STUDENT-PRODUCED EDUCATIONAL MEDIA

AS A LEARNING STRATEGY

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ABSTRACT

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The relative effectiveness of media production was investigated to determine the significance of this approach in improving the learners' achievement of specific content related goals. Consideration was also given to the effectiveness of this method for the "low-achievers" in comparison with the "achievers". The operational hypothesis was tested by a quasi-experimental factorial design. Learners of grade V-VI levels, 57 in numbers, were stratified into high, medium and low-achieving groups and were assigned to two treatments: conventional and media methods. Subjects served as their own control group; the difference - gain or loss - in achievement between the two methods was compared and analyzed based on the results of pre- and posttests of two units of instructions. The units were chosen from the curriculum in natural science for that grade level and they were from the same general topic: reproduction. Repeated measures analysis of variance revealed a significant interaction between the two methods indicating, as it was hypothesized, that the media condition facilitated greater learning gains compared with the conventional method. Thus, Hypothesis 1 was accepted. Levels of subjects did not perform differentially in the testing, suggesting that the null-hypothesis should be accepted for Hypothesis 2.
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WHAT MAKES A GOOD EDUCATION?
WHAT MAKES A GOOD LIFE?

J. Holt.
CHAPTER I

Introduction

Since the late sixties much has been written about the inadequacy of the existing educational practices. There are those who argue that schools are not keeping pace with the rapid changes occurring in other facets of the social environment. Ferkiss (1974) goes as far as to suggest that the present educational system is not devoted to the improvement of society, but rather serves a society concerned only with the sale of new goods and the creating of new ways of destruction.

While there are as many types of educational goals as there are educators, many agree that education should provide learners with the skills "society deems requisite to a full and effective life" (Geller and Laybourne, 1978, p. 7). This is not a new thought. As far back as 1897, Dewey noted that schools must represent a life which reflects the life that is carried on in the home, the neighbourhood and in the playground. Seven decades after Dewey's assertion, McLuhan (1964) concluded in a similar vein:

We are entering the new age of education that is programmed for discovery rather than instruction. (p.x.)

The difficulties facing schools today may be attributable to the fact that by the time new educational goals have been established, the culture in which the school system exists has changed - a new socio-cultural pattern has devel-
oped which demands new educational strategies. Regardless of the academic potential of young learners, the increasing complexity of our environment puts increasing pressures on both learners and educators. Education in elementary and high schools may have been deteriorating precisely because it cannot keep pace with the complexity of the environment; society is changing too rapidly for the educational system to serve as a forerunner; as a fact it is rather lagging behind those very changes. The gap between educational needs and capacity of the learners has widened increasingly in the last decades. It can be assumed that lack of communication and other social skills have contributed to this increasing gap. Consequently, conflicts and serious stresses have developed within the learners, in educational institutions and in society.

**Context of the Problem**

One of the most striking examples of educational failure is the neglect of the communication explosion which is so much a part of our everyday lives. McLuhan (1967) in his *The Medium is the Message* concludes that in this electronic 20th century, students are in fact living in a 19th century classroom. Many others, often called "futurist writers" such as Toffler (1970) and Illich (1972) have pointed to the fact that current schooling practices are not aimed at developing in students the skills necessary to interpret media codes that are so pervasive in today's society. Similarly, Donald P. Ely (1977) makes the following point:
In the United States there are more television sets than indoor toilets. By the time a North-American youngster finishes secondary school, he has spent more time watching television than in school. (p. 7)

Kit Laybourne (1978) referring to the 1975 statistical reports states that the television set in the average American home is on for 6.2 hours a day. During the elementary grades the average student watches the tube for over twenty-five hours a week. Indeed, there is evidence that children may acquire more education outside of the classroom, in a world influenced to a large extent by the media, than in it.

Technology has ended the monopoly of home, church and school on learning. Today a large proportion of information comes from the outside world, through the medium of television, films, etc. Hence, the importance of understanding the new forms of communication must be recognized. Schools should provide opportunities for learners to become selective and critical consumers of the technology and its content.

There seems to be growing concern about the need of learning other than verbal and numerical and that to ignore other modes of response limits children's understanding and progress. As it has been pointed out by McLuhan (1964):

In a highly visual culture, it is as difficult to communicate the nonvisual properties of spatial forms as to explain visuality to the blind. (p. 290)
Furthermore, there is a pressing need to facilitate and capitalize upon modes of success for the learners who can achieve little in the traditional verbal and mathematical literacy modes. There is evidence that it is important to explore the world visually, auditorily and kinaesthetically. Eisner (1978) claims that the non-verbal forms of knowing are valid ones, and that to appreciate this fact one has only to think of the way great dancers interpret the world or to consider the intelligence of Henry Moore as a sculptor.

Those who have worked with young learners over a period, know how important to them are the non-verbal modes of communication, particularly movement, gesture, sound and visuals. Although a great number of audio-visual aids are being used in teaching, they mainly transmit information. Production of media, with children experiencing creative learning directly, is rarely employed. Media technology in our schools is still used largely to perpetuate teacher-oriented, expository patterns of teaching, neglecting the kind of learning demanded by Bruner, McLuhan and many others as early as the 1960s. Robert L. Shayon (1973) summarized this idea by saying:

What would you think of the literacy of a person who could read but not write? He would be a half illiterate. In a culture where status is derived from the ability to write, he would feel inferior. By the same logic today, to be only able to receive media messages is to be electronically illiterate. (p.12)
Electronic or media literacy on the other hand would mean ability to receive and send messages. According to Levie (1978), media literacy could be defined as the ability to identify and use codes that are characteristic of media.

Levie also debates the question of "who is in need of instruction in visual literacy." He feels that although the subjects of research cited in most studies are either young learners or adults in underdeveloped countries, the fact remains that most adults in our culture are unskilled in this field. Student participation in media production could lead to an increased number of "media literate" adults in our society. Active media work may also have an indirect effect on learners aptitudes. This study aimed to investigate the extent of such effects on fifty-seven young learners.

Statement of the Problem

The purpose of this paper is to examine whether participation in production of educational media material produces better comprehension in the content area than participation in conventional classroom activities. The following question was also considered: Does student production of educational media produce a comparatively greater gain in comprehension for "low-achievers" than high achievers? Other problems discussed in this study deal with the effectiveness of media production as a learning strategy compared with other, more conventional methods.
Significance of the Study

A thorough review of the literature provided some information on the topic of student production but more extensive empirical studies seem to be quite rare. There was no literature found by this researcher, in spite of a survey of ERIC and computer searches at McGill as well as at Concordia University on the effect of student-produced educational media on learners' achievement. However, the benefits of discovery-oriented learning and direct experience have been widely discussed in the literature. As producing media is based on activity by the learner, it could be considered one basic form of discovery learning.

Results of this study may have practical implications by encouraging inclusion of such media-related activities in the curriculum not only to a greater extent and not simply as an art or enrichment activity, but as an integral part of the total curriculum.

Furthermore, if an improvement can be demonstrated particularly for learning of low achievers, such research may shed some light on an effective method of instruction for the "underachievers".

Finally, the writer anticipates that by filling some gaps in the literature related to student-production, other researchers will also carry out some investigations in this rather neglected area of instructional communication.
CHAPTER 2
Review Of The Literature

In order to structure a thorough investigation of the literature, three areas were identified by the researcher as relevant: 1) direct experience, 2) learners' preference of visual symbols versus verbal ones and 3) the appeal of activity-based learning and its effects on the "low-achievers". Some of the literature on direct experience or "activity-based" instructions is included in the review since the method proposed and evaluated in this thesis is fundamentally related to active versus passive learning. Literature on non-verbal form of experience is included because this formed the basis of the production methods employed in the experiment. Literature related to the second aspect of the study, achievement level and preferred learning mode is also discussed in this review.

Direct Experience

In the area of curriculum studies, direct experience has been a major concept since the early 1900s. Ralph Tyler (1950) and Hilda Taba (1962) view it as critical in the curriculum development process. Dewey emphasized the importance of participation of the learner in the formation of the purposes of his own learning since the beginning of this century.

The nature and definition of direct experience is wide-
ly debated in educational literature. According to Bruner (1966) there are three modes of experience: enactive, iconic and symbolic: the first being related to the learner's direct activity upon an environment, the second to the learner's observation on another's activity and the third mode of experience related to arbitrary symbolic systems. Dale (1946) and others (Morris, 1946; Carpenter, 1953) have claimed that instruction at the symbolic level, without involving direct experience to relate it to, is likely to result in meaningless rote learning which is easily forgotten and is of little long-term value. Dale's "cone of experience" (see Figure 1) demonstrates this hypothetical relationship between skills and experience. As Heinich and Molenda (1982) point out it is interesting to note that the theories of Bruner (1966) closely parallel to Dale's "cone of experience". It can be noted from the right side of the cone that experiences in which the learner is involved are designated enactive experiences by Bruner. At a higher level in the cone, experiences in which the learner is more passively involved, nevertheless retained due to some element of reality (i.e. realistic cues), are considered to be iconic experiences. At the highest level, the learner participates in symbolic experience, and since this has been preceded by more concrete experiences it can relate to the arbitrary modes of learning. According to Dale (1946) and Bruner (1966), concrete direct experience has to precede symbolic experiences to have value.

