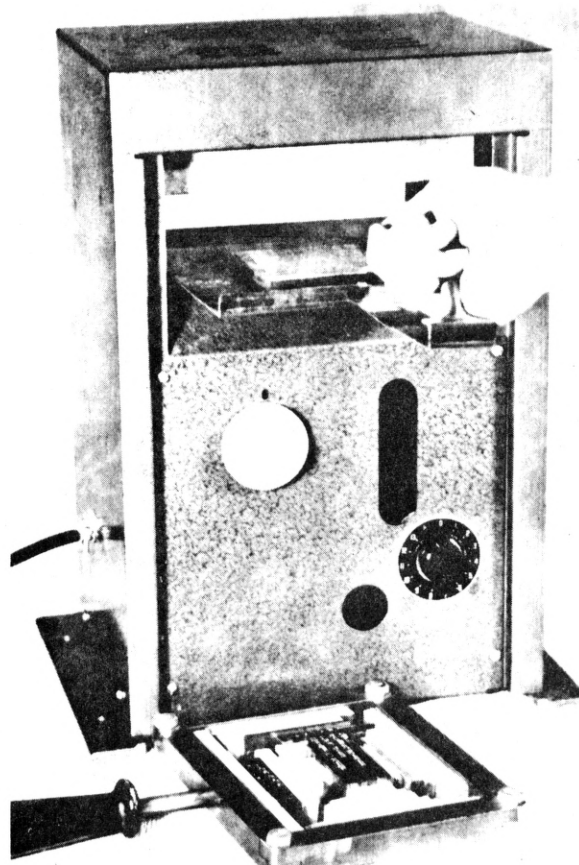
After the mold has baked for ten minutes, the chase and mold are removed from the press. Since the chase is hot, it is placed on an unpainted metal surface. Then carefully pry the matrix from the type form.



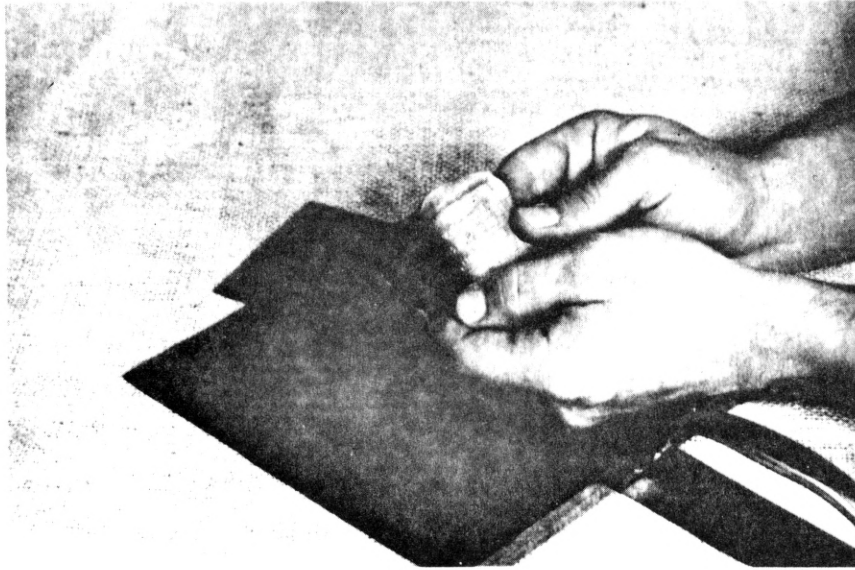
Cut a piece of stamp gum to overlap 1/8 inch on each side of the plastic matrix. Dust both the gum and matrix with soapstone. Be sure to remove all excess powder from the mold cavities.



Place the matrix, mold side upward, on the galley tray. Then place the stamp gum face down directly over the cavity in the matrix. Cover the stamp gum with a piece of paper or metal.

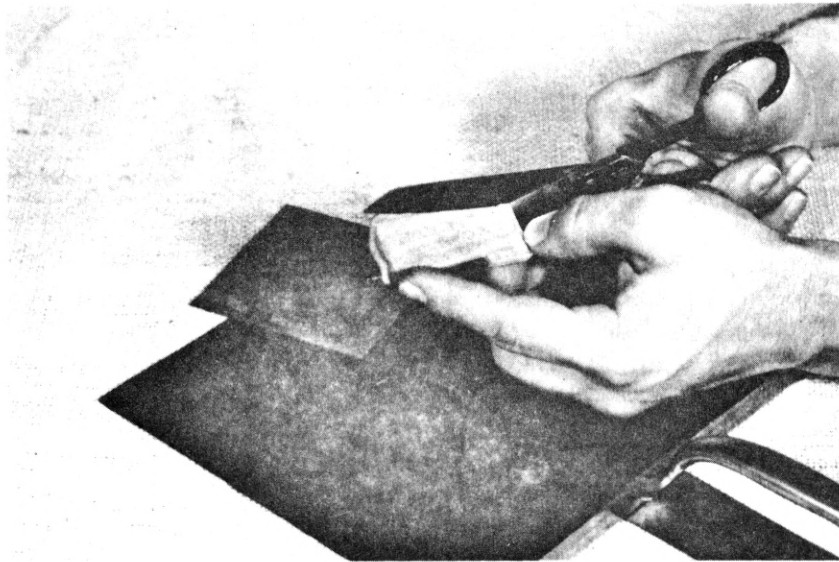


Slide the tray back into the press. Raise the bed until resistance is felt. After six minutes, the stamp gum will be vulcanized and the tray can be removed from the press by lowering the platen.