Building up a learner's base of knowledge is only one
Figure 1. Dale's Cone of Experience paralleled with Bruner's theories

Note. From "Media and the New Technologies of Instruction" by Heinich and Molenda (1982)

200 % of original size
of the gains of direct experience, according to Bruner and Olson (1974). While the knowledge provided by a given form of experience eventually converges, or forms a common schema (Anderson, 1978), the skills that are derived from a variety of experiences may differ. For example, in learning about a chair, through either sitting in one, watching somebody sit in one or reading about sitting in one, the learner derives skills which may or may not be related to one's eventual knowledge of "chairness". In the first case, learning to sit is functionally related to learning about sitting, whereas in the other cases the skills component (watching and reading) are less integrally connected to the knowledge component. Except in the skills area (i.e. reading and math) it could well be debated, that direct experience provides a blend of skill and knowledge which is difficult to attain in either of the other forms of experience. Once acquired through direct experience, future iconic or symbolic experiences are likely to be more meaningful to the learner, assisting formality and structure.

Even though this line of argument has been around at least since Dewey, it is not always practiced in a classroom mainly because it is difficult to provide direct experiences in a schooling environment. Nevertheless, theorists of instructional technology (Dale, 1946; Morris, 1946; Carpenter, 1953)

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This point is also made by Salomon (1979) citing a collection of work from a variety of sources. He argues that the more articulate a learner's schema, the less difference will result from various forms of experience in content learning.
have advocated using surrogates of realism as aids to learning. Pictures, models, films, televisions and more recently computers (i.e., as simulators) have been hailed as successful in providing a link between purely symbolic learning and active experience. Nevertheless, with the exception of computer-assisted instructions, that relies heavily on symbolic systems, most of the methods mentioned above are likely used in a passive, iconic-like manner in teaching. The individual who does not possess the required level of literacy in the previously listed modes of learning, has to compensate, in many cases, trying to use acquired knowledge from personal experience as stated by Carroll (1964) and Masters and Branch (1969). Thus language and other cultural media (numbers, diagrams, graphs, etc.) rely heavily on competency upon literacy in that particular medium. The meaning will also be limited to the meaning previously acquired by certain symbols. To interpret a picture a person has to be familiar with the "realia" represented in the picture. The diagram of a snowflake, for example, may have no meaning to a desert inhabitant.

A feasible alternative to the passive, instructor-oriented media method, described here, is to allow learners to participate in producing the media. For this instruction the learner is provided with many of the positive benefits of direct experience (i.e., doing the media) while at the same time actively participating in the content research of the topic being taught.

Discovering something by doing rather than by simply
being presented will most likely motivate young learners even to a greater extent than adults. Direct, activity-based experiences such as those involved in producing audio-visual materials seem to satisfy an intrinsic need of the young learners to explore the environment. Herein lies the importance of activity-based learning vs. only symbolic learning for children and another justification for "doing the media".

Among activity-based experiences, films, TV programs, filmstrips, sound recording and simulation games should not be dismissed as 'merely enrichment' says Bruner (1966). Bruner calls upon these devices to provide "vicarious experience" for all types of learners. Mitchell (1971), referring to an experiment by Cohen, concludes that participation results is strong positive reinforcement. Modified learning strategies including programmed texts and a revised curriculum may result in more academically competent youngsters who through recognizing their success in an area in which they had previously failed, become better achievers. According to Cohen (1967) this has been substantiated.

Some educators and researchers seem to go even further in advocating experience-oriented curriculum. At the extreme, people like J.A. Dator (1971) demand the discontinuance of the teaching of reading and writing as 'basics'. Instead, Dator recommends replacing these subjects with Super 8 cameras and Portapak instructions, three-dimensional modeling, aural communication technologies, computer programming followed by
lasers, holograms and other advancing technologies.

In summary, activity-based experiences and careful structuring of such activities seem to be advantageous in developing various communication and social skills as well as providing an effective method of learning the subject itself. Many researchers conclude that such experiences should become integral parts of the curriculum.

Pictorial and Verbal Learning

Another potential benefit of student produced media is that learning can occur through the internalization of both pictorial and verbal information. Adherents of dual-coding (Paivio, 1971) have long argued this point in favor of audio-visual presentations. Collectively, however, the results of several decades of research in which dual channel (audition and vision) effects have been studied has produced only mixed support for combining words and pictures. Some recent examples from the literature are reviewed here.

Hartman (1961) Hsia (1971) found printed text more effective when information to be learned was difficult, but audio-visual presentations were found superior for less complex material. This finding is in agreement with a study by Fryluck and Snow (1967) which found that in the case of relatively simple materials, films facilitated cognitive transfer faster than verbal instructions. On the other hand, studies of print plus pictorial materials for children have generally con-
cluded that pictures have a positive learning effect when used in concert with print materials (Levin & Leagald, 1979).

A great number of studies have been conducted on the effect of various symbol systems and coding elements on learning (Levie, 1978, Meierhenry, 1969, Biekert, 1971). Most studies conclude that there is no one best symbol for any learner, but the codes that match a prior experience of a particular learner are the most effective. Salomon (1979) has summarized this idea by saying that symbol systems can be used to activate certain mental skills in students if they already possess these skills, or can supplant these skills in learners who do not.

C.F. Hoban and E.V. van Ormer (1970) summarized reports on the instructional value of films compared with other methods. Although the findings were somewhat controversial, some reports indicated that instructional films may contribute to more factual learning than comparable reading materials or lecture presentations, and could reduce instructional time. A more recent annotated bibliography of 73 reports of research on the impact of instructional media seems also controversial in findings. Nevertheless, some of the reports show evidence of gains by the experimental media group. (M.R. Simonson, 1980) In other research, media instructions led to increased interest in the learners. In Biekert's experiment industrial education students (N = 47) received instruction via hands-on experience versus visual media. While there were no significant differences between the groups, the students who received visual
media instruction had the greatest positive interest gain. Another report in the above bibliography accounts for improved attitudes toward mathematics in 89 high-school students as a result of computer-assisted instruction (Hall, Mitzel, Riedsal, Suydam, Trueblood & Kehlin, 1969). Amiran (1962) conducted a study among elementary school children of natural science material and of science attitude and interest changes following a program of science series by television. Fifth-grade students (1,600) in 90 classrooms received the treatment and one control group was included in the design. Results indicated that students who had assignments in addition to other treatments changed significantly in science attitude.

F. Dwyer (1978) believes that no valid comparison of different media can be made in relation to one type of learning objective, but each medium should be evaluated in terms of the learning objective for which it is best suited. Levine and Dickie (1973) propose to specify relevant variables in media research to shift from comparing one media with another to investigating more complex interactions between instructional variables. Most researchers seem to agree that research should aim a closer link with educational practice. Allen (1971) feels that research findings should be translated into practice. Salomon, summarizing findings of Gagne, Chu & Schramm, and Jamison & Wells concludes that future research will shift to qualitative dimensions instead of just asking questions such as "Is medium A better than B?" Both Levie and Salomon claim
that more complex teaching methods are required in extracting information from visual symbols and that production may be an excellent method of such training.

Evidence seems to support the notion that there are three main connections between language and thinking. The first is concept building; words play a central part in the formation of generalizations about the world (Luria and Yudovich, 1971). Psychological and philosophical research, both suggest that learning to recognize colors for example is speeded up by the use of associated words (Vigotsky, 1962). Another key benefit of language, according to Luria and Yudovich is that it enables the learner to make generalizations in the absence of objects or relationships from which they are made. The third contribution of language to thinking is that it promotes generalization to be matched with concrete experience. However, if verbal generalizations were the only form of thinking, then it would be difficult to explain many teachers' findings that children are often able to make more complex statements in audio-visual terms. Referring to Bruner and Piaget, Lorac and Weiss (1981) suggest that at the level of pure language there are context-free manipulation of ideas by limitations imposed through logic, but at the level of direct experience there are real objects and relationships which are not limited but rather complex. Many youngsters struggle and may not achieve context-free manipulation because they have not fixed new ideas in the iconic mode. In creating a picture a child puts a frame around part of the enactive, real world which becomes
the first stage of abstraction - iconic imagery. The child then puts frames around other parts of the enactive world obtaining a series of images which he then rearranges, getting to the purely thinking or verbal stage. Thus the relationship between the enactive, iconic and symbolic modes of learning is strengthened and will lead to creative ideas that often may not develop in a traditional learning situation.

Levie (1978) concludes that some kind of functional equivalence between images is at the root of our ability to interpret pictures; the mental images evoked by various pictures of an object function as if they were equivalent and this is the explanation for the characteristic of the iconic mode which is nontranslatable into the verbal mode, making a picture "worth" more than thousand or any number of words. Levie feels that further research in visual literacy should investigate the interrelationship between pictorial stimuli and mental imagery and answer questions involving identification of effective learning strategies. Both, Levie and Salomon (1978) feel that production is a more reliable criterion for testing cognitive understanding. Nevertheless, as it was mentioned before in this study, research on the effect of media has been mostly concerned with presentations and not production of media materials. The present study attempts to investigate the production aspect as well as the interaction between production and learners' achievement level. The visual elements
contained in media production may have a special appeal for young learners. Luria (1973) is particularly concerned to debate the 'psychomorphological' approach of experts who try to pin down separate geographical areas of the brain for cognitive and affective functions. Luria's claim is that the empirical experience of many teachers suggests that when students are encouraged to bring emotions and ideas together into a learning experience, then the language development and the learning are much more powerful. Luria finds it reasonable to assume that the ability to manipulate language to express feelings is similarly acquired to the ability to manipulate language to express ideas. Words are emotionally neutral only until they generate images which are laden with value and emotions. It could be assumed that valuing and responding to ideas and feelings takes place at the level of imaging. This may explain the increased motivation and emotional involvement of learners participating in media production and image creations. In their first years of schooling children are generally very eager to learn and they enjoy school activities. Bosworth (1976) claims:

Children first learn about their world through visual experiences. Visual communication to them is the normal and exciting mode of learning. This visual learning cycle takes place in formal public education through about the third grade level. (p.4)

\[\text{(Hill, 1978)}\]
Verbal messages take over after the third grade and only limited number of visual messages are presented in the higher grades. This may be one factor contributing to a loss of interest so often manifested in senior grades. Hence, the multi-image character of media work may result in increased motivation and therefore achievement.

Media and the Low-Achievers

The interplay of instructional variables may even be more complex in the case of "low-achievers". Many educators have pointed out that language - verbal literacy - is deceptive with respect to communication. While studies, such as Bernstein's (1962) have demonstrated the correlation of differences in verbal expressive ability within various social classes, other researchers have shown that socially disadvantaged children perform better on measures of figural creativity than their 'advantaged' peers (Torrance, 1966). This seems to be in agreement with Salomen's stand regarding qualitative responses to particular media. Research dealing with "low-achievers" often suggests simplification of the curriculum and simplification of programs to basic skills. However, Loreten and Umans (1970) claim that the 'disadvantaged learners' need exactly the opposite of a dull curriculum. They are the ones who need exposure, discovery and not enclosure. Nemchin (1971) also suggests that students with educational problems may perform better with participation in materials development.
Several experiments carried out with regards of disadvantaged learners seem to confirm the advantages of discovery oriented learning for those learners. Besides the Cohen experiment (1967) mentioned before, Allen, Sweet & Cooney conducted an experiment in 1968 in Los Angeles with culturally disadvantaged students. They used five experimental treatments with slide-sound presentations. All experimental groups made positive attitude shifts compared with a control group, but only the treatment that included the option for the subjects to select the next format to be viewed coupled with active participation produced significantly greater attitude change than the one demonstrated by the control group. It was concluded that attitude changes can be produced by audio-visual materials but that such changes are most likely when subjects are provided an opportunity to participate actively by responding to the content of the message. Students of lower mental ability were most susceptible to attitude change in the experiment.

Shayon refers to a graduate study at the University of Pennsylvania using videotape with educable mentally retarded children (1973). He concludes:

"The students developed an increased sense of identity and an awareness of self by instantaneously seeing and hearing themselves as others see them. (p. 14)"

Shayon finds this in line with the assumption of social scientists who believe that there are three basic elements of edu-
cation, schooling, enculturation and learning and television seems to be one of the most significant influences in enculturation and in forming a personal identity.

Vickers (1972) has analyzed three methods of teaching of English on the attitude and achievement of educationally deprived children. Post-test results showed that the students who received an interrelated English program that used media (transparencies, recordings, and worksheets) extensively achieved significantly better results and showed significantly more positive attitudes toward English than subjects who received instruction without media.

A two-year project conducted in New College, Durham, England in 1976 investigated the effect that production of TV, film and tape-slide programs by pupils themselves would have upon their learning. Twenty teachers, thirty subject areas and ten schools were selected. Pupils of secondary age from all abilities and for a wide range of curriculum subjects were involved in the research. There was unanimous agreement among the teachers of the lowest-ability groups that the work was invaluable. Teachers were amazed to observe the high level of intellectual ability shown by children designated as of low ability (Lorac 1981). These pupils were more able speakers than writers which is most often the case with low achievers, and the planning of visual sequences helped them to organize their thinking. It was also noticed that working with colorful illustrations had a great influence on motivation and heightened
the enjoyment level of learners.

The above findings are also in harmony with Bruner's theory of instruction based on empirical work particularly with slow learners (1966). According to this theory, schools arrive too quickly to the symbolic modes of teaching for most children when their symbolic reasoning is still undeveloped. Consequently, their symbolic logic will be superficial and uncertain. Bruner, referring to his experience in the Judge Baker Guidance Center with 'learning blocks' says:

There is a sharp distinction that must be made between... behaviour that copes with the requirements of a problem... Once our blocked children were able to bear the problems as set... their performance was quite like that of other children, although often less skilled since they had not quite learned to handle the technical instruments of the subjects they were supposed to be learning. (pp. 3 - 5)

The same could probably be said about active, audio-visual work that would give children a chance to explore difficult concepts thoroughly through the en-active and iconic modes.

The Durham project, for example, reports on a fifth-grade class whose attitude impressed the teachers very much. The class had the worst truancy record in their area yet none of the students of this class missed the health classes which used the method of the media
project mentioned before. They were non-exam, "bottom-band" children, with very low academic expectation of themselves. Their enthusiasm for this class was evident due to the fact that instead of studying health as an academic subject from texts, they were busy making animated films to explore the concepts. However, in the process of illustration, for example, the dangers of smoking, they had to grasp basic biological and physiological principles in order to communicate their message and explanations. The teacher contributed the success with this class to the Piaget theory which claims that meaning for the learner consists of patterns of concepts that are rooted in concrete, active experience (Piaget, 1971).

In summary, empirical studies and projects have been presented dealing with the three basic characteristics of active, and media experiences: direct experiences with activity based learning, visual communication and the effectiveness of this approach with the low-achievers. In spite of numerous publications on the topic of visual literacy, very few studies take into consideration the effects of active, student-produced educational media materials on the achievement level of the learners. The writer of this study hopes to fill in some gaps in this area and is anticipating to generate more research in this neglected field by reporting the findings of this experiment.
Hypotheses

Hypothesis 1

Following the production of simple, educational media integrated with the standard curriculum, the experimental group results will show an improvement in the comprehension of the content presented as compared with the results of conventional teaching methods.

Hypothesis 2

There will be an interaction between teaching methods (media-activity and conventional) and levels of achievement (low, average and high) that will result in greater gains for the underachievers in the media treatment as compared with the gains of the "achievers".
CHAPTER 3

Method

Sample

The study involved 57, Level V-VI students (from so-called "split classes") from a PSBGM elementary school in Montreal. Two intact classes were used: one class was the homeroom class of the researcher. Subjects ranged in age between 10 to 12 years. Roughly 60% of the subjects were males with the remaining 40% females.

The school was located in the West End of the city and its student population ranged from low to affluent classes. However, since the school itself was located in a suburb of relatively high socio-economic area, a number of parents could afford to enroll their children in private schools. From these homes mostly children who could not cope with the higher requirements of private school were attending this school. Hence, there were relatively few learners with outstanding academic aptitudes, and the achievement levels designated low, medium and high in this experiment are referring to below average, average and above average standards with only a small number of students - 10 out of 57 - over the 80th percentile rank.

Design

The study employed a 2 x 3 factorial design with two
between-group factors: teaching method (conventional and media productions) and achievement levels (low, medium and high). Due to limitations imposed by the school schedule, intact groups were used. As a result, this study qualifies as a "quasi-experimental" (Tuckman, 1972). To partly offset this deficiency in design, two independent experiments were conducted, using two different but related topics. For the first part of the study, one intact class was assigned the media treatment and the second class was receiving conventional teaching, both involving the first topic: Reproduction of Plants. For the second content, the intact classes were reversed in terms of their treatment designation and topic to be covered: Reproduction of Animals. (Figure 2)

The dependent variable was operationalized as the difference between a pre-measure taken before each of the respective treatments and a post-test measure taken immediately afterwards. Therefore, there were two different scores, one for each of the content areas.