After the matrix has cooled, strip the vulcanized rubber from the matrix. The stamp is properly vulcanized if no permanent mark is left when the thumbnail is pressed into the stamp gum.

Examine the stamp carefully to make sure the letters are clear and sharp. If a defect is discovered, examine the mold carefully and, if the mold is in good condition, another stamp can be vulcanized from the same matrix.



Trim the vulcanized stamp as close to the raised printing surface as possible. Taper the cut away from the printing surface for best results.



Select a molding that is just wide enough to accommodate the stamp. Cut it to length, not to exceed the length of the longest line by more than $\frac{1}{16}$ inch. Attach the stamp to the sponge rubber of the mounting strip with rubber cement.



With stamp pad and paper, make a trial impression of the stamp and inspect for defects. The trial stamping may then be trimmed so that it can be inserted under the plastic coating on the mounting strip of the molding, which will identify the subject.

APPENDIX B

Lesson Plan

Lesson Plan

- I. Terminology
 - A. Relief printing
 - B. Flexography
- II. Materials for setting type
 - A. Composing stick
 - B. Chase
 - C. Galley tray
 - D. Furniture
 - F. Quion key
 - G. Slugs
 - H. Spaces
 - I. Soap Stone
 - J. Stamp press
 - K. Stamp molding
- III. Procedure for setting and locking up type
 - A. Properly arrange type in composing stick
 - B. Add slugs for space between sentences
 - C. Lock type in chase using furniture and quions
 - D. Use a metal slug to fill up gaps
 - E. Test tightness of type by lifting one side
 - F. Add small amounts of spacing to tighten type
- IV. Procedure for making stamp
 - A. Preheat type at 300° for one minute
 - B. Place red side of matrix over pre-heated type, overlap 1/8" on each side
 - C. Raise platen until resistance is felt, heat matrix for one minute
 - D. Raise platen to the maximum height allowed by the limit stops, heat type for ten minutes
 - E. Pry matrix from type
 - F. Cut stamp gum to overlap 1/8" on each side of matrix
 - G. Dust both gum and matrix with soapstone
 - H. Place gum directly over matrix cavity
 - I. Cover stamp gum with a piece of paper or metal
 - J. Bake gum for six minutes
 - K. Test gum for proper vulcanization with thumbnail
 - L. Trim vulcanized stamp, taper cut away from printing surface
 - M. Attach gum to molding
 - N. Test stamp on paper and place test strip under plastic strip

APPENDIX C

Pre-Test / Post-Test

Pre-Test / Post-Test

Rubber Stamp Making

Instructions

- Completion Questions - In the space provided, fill in the correct response which makes the statement complete.
- Multiple Choice - Select the correct answer and place the corresponding letter in the space provided.
- True & False - The statements are either true or false. If the statement is true, circle the "T" at the left of the numbered item. If the statement is false, circle the "F".

True & False

- T F 1. More than one rubber stamp can be vulcanized from one mold?
- T F 2. Paper can be used to prevent the matrix and gum from sticking to the heated platen?
- T F 3. The metal type must not be pre-heated before an impression can be made in the plastic matrix?
- T F 4. You should wait for one minute after resistance is felt on the plastic matrix and type, then carefully apply a little more pressure?

Multiple Choice

- _____ 5. In molding matrixes for rubber stamps the material is heated for:
 (A) ten minutes
 (B) six minutes
 (C) two minutes
 (D) one minute
- _____ 6. The matrix used for making rubber stamps should be dusted with soapstone:
 (A) before the matrix is molded?
 (B) before the stamp is vulcanized?
 (C) after the stamp has been vulcanized?
 (D) before it is in contact with heat?

Completion

7. Rubber stamp is a form of _____ printing?
8. The kind of plastic used for rubber stamps becomes soft at _____°F., and then hard upon the continued application of heat at _____°F.
9. The stamp gum receives its impression from the _____?
10. When you press your thumbnail into the stamp gum and a permanent mark is left this is an indication that the stamp is properly _____?

APPENDIX D
Panel of Experts

- Dr. Max Amberson
Department Head & Instructor
Agricultural & Industrial Education Dept.
- Dr. Jerry Roiter
Instructor & Committee Chairman
Agricultural & Industrial Education Dept.
- Dr. Doug Polette
Instructor
Agricultural & Industrial Education Department
- Mr. Paul Jesswein
Instructor & Acting Department Head
Film & Television Dept.
- Mr. Jeff Deitz
Research Assistant
Agricultural & Industrial Education Department

APPENDIX E
Student Objectives

Student Objectives

- 1) Upon completion of this study, students will be able to demonstrate familiarity with terms pertaining to rubber stamp printing and hand set type, and with the characteristics of each major tool and piece of equipment used in rubber stamp preparation.
- 2) Each student will be able to properly operate the rubber stamp heating press.
- 3) Each student will be able to properly make an impression into the plastic matrix.
- 4) Each student will properly vulcanize a piece of stamp gum.
- 5) Each student will be able to properly mount the stamp gum to the molding and print one impression from the stamp.