As previously mentioned, the design included a blocking variable or moderating variable which, for the purposes of this study, was called achievement level. This variable was operationalized based upon student scores on a standardized achievement test (Gates, 1978). Students scoring above the 75th percentile were defined as high (above average) achievers; between the 50th and 75th percentile as average achievers; and below the 50th percentile as low achievers. These norms conform
**TYPE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Achievement Levels</th>
<th>Conventional</th>
<th>Media Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Content 1</td>
<td>Reproduction:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plants</td>
</tr>
<tr>
<td></td>
<td>Content 2</td>
<td>Reproduction:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Animals</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 2. Illustration of the 2 x 3 factorial design with the two in between-group factors*
to the customary grading criteria used by the teachers in the school in which the study was completed.

Procedure

The conventional treatment consisted of standard elementary classroom activities divided into three 45 minutes lessons, one additional review lesson and one period for the test. Class activities included teacher-initiated question-and-answer periods, blackboard illustrations, pictures from reference books and materials, diagrams, overhead transparencies as well as observation and experimentation with real plants, fruits, seeds and flowers.

The media treatment consisted of the same number of 45 minute periods. It started with a presentation of a slide-tape show, drawn and colored by Grade V-VI students of the researcher from previous media work. The topic of the slides varied from Animal Care to Multiple Sclerosis. After the presentation, sample storyboards and scripts were shown to the students who were then asked to produce a story-board of their choice. The experimenter explained some simplified "film vocabulary" terms, mainly types of "shots" (i.e. close-ups), using the "draw-on" slides as samples from the presented slide-tape show. Students were given a few days to produce their storyboards and researcher was available for assistance after school and during school breaks (recess, lunch).

After consultation with the experimenter, participants in the second lesson were asked to transfer their story-boards
into scriptforms; steps to follow in producing scriptforms were outlined to the students. Finally, during the third lesson, students were provided with a worksheet and a dialogue and were asked to produce the visuals for a storyboard and a scriptform on the given content.

Students were informed that artistic standards will not be required and that the grading of the visuals will be based on the relevance of visuals to the dialogues or as they were told "how well the pictures will match the sentences". Clarity and neatness though was emphasized. Students had a week to present their scriptforms, consisting of twenty-five to thirty frames.

During the fourth, review lesson, the best scriptforms, transferred into overhead transparencies and colored with markers, were presented to the classes. Dialogues were also taped and played with the transparencies. Students discussed these scripts with the guidance of researcher. Special emphasis was given to the appropriateness of visuals to the dialogue.

Children who did not complete their work were given additional days to complete their scriptforms before the test. In the conventional treatment children were asked to study their revised notes after the fourth, review lesson, for the test.

Scriptforms, as well as notes and pictures from conventional method activities were marked by researcher and marks
could be applied towards language arts, science and art scores if class teacher preferred to do so.

The two units were taught in a 6-7 week period. Students were encouraged to spend additional time above and over the four 45-minutes lessons, doing research or completing the production, in school and/or at home.

Unfortunately, it was not feasible to produce the actual slides or filmstrips in this experiment. This was due to many reasons: psychologically, as well as in order to uniformly test the learning occurred, it would not have been advisable to let some children produce the actual slides and others not. To produce close to two-thousand slides would have not been financially possible considering the price of slides or 35 mm film and transparency markers. Nevertheless, all that was left from the production was the mechanical tracing of the script visuals on the slides or filmstrips.

The important learning goals of producing the slide-tape presentations were all attempted. Just to mention a few: children were involved in research in order to find pictures; in reading and understanding the dialogue; in comparing and choosing visuals; in constructing the right format; in deciding what material should be included; in identifying relevancy; reshaping and reducing size; evaluating content, sequence, clarity and relevancy through discussion, getting used to speaking into microphones; recording sound, and so on. Students were also asked to decide which of the completed scriptforms were the best to convey the content of the units. The size of the work-
sheet story-boards and scriptforms were the actual size of the frames of the slides or filmstrips, providing practice in illustrating visuals in a relatively small format.

After the completion of the lessons and activities, posttests were administered to all participants to evaluate the difference in achievement between the two treatments. The posttest questions were identical in both units with the pretest questions administered before teaching the units. Subjects served as their own control groups, using the results of the conventional instructional method in comparison with the media treatment results.

Materials

The content of the units - both from the field of natural science - were similar in complexity as in the anticipated interest levels.

Materials for the conventional treatment included: chapters on reproduction from STEM textbook (Grade V-VI levels), diagrams, pictures and blackboard illustrations, vocabulary lists, overhead transparencies, reference books from school library and various seeds, plants, fruits and flowers. Notebooks were also used by students to record some of the information.

For the media treatment, the material included worksheets for student for making storyboards, sample storyboards and scriptforms, a list of steps to follow in producing scriptforms and various slide-tape presentations of work by students of similar age. None of the slide programs
were related to the topic of the study. Due to the early age of learners, the slides were "draw-on" slides with markers and the dialogue for the audio portion was provided for the students.

The tests - pre- and post - for both treatment and both contents, consisted of "fill-in the blank" type questions with a possible total score of 25. Both tests included fill-in diagrams. The format of the pre- and posttests for the respective content units were identical. (Appendix A and B) The tests were constructed and illustrated by the researcher and were used the first time for the purpose of this study.
CHAPTER 4

Results

Introduction and Hypothesis

The purpose of this set of studies was to investigate the hypothesis that activity-based media production when used as a classroom method, leads to higher achievement of specific content related goals. More specifically, the goals of this study were operationalized as the cognitive learning achieved from two units of instructions. As was noted before, two separate experiments were carried out relative to the goals of this study in order to reduce the possible bias resulting from using intact classes as the experimental sample.

One unit of instruction was related to plant reproduction and the other was concerned with animal reproduction, forming the content basis for the materials and instructional procedures. During the first unit, class one (arbitrarily designated) participated as subjects in the media treatment and class two received the conventional teaching treatment. In unit two, class one received the conventional and class two was given the media treatment. The results of these independent experiments are summarized in this section of the thesis.

Experiment One - Plant Reproduction

Table 1 provides a listing of means and standard deviations associated with the conduct of experiment one. Both
pretest and posttest are reported broken dawn by the achievement level as a blocking factor.

Two-way analysis of variance with the pretest and posttest treated as repeated measures were performed on the data. Since the major aspect of the study lay in the relationships of pretest and posttest to the other independent factors, the between-group portion of the analysis was not considered pertinent to the analysis of the results; the comparisons were averaged across pretest and posttests. Table 2 presents the ANOVA summary table which was obtained as a result of this analysis.

As was mentioned, only the within-group portion of Table 2 is interpretable in view of the hypotheses as they were originally formulated. Therefore, the upper half of the table was disregarded. In the within group model the effect of Scores (pretest and posttest) and Scores by Group (S x G) do not relate directly to the test of the hypotheses. The impressive scores effect, however, does indicate that, overall, students across all levels and treatments learned the content. The S x G interaction indicates that the levels of students (High vs. Medium vs. Low) performed differentially across the pretest and posttest. These results are not surprising nor particularly interesting.

Of interest, however, are the three way interaction of Scores by Groups by Treatments (Hypothesis 2) and the Scores by Treatments interaction (Hypothesis 1). As a result of this
Table 1
Means and Standard Deviation from Experiment 1
Across Achievement Levels

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Pretest</th>
<th></th>
<th>Posttest</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$X$</td>
<td>SD</td>
<td>$X$</td>
<td>SD</td>
</tr>
<tr>
<td>Media</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>12.67</td>
<td>6.32</td>
<td>20.56</td>
<td>3.71</td>
</tr>
<tr>
<td>Medium</td>
<td>13</td>
<td>6.15</td>
<td>4.67</td>
<td>14.62</td>
<td>4.57</td>
</tr>
<tr>
<td>Low</td>
<td>6</td>
<td>4.00</td>
<td>1.89</td>
<td>6.67</td>
<td>4.97</td>
</tr>
<tr>
<td>Traditional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>8.20</td>
<td>2.82</td>
<td>13.90</td>
<td>3.60</td>
</tr>
<tr>
<td>Medium</td>
<td>10</td>
<td>4.90</td>
<td>2.18</td>
<td>10.50</td>
<td>3.14</td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
<td>4.67</td>
<td>1.41</td>
<td>5.78</td>
<td>3.11</td>
</tr>
</tbody>
</table>
Table 2  
ANOVA Summary of Experiment 1 Results

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups (G)</td>
<td>1229.31</td>
<td>2</td>
<td>614.66</td>
<td>28.78</td>
<td>.001</td>
</tr>
<tr>
<td>Treatments (T)</td>
<td>209.78</td>
<td>1</td>
<td>209.78</td>
<td>9.82</td>
<td>.003</td>
</tr>
<tr>
<td>G x T</td>
<td>123.35</td>
<td>2</td>
<td>61.68</td>
<td>2.89</td>
<td>.06</td>
</tr>
<tr>
<td>Error</td>
<td>1089.36</td>
<td>51</td>
<td>21.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores (S)</td>
<td>741.75</td>
<td>1</td>
<td>741.75</td>
<td>92.62</td>
<td>.001</td>
</tr>
<tr>
<td>S x G</td>
<td>135.80</td>
<td>2</td>
<td>67.90</td>
<td>8.48</td>
<td>.001</td>
</tr>
<tr>
<td>S x T</td>
<td>32.77</td>
<td>1</td>
<td>32.77</td>
<td>4.09</td>
<td>.05</td>
</tr>
<tr>
<td>S x G x T</td>
<td>1.92</td>
<td>2</td>
<td>.96</td>
<td>.12</td>
<td>.89</td>
</tr>
<tr>
<td>Error</td>
<td>408.42</td>
<td>51</td>
<td>8.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
analysis, hypothesis 2 was rejected. It was determined that levels of subjects do not perform differentially in the two treatments across the two dependent measures.

As can be seen in Table 2, the S x T interaction was significant. Figure 3 provides a graphical representation of the results of this interaction. Tukey's procedure was used in conducting post hoc analysis in order to determine the locus of this significant effect. Two tests were carried out, one across treatments (Traditional and Media) at the level of the pretest and another at the level of the posttest. As was anticipated, the pretest means were not significantly different ($p < .12$), indicating that the groups were similar in their pre-experimental knowledge of the unit content. However, the difference between the Traditional Posttest and Media Posttest was significant ($p < .02$), suggesting that the media condition may have facilitated a more positive learning experience for the subjects. To determine if the same relationships held when the roles of the two classes was reversed, Experiment 2 was conducted.

**Experiment Two - Animal Reproduction**

The means and standard deviations obtained from testing in Experiment 2 are presented in Table 3. Again, two-way analysis of variance was conducted to test the differences in groups, treatments and between pretest and posttest. The ANOVA Summary table in Table 4 shows the results of this analysis. It is evident from this table that a similar relationships
Figure 3. Comparison of mean scores by treatment in Experiment 1. across all three levels of achievement
Table 3
Means and Standard Deviation in Experiment 2

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$\bar{X}$</td>
<td>SD</td>
</tr>
<tr>
<td>Media</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>5.80</td>
<td>3.05</td>
</tr>
<tr>
<td>Medium</td>
<td>10</td>
<td>4.40</td>
<td>3.17</td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
<td>3.11</td>
<td>1.76</td>
</tr>
<tr>
<td>Traditional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>12.00</td>
<td>6.04</td>
</tr>
<tr>
<td>Medium</td>
<td>13</td>
<td>7.15</td>
<td>3.02</td>
</tr>
<tr>
<td>Low</td>
<td>6</td>
<td>2.67</td>
<td>1.75</td>
</tr>
</tbody>
</table>
existed in the within-group portion of the design as were determined in Experiment 1. Again, there was a significant increase between the pretest and posttest and a significant interaction between the pretest-posttest and the factor groups.

As in the case of the first experiment, the S x G x T interaction was considered a test of hypothesis 2 (that low achieving learners would profit more from the media treatment that high or medium level learners) and the S x T interaction was a test of hypothesis 1 (that the media treatment would produce better learning results than the traditional method).

In the case of hypothesis 1, the results indicate that significant differences exist between the two instructional treatments when tested across the pretest and the posttest. To demonstrate this interaction of treatments and testing, the graphic representation in Figure 4 was constructed.

It is evident from Table 4 that hypothesis 2 should be rejected. Although low achieving learners did profit differentially from the two methods, as shown in Figure 5 and 6, this effect was not potent enough to produce a statistically significant interaction.

**Post hoc Analysis**

Tukey analysis revealed a different pattern of relationships than were evident in Experiment 1. While in the first experiment, the groups did not differ on the pretest, but did in the posttest, in Experiment 2 differences were found in the pretest but not in the posttest.
Table 4
ANOVA Summary of Experiment 2 - Results

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups (G)</td>
<td>1509.34</td>
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<td>36.79</td>
<td>.001</td>
</tr>
<tr>
<td>Treatments (T)</td>
<td>61.99</td>
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<td>61.99</td>
<td>3.02</td>
<td>.088</td>
</tr>
<tr>
<td>G x T</td>
<td>166.76</td>
<td>2</td>
<td>83.38</td>
<td>4.06</td>
<td>.02</td>
</tr>
<tr>
<td>Error</td>
<td>1046.27</td>
<td>51</td>
<td>20.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores</td>
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<td>1</td>
<td>648.12</td>
<td>64.45</td>
<td>.001</td>
</tr>
<tr>
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<td>105.76</td>
<td>10.52</td>
<td>.001</td>
</tr>
<tr>
<td>S x T</td>
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<td>47.26</td>
<td>4.70</td>
<td>.035</td>
</tr>
<tr>
<td>S x G x T</td>
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<td>12.19</td>
<td>1.21</td>
<td>.31</td>
</tr>
<tr>
<td>Error</td>
<td>512.89</td>
<td>51</td>
<td>10.06</td>
<td></td>
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</tbody>
</table>
Figure 4. Comparison of mean scores of treatment by testing in Experiment 2 across all three levels of achievement.
Figure 5. Comparison of mean scores treatment by testing of the low-achieving group
Experiment 2

Figure 6. Comparison of mean scores treatment by testing of the low-achieving group
The pretest means (Media, $\bar{X} = 4.48$; Traditional, $\bar{X} = 7.75$) was significant ($p < .03$), but the posttest means (Media, $\bar{X} = 10.79$; Traditional, $\bar{X} = 11.75$) were not significantly different ($p < .29$). The results here, although conforming to a different pattern, represent essentially the same gain as was observed in Experiment 1. Apparently, even though the group began at different levels, the media condition was sufficiently potent to compensate for this initial difference in the pretest.

**Summary of Results**

In summarizing the results, it is evident that similar relationships exist in the within-group portion in both experiments. There was a significant interaction between the pretest and posttest and a significant interaction between the pretest-posttest and the factor groups.

The Scores by Groups by Treatments interaction did not support Hypothesis 2, therefore this hypothesis had to be rejected.

The Scores by Treatment interaction supported Hypothesis 1, in favour of the media treatment.

The *Post hoc* Analysis revealed that the media condition compensated for initial differences in the pretest.

The difference between the Traditional posttest and Media posttest was also significant, suggesting that the media condition have facilitated a more positive learning environment for the learners.
CHAPTER 5

Discussion

This study represents an initial inquiry into the effects of students' participation in media production on their learning in the cognitive domain. Two experiments were conducted to test the hypothesis that student production related to a content area in elementary school instruction results in superior learning gains than conventional, verbally-based instruction in the same content area.

Although both experiments were analyzed using two-way analysis of variance with repeated measures, only the within-group portion of the analysis tested the hypotheses directly. The results of these analyses as presented in Tables 2 and 3 respectively, seem to support the basic hypothesis, indicating that the media condition facilitated greater learning gains than the traditional method of instruction.

The findings are consistent with Bruner's theory (1966) that attributes basic benefits from discovery and activity-oriented learning. For that reason it is difficult to argue that the benefits derived from this experience are solely related to the media treatment. It is conceivable that similar results would be achieved with any activity-based treatment of the content. However, these findings do extend the range of involvement-type learning activities to include those that deal with manipulation of imaginal as well as verbal
symbol systems. The results represented by Figure 3 also support Luria's claim that empirical evidence of many educators suggests, that when learners are encouraged to create images, the learning will be more powerful (Luria, 1973). Although the pretest means in Experiment 1 were not significant, the difference between the Media Posttest and Traditional Posttest was significant, indicating the benefits of the media treatment.

The results of the post hoc analysis are in agreement with other findings (Biekert, 1971, Cohen, 1971, Levie, 1978) demonstrating that even though the groups started from different levels, the media condition was compelling enough to compensate for the initial differences.

A second purpose of the experiment was to determine the effects of activity-based media production on low-achieving learners compared with high or medium level learners. It was hypothesized that there would be an interaction between teaching methods and levels of achievement resulting in a relatively greater gains for the "underachievers". The evidence represented in Table 2 and 4 strongly suggests that the null hypothesis should be accepted since levels of subjects (i.e. high, medium and low) did not perform differentially in the two treatments. This finding, however, does not completely contradict the observations of researchers such as Simonson (1980), Nemchin (1971), Vickers (1972) and Lorac (1981) who found that low ability learners were more successful in or-
ganizing ideas by planning a visual sequence. The analysis of the results, as shown in Figure 5 and 6 suggests that low achieving learners profited differentially from the two methods in favour of the media treatment, but only when compared with same subjects' achievement in the traditional method.

Certain limitations are inherent in most thesis undertakings. Critics of this study may consider the fact that the experimenter was the class teacher of one group involved in the research and carried out the experiment with both groups herself to constitute a bias which would threaten the internal validity of the study. This assumption could at least be partially debated upon grounds that the results were replicated in the second experiment. This counterbalancing of intact treatments across experiment was designed to reduce this threat. However, it should be noted that even this procedure does not substitute for random assignment of subjects to treatments and more substantial measures to guard against instructor bias.

Another objection may be raised over whether the positive effects of the media treatment was due to stable characteristics of the method or are the result of novelty. This is often the difficulty in experiments such as this one where new methods (this one may not be new but it is certainly unpracticed) are being compared with traditional methods that are currently in wide practice. Using naive subjects i.e. those having received no instruction jeopardizes external va-
lidity, while employing a new method with subjects accustomed to old methods reduces internal validity. Use of an attenuation period is often suggested (Campbell & Stanley, 1962), but this was not possible in the limited time available for the experiment. However, since the homeroom class (media first, traditional second) was exposed to media work for over six months by the time of the experiment and produced favorable results when given the media treatment, tentatively suggests, that novelty is not the primary cause of observed effects.

It is recognized, though, that any method, however interesting and exciting initially, can become boring if used extensively. Activity-based learning is probably no exception. It is argued on the strength of the researcher's experience, however, that active involvement, and especially creating media products, has a far longer interest span than traditional teacher-directed instructional method. This is probably due to the fact that media production lends itself to a much wider choice of activities and a variety of approaches than verbally-based instructions. The researcher also suggests that media-based activities should be interchanged with traditional activities to produce the maximum interest level.

A methodological weakness of this experiment was that subjects were not assigned to conditions at random. This was precluded by schedules of instructions in the school in
which the experiment was conducted which would have caused a major conflict in completing the testing within the available resources and time. However, this was partially compensated by carrying out two separate experiments with counterbalanced treatments. Also, the analysis shown on Table 1 suggests that there was no sampling bias between the treatment groups since the initial performance on the pre-experimental knowledge indicates that the groups were quite similar.

The significant difference between the pretests in Experiment 2 could probably be attributed to the fact that one of the two classes (the experimenter's homeroom) more effectively generalized from the instruction and testing in Experiment 1 to the pretest of Experiment 2. However, as reported earlier these initial gains were apparently offset and reduced by the traditional instruction treatment.

Probably the most substantial limitation of the study was the fact that it was not possible to isolate the effects of the media treatment from the effect of activity learning so as to test the unique contribution of media to the learning process. Imagery studies have shown that construction of images (internalized external representations) results in more positive learning gains than viewing pre-constructed images, suggesting that the construction process (schema development) may be more important than the symbolic form (words or pictures) of the construction. It is conceivable, then, that
any activity-based instructional treatment which encourages active construction would out-perform more passive forms of learning experiences, whether verbally or audio-visually based. As yet, however, this question has not yet been successfully addressed, either theoretically or empirically.

Based on the results this writer would suggest that additional research could be instituted into the nature of interaction between symbolic form and activity-reception in children's learning. Just as "doing writing" produces greater verbal literacy than reading, so should "doing media" produce greater competency in non-verbal symbolic forms than viewing media. However, it is the possibility of differential outcomes of such diverse experience (viewing vs. doing) in combination with diverse symbolic forms that may be of particular interest in future investigations.

Further research may consider the comparison of achievement gain between other novelty methods (i.e. model building) versus media production, or even passive media methods with activity based media work. There is also a need to conduct research comparing different strata of population. Age, socioeconomic level, cultural level, sex and other groups may form the subjects of such studies.

Another point of interest raised by this study may well be the effect of student production on the learners' self-esteem. Studies in the affective domain may include comparisons of acquisition of social skills such as cooperation,
leadership potentials, communication skills, participation in group work, the effect of improved motivation on clarifying learners identity, etc.

As mentioned earlier, the statistical analysis did not support the hypothesis that "underachievers" benefit differentially compared with the other groups under the media treatment. However this may have been due to the fact that there were not enough subjects in this group to adequately test the hypothesis. Figures 5 and 6 suggest that at least some of the low achieving learners also benefited from the media conditions and re-examination of the raw data confirmed that one of six and two of nine in their respective groups effectively improved from failing to passing grade and almost all of the others increased their gains in achievement. Since similar gains would bear great importance for the low-achieving learners as well as for the instructors of such learner, the writer would suggest that further research should be implemented into the effect of media production on the "underachievers". Such research could especially be interesting if the researcher would have access to the same student population for a longer period of time and would have larger groups to work with. The writer hopes that the self-instructional script-form in Appendix H provided for future instructors of students and experimenters, using student produced media, will prove to be helpful to readers of this study.
REFERENCES
REFERENCE NOTE

REFERENCES


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APPENDIX A

Pre- and Posttests
Unit I - II
APPENDIX

Pre- and Post Test
Unit I

Unit I. Reproduction - Plants

Name ___________________________ Grade ______
School ___________________________ Teacher ____________

Part I.
Directions: For each word in List I, choose the correct answer in List II. Write the letter of the definition in the blank in front of the word. You will not use all of the answers (definitions) from List II.

**LIST I**

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell</td>
<td>A. male structure in flower</td>
</tr>
<tr>
<td>organism</td>
<td>B. early stage of what develops from fertilized egg</td>
</tr>
<tr>
<td>seed</td>
<td>C. union of sperm and egg cells</td>
</tr>
<tr>
<td>ovary</td>
<td>D. part that is most highly colored in flowers</td>
</tr>
<tr>
<td>embryo</td>
<td>E. an embryo with food and protective cover</td>
</tr>
<tr>
<td>egg</td>
<td>F. where egg cells are formed</td>
</tr>
<tr>
<td>sperm</td>
<td>G. female structure in a flower</td>
</tr>
<tr>
<td>fertilization</td>
<td>H. making a copy</td>
</tr>
<tr>
<td>anther</td>
<td>I. male plant structure that often gets carried to another plant, or another part of the same plant</td>
</tr>
<tr>
<td>pistil</td>
<td>J. the swollen part of a stamen, where pollen is formed</td>
</tr>
<tr>
<td>pollen</td>
<td>K. the basic unit of a living matter, usually very small</td>
</tr>
<tr>
<td>stigma</td>
<td>L. a living thing</td>
</tr>
<tr>
<td>stamen</td>
<td>M. a female cell</td>
</tr>
<tr>
<td>generation</td>
<td>N. group with members of about same age (born at about the same time)</td>
</tr>
<tr>
<td>sexual</td>
<td>O. joining of a male and female cell</td>
</tr>
<tr>
<td>asexual</td>
<td>P. two basic groups of organisms</td>
</tr>
<tr>
<td>plants</td>
<td>Q. the stem of the flower</td>
</tr>
<tr>
<td>animals</td>
<td>R. reproduction without male and female cells</td>
</tr>
<tr>
<td>ovule</td>
<td>S. sticky top on top of flower</td>
</tr>
</tbody>
</table>

**LIST II**

A. male structure in flower
B. early stage of what develops from fertilized egg
C. union of sperm and egg cells
D. part that is most highly colored in flowers
E. an embryo with food and protective cover
F. where egg cells are formed
G. female structure in a flower
H. making a copy

Part II. Directions: Label the parts of the flower below. Use labels from the list below:

Pistil  Stamen  Petal  Ovary  Stem  Anther

1. [Label]
2. [Label]
3. [Label]
APPENDIX

Pre- and Post Test
Unit II

Unit II. Reproduction - Animals - Mammals

Name ___________________________ Grade ____________
School __________________________ Teacher __________

Part I.
Directions: For each word in List I, choose the correct answer from List II. Write the letter of the definition in the blank in front of the word. You will not use all of the answers (capital letters) from List II.

List I

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>species</td>
<td>A. animals with milk-producing glands</td>
</tr>
<tr>
<td>genus</td>
<td>B. food for embryo containing fat</td>
</tr>
<tr>
<td>offspring</td>
<td>C. connects embryo to placenta</td>
</tr>
<tr>
<td>reproduction</td>
<td>D. joining of egg cells with sperm cells</td>
</tr>
<tr>
<td>sexual</td>
<td>E. one kind of living things</td>
</tr>
<tr>
<td>reproduction</td>
<td>F. food for embryo with protein</td>
</tr>
<tr>
<td>mammales</td>
<td>G. young copies of mature organisms</td>
</tr>
<tr>
<td>egg yolk</td>
<td>H. ovary</td>
</tr>
<tr>
<td>egg white</td>
<td>I. fertilization</td>
</tr>
<tr>
<td>uterus or womb</td>
<td>J. group of several species that are similar in a way</td>
</tr>
<tr>
<td>placenta</td>
<td>K. producing copies that ensures continuation of species</td>
</tr>
<tr>
<td>umbilical cord</td>
<td>L. where the embryo develops</td>
</tr>
<tr>
<td>vagina</td>
<td>M. mature egg cell in mammals</td>
</tr>
<tr>
<td>birth canal</td>
<td>N. birth canal</td>
</tr>
<tr>
<td>placenta</td>
<td>G. fertilizing fluid consisting sperm</td>
</tr>
<tr>
<td>membranes</td>
<td>H. membrane covering fertilized egg to prevent other sperm entering</td>
</tr>
<tr>
<td>ovum</td>
<td>R. passageway for fertilized egg in mammals</td>
</tr>
<tr>
<td>fallopian tube</td>
<td>S. contains arteries and veins for embryo and leaves mother's body after birth of offspring</td>
</tr>
<tr>
<td>ovary</td>
<td>T. protects embryo as a shock absorber</td>
</tr>
<tr>
<td>ovary</td>
<td>U. releases the egg cell in mammals</td>
</tr>
</tbody>
</table>

Part II. Directions: Label the parts shown with arrows and a blank line. Use labels from the list below:

Birth sac Umbilical cord Placenta Ovary Uterus Vagina

MAMMAL EMBRYO

SPERM EGG FALLOPIAN TUBE

FEMALE REPRODUCTIVE ORGAN
APPENDIX B

Fill-in Diagram-Sample
Conventional Method
APPENDIX B

Fill-in Diagram (sample)
(Conventional treatment)

NAME
GRADE
ROOM

REPRODUCTIVE ORGANS
OF PLANTS

PETAL
STIGMA
STAMEN
ANTHER
OVARY
PISTIL
STEM
APPENDIX C

Sample Storyboards
Multiple Sclerosis
By Chiyo
Grade 6
Room 15
Teacher: Mrs. Berger

THE END
This picture shows the brain from the front view.

This shows the nerves that send messages to all parts of your body.

Here you can see the brain, the spinal cord, and the nerves.

Here is a boy kicking the ball. The brain is sending the nerve messages to kick the ball.

You can see that there are spots on the nerves. These are hardenings of the protective nerve covering in scattered areas throughout the central nervous system.

It means that the brain can't send messages to all parts of your body.

Here you can see that there are two people who are disabled by Multiple Sclerosis.

You can see that the girl is standing. She can not bounce or kick the ball, because she has Multiple Sclerosis and her brain can't send message to her hand or feet.

Scientists are trying to find a cure for Multiple Sclerosis, so to heal the disabled people.

Eat healthy food from all four food groups to avoid Multiple Sclerosis.

And also exercise to stay healthy and growing.

You shouldn't laugh at people who have them. They are already suffering enough, and you should keep them happy as if they don't have disease at all.

Don't think Multiple Sclerosis is nothing. It disables lots of people. And you may be the next victim. And if you want to find out more, look in the library for books on MS. Thank you!
Orders are given through the radio.

The German radio operator tells his commander about it.

The commander orders his soldiers to go "forward" to the American position.

The Americans shoot the Germans.

The Germans start shooting.

The Americans start shooting.

The American radio operator calls for help.

The American radio operator gets shot.

The battle is over, but none has won yet, because...

American reinforcements are waiting in the bushes.

The Americans attack... and win!

It all shows that you can't judge a book by its cover!
APPENDIX D

Sample Scriptforms
Multiple Sclerosis

By: Chiyoko Ma
Grade: 6 Room: 15
Teacher: Mrs. Berger

1-3 DIALOGUE
Music

4 DIALOGUE
This picture shows the brain from the front view.

5 DIALOGUE
This shows the nerves that send messages to all parts of your body.

6 DIALOGUE
Here you can see the brain, the spinal cord, and the nerves.

7 DIALOGUE
Here is a boy kicking the ball. The brain is sending the nerve messages to kick the ball.
Music

Music getting louder.

Panzer 71 receives a message.

Orders are given through the radio.

The German radioman tells his commander about it.
APPENDIX E

Sample Worksheet
<table>
<thead>
<tr>
<th>Title</th>
<th>Work Copy</th>
<th>10</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>done for you</td>
<td>done</td>
<td></td>
<td></td>
</tr>
<tr>
<td>done</td>
<td></td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>done</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>done</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>done</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

Additional note: ROGER took notes.
<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Year</th>
<th>Completed Worksheet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>corr</td>
<td>982</td>
<td>SIMPLE</td>
</tr>
</tbody>
</table>

| 1. | O |
| 2. | done |
| 3. | done |
| 4. | done |
| 5. | done |
| 6. | done |
| 7. | done |
| 8. | done |
| 9. | done |
| 10. | |
| 11. | |
| 12. | |
| 13. | |
| 14. | |
| 15. | |
| 16. | |
| 17. | |
| 18. | |
| 19. | |
| 20. | |
| 21. | |
| 22. | |
| 23. | |
| 24. | |
| 25. | |
| 26. | |
APPENDIX F

Completed Scriptforms

Unit I
Reproduction of Plants

By Chiyoko Ma, Grade 6 Room 15 Hampstead School
Teacher Mrs. Berger - 1982

3. An organism is a living thing that needs to be born that needs breathing, developing and that can reproduce or multiply itself.

4. "We may group organisms into sub-group, such as several generations.
Generation is a group with members of about the same age. Or we may group organisms into PLANTS and ANIMALS.

5. "A cell is the smallest basic unit of an organism."

There are two basic types of reproduction:
Sexual reproduction is the joining of a male and a female cell.

7. "The other is the asexual reproduction which does not need the joining of a male and a female cell. 
Splitting is one kind of asexual. Another type is cutting. 
A stem from a plant placed in water will start growing roots and become another plant."

8. "Most plants are reproduced through sexual reproduction that takes place in the flower in most plants."

9. "Here the diagram shows the whole flower."
"Here you can see the petal of the flower which is shaded in."

"Here the pistil is shaded in which is the female organ of the flower."

"Style is another part of the female structure of a flower. A stigma is the sticky top which is on top of the pistil."

"A stamen is the male structure in a flower. An anther is the swollen part of a stamen, where pollen is formed."

"Pollen is a male plant structure that often gets carried to another plant, or another part of the same plant."

"Fertilization is an union of sperm and egg cells."

"An egg is a female cell which is produced inside a female organ. A sperm is a male cell which is produced inside a male organ."

"In a typical flower, this is how fertilization happens. The wind, an insect or sometimes people will carry the pollen from the anther."

"To the pistil of the flower especially to the stigma that has a sticky top. Some of the pollen will get to the ovary and fertilize one female egg cell in the flower."
<table>
<thead>
<tr>
<th>Page</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>&quot;Then the cell develops into a seed, a new life. A seed is a protective shell for an embryo with food and protective cover.&quot;</td>
</tr>
<tr>
<td>20</td>
<td>&quot;An embryo is an early stage of development from fertilized egg. It is an offspring before birth.&quot;</td>
</tr>
<tr>
<td>21</td>
<td>&quot;Seeds come in various sizes.&quot;</td>
</tr>
<tr>
<td>22</td>
<td>&quot;The diagram shows the seed of a coconut and the seed of a poppy.&quot;</td>
</tr>
<tr>
<td>23</td>
<td>&quot;A tomato is nothing else but an ovary with ovules and seeds.&quot;</td>
</tr>
<tr>
<td>24</td>
<td>&quot;If you cut an apple across a star with five pointed ovules of the ovary and the seed.&quot;</td>
</tr>
<tr>
<td>25</td>
<td>&quot;Some seeds could be preserved over a thousand years. A seed from a pyramid sprouted after over three thousand years.&quot;</td>
</tr>
<tr>
<td>26</td>
<td>&quot;And does the life in the world of plants go on.&quot;</td>
</tr>
<tr>
<td>27</td>
<td>&quot;The End.&quot;</td>
</tr>
</tbody>
</table>
APPENDIX G

Completed Scriptforms

Unit II
These eggs are almost ready to hatch. They lie among rocks and gravel at the bottom of a stream. The dark spots are the eyes of baby trout to be born.

How does a pea-sized trout egg grow into a baby trout? How does any egg become a baby animal?

An egg cannot grow into an animal by itself. First the egg must be fertilized.

It must be joined by the father's sperm. Fertilization means the union of sperm and egg cells.

Young copies of mature organisms are called OFFSPRINGS. First the babies are too weak to be on their own. They have to be looked after. The parents feed their babies and provide care.

One kind of living organism is call SPECIES. Cats, for example are species, so are dogs.

A group of several species that are similar in a way are called GENUS. For example, chickens are species that belong to the genus of birds.

Producing copies of a living organism is known as REPRODUCTION. This ensures continuation of the species.
Whenever an egg cell joins a sperm cell resulting in fertilization, we call it SEXUAL REPRODUCTION.

A male and a female is needed for sexual reproduction.

A male rooster and a female hen is needed to produce baby chicks.

The eggs of a chicken are fertilized in the hen's body. Not all eggs are fertilized. For the egg to be fertilized, a rooster must mate with the hen.

After the eggs have been fertilized, changes will start and the chick will start to form.

The EGG YOLK provides food containing fat for the chick. The EGG WHITE contains food with protein.

At 13 hours after the egg is laid, the cells in the egg have divided many times. After 56 hours, the chick will already plump.

Before birth, the chick or any other organism is called an EMBRYO. An EMBRYO is an offspring or a young copy of organisms before birth.

MAMMALS are genus with milk-producing glands, bearing their young alive. One species within mammals are humans.
When the egg is fertilized, most embryos of mammals develop in the womb or uterus of the mother.

This is a diagram (picture) of the female reproductive organs. It consists of the uterus, the ovary, the Fallopian tube, and the vagina.

The ovary releases the egg cell in mammals. The fertilized egg travels through the Fallopian tube and gets attached to the wall of the uterus.

The fertilizing fluid containing the male cell is called semen. When the egg is fertilized, a membrane or covering layer protects other organs from entering the egg. This is called zygote.

Egg cells mature in 28 days in human females. The unfertilized egg has the woman's body each 28 days. This is called menstruation. If the mature egg cells are called ovum.

The mammal embryo develops in a birth sac that acts as a shock absorber to protect the fetus (mammal embryo). The umbilical cord connects the embryo with the placenta that contains veins supplying the embryo with nourishment.

The placenta leaves the mother's body after birth. When developed, the embryo leaves through the vagina or birth canal that stretches. The umbilical cord will have to be cut. The belly buttons or navel marks the spot where the cord was attached to the baby, making it the end of the cord, more so 200.

One exception is the seal. The eggs are fertilized in a pouch or the father's belly. When he is ready to give birth, he rolls his tail around, sealed, and is bent back and forward to squeeze the babies out as many as 200.

These are some of the wonders of animal reproduction.

The End
APPENDIX H

Self-instructional Unit - Sample

For Teachers
This script form aims to outline the steps to follow in training your students to produce their own educational slide- or filmstrip presentations.

MUSIC — HAPPY, VIVID

PART I
THE STORYBOARD

One of the best ways to start a media presentation is to design a STORYBOARD.

A STORYBOARD could be the starting point for any media show: slides, filmstrips, films, VTR, simulation games, slides, plays, etc.

A storyboard is a story in pictures.
The purpose of a storyboard for a media production is the same as the purpose of an outline for a composition: it helps you to organize your information.

A rectangular sheet of paper of convenient size (21 x 28 cm - the size of this notebook) could be used horizontally.

A vertical division by folding the paper or making a line would be helpful.

The left side of the sheet should be divided into rectangles, approx. 12 x 20.

Each rectangle will contain a visual message.

In the first frames (rectangles) they should place their TITLES
NAME (and GRADE or Age if they are students, or course number if they are taking a course)

HAMPSTEAD SCHOOL (MONTREAL)

the NAME of their SCHOOL with its location

A CLASSIC PRESENTATION McALLISTER

and the YEAR of PRODUCTION

EXAMPLES

How they are ready to sketch their first VISUALS (pictures)
On the fifth frame they will make a rough sketch of their first scene.

They continue with their scenes in chronological order.

While the left side of their storyboard contains their visuals (pictures) the right side will be their dialogue.

The dialogue of the storyboard will contain the verbal messages, sound, sound effects and music (optional).

WHAT IS A STORYBOARD

DIALOGUE

OVERVIEW
THE CONTENT OF A STORYBOARD

17 DIALOGUE

A) Before you have started your storyboard, you have a "STORY" or information package in mind.

B) Your story or information have to be broken up into sentences or visuals that will become your VERBAL part of your storyboard called: DIALOGUE

C) See frame 20

18 DIALOGUE

D) Your dialogue should be measured and should correspond to your VISUALS.

E) Your dialogue for one frame should not be too long (NOT MORE THAN 2-3 SENTENCES)

19 DIALOGUE

F) You don't need a dialogue for every frame.

G) You may "fill in" some frames with sound effects or even silence especially in the beginning and in the end.

20 DIALOGUE

A) Make sure your dialogue is clear to the point and without mistakes.

B) You may write a draft copy on a paper, first and edit it before transferring it to your SCRIPT FORM.

See frame 17.
I. Long producing your script form is done in school as part of your learning activities, the storyboard should have an educational message. (This is very easy, since your group will design a storyboard on a topic related to any school subject.)

For example, they may produce a script form on pets and they may discuss "looking after a dog" or they may discuss "how to be a good pet." They may explain the steps in a long division.

After their first topic they will find it difficult to write from the hundreds of possible topics.

To summarize:
A storyboard is a "story" in pictures.
A storyboard consists of two basic parts:
1. the visual part (pictures)
2. the dialogue (verbal information)

The audio part
25 Dialogue

**IMPROVEMENTS**

Better

Better

Hold slide

CONTENTS

Edit and revise the storyboard of your pupils.

A conference or discussion with them and their agreement is very important to avoid disappointment and loss of interest.

26 Dialogue

**SAME AS #25**

After revising the final version, provide blank forms for your students to transfer their storyboard to a script form such as this.

Ask your students to improve their stories, clarity, and language as well as the pictures on the storyboard.

27 Dialogue

**EXAMPLES**

Coloring the pictures would improve the storyboard and make it more enjoyable for most pupils.

28 Dialogue

**EXAMPLES**

For some topics, black and white is just as acceptable.

This could also be a question of personal preference.

It is advisable to let your pupils decide certain details.
PART I
TRANSFER TO
THE SCRIPT FORM
IN PENCIL WORKING.

Now that your students have completed
their storyboard, you are ready to train
them to "transfer their storyboard into
the script form"

PART I
TRANSFER TO
THE SCRIPT FORM
IN PENCIL WORKING.

You are looking at a script
form.
A script form consists of:
1) frame for visual
2) space provided for audio
(you dialogue)

It may be a good idea to ask
your students to prepare a draft
script form. They could use a blank
paper (full sheet) with a margin
approx. 3 cm wide.

Horizontal lines on every seventh
line could provide divisions for
the frames and the dialogue.
The margin will form with the
horizontal divisions the visual frames
Students can first transfer their storyboards to the draft script frame prepared as outlined before.

Before the final transfers, read the dialogues with your pupils and see that they correspond with the visuals. Ask them for ideas for improvement and suggest yours for their approval.

Ask your pupils to prepare final script forms (already provided). Check and approve final forms.

Can you recall the two basic elements of a storyboard?
97

**Script Form**

**Presentation**

**Feeding**

If your answer was
1) Visuals (pictures) and
2) Dialogue or audio, verbal information & sound!
You are absolutely right!

**Follow Through**

**Presentation**

**Dialogue**

Now try to recollect the steps for creating a storyboard into a script form. Compare your answers with the steps listed on the sheet in your manual titled: STEPS TO FOLLOW IN PRODUCING SCRIPT FORM

**Presentation**

**Dialogue**

You are now ready to write your own script form keeping in mind the level of your students.

**Presentation**

**Dialogue**

The best test for your script form will be the successfulness of the script form produced by your students.

**Follow Through**
First, ask your students to read your script form. After reading your script form, your students should choose a topic. If they find this difficult, question them about their interests and advise them to help decide.

Follow Through

Your students, just like you, should first produce a story-board. To avoid disappointment, ask them to show you their first five to six scenes with special attention on first introducing film and visuals (pictures). Then, after storyboarding is complete, check and ask for changes. Review yourself and your students or approve storyboards. You may mark them.

Enrichment
Ask students to transfer their storyboard into DIALOGUE - to rehearse, see Frames and Dialogues No 17-21.

After the dialogue have been completed, ask them to complete their VISUAL and DIALOGUES on the final SCRIPT-FORM. See Frames 37-39 again.

Check and secure students' combined information on draft SCRIPT. Ask them to do final SCRIPT-FORM or provide sheets identical to this one.

Produce overhead transparencies of the final SCRIPT-FORM for group discussion, evaluation, and revisions as well as for FOLLOW-UP activities for group.

CONGRATULATIONS!
Now your students are ready to transfer their presentations into a filmstrip, slide tape, show or into other forms of media. To proceed see PART II: SLIDE PRODUCTION.
Special thanks to my roommate Constantine and our four legs and communications.

Music

God to Connie Law, Chiyoke M., Pearl Khemani and Class XI Students for the beautiful illustrations.

Music cont'd

Music expressing joy, completion (victory), success.

Music cont'd to the end.
STEPS TO FOLLOW IN PRODUCING
A SCRIPT-FORM:

PART I: STORYBOARD
1) Choose a topic* (or use assigned topic)*get approval of topic.
2) Write your outline first, then your story.
3) Break up your story into scenes (frames) and
   number them in chronological order (draft copy).
4) Write a verbal message format of your scenes.
   (frames) number them on your draft copy.
5) Make sure you have a message (educational
   content).
6) Read your verbal message (dialogue) with your
   pictures (visuals) to see that they correspond.
7) Do storyboard - color pictures, work neatly.
8) Start with: TITLE, Your Name and Level,
   Name of School (Teacher) Date.
9) Continue with scenes and dialogue.
10) Complete your storyboard.
11) Edit your storyboard and get approval from
    teacher. Revise if necessary.

PART II: TRANSFER TO SCRIPT-INDEX
12) Transfer visuals and audio into draft script.
13) Get approval - revise if necessary.
14) Do final script soon.
15) After approval transfer to overhead
    transparencies for evaluation.

   And