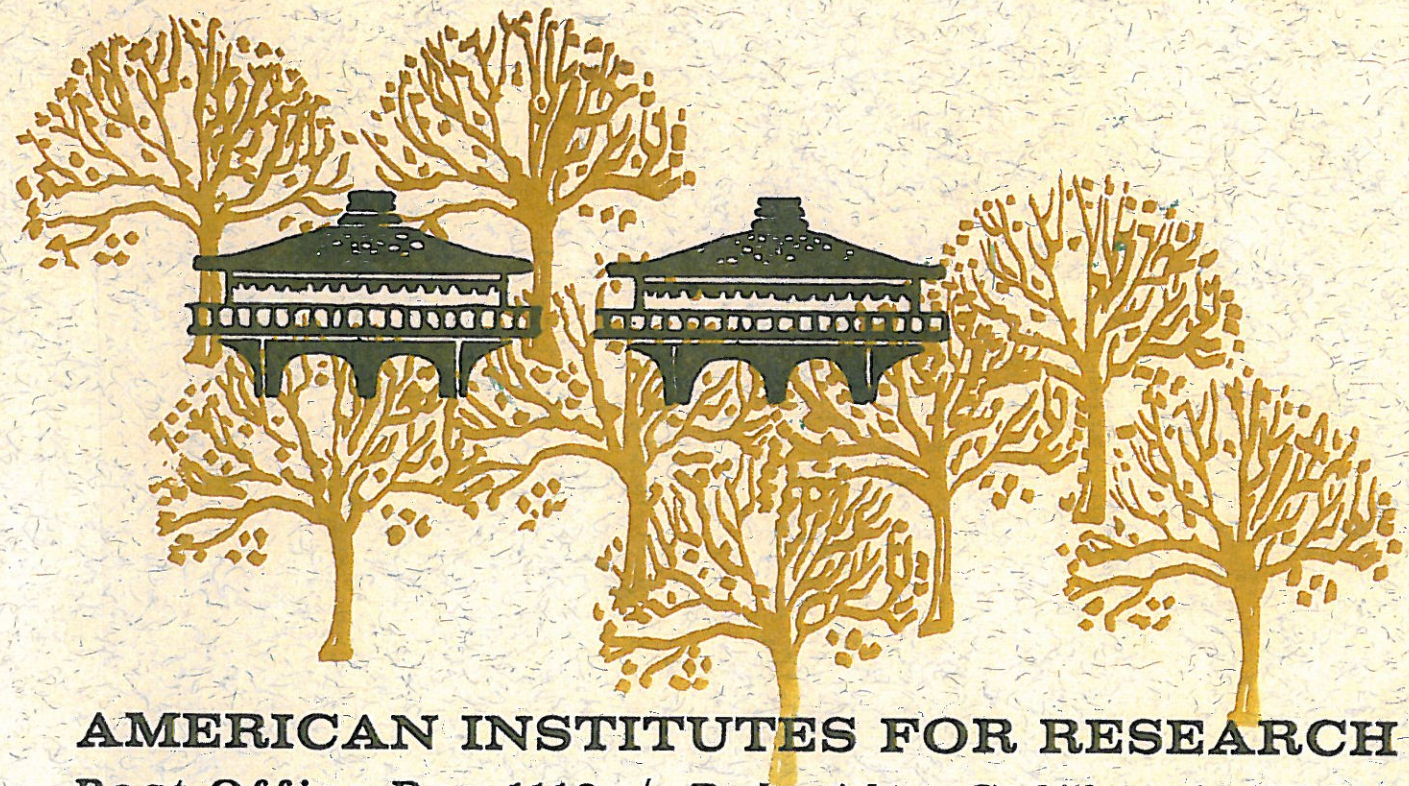
PRODUCT DEVELOPMENT REPORT NO. 15

MATERIALS AND ACTIVITIES FOR TEACHERS AND CHILDREN—THE MATCH PROGRAM

DEVELOPED BY THE CHILDREN'S MUSEUM, BOSTON, MASSACHUSETTS

January, 1972

Contract No. OEC-0-70-4892



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American Institutes for Research
in the Behavioral Sciences

Palo Alto, California

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The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Office of Program Planning and Evaluation

PREFACE

This product development report is one of 21 such reports, each dealing with the developmental history of a recent educational product. A list of the 21 products, and the agencies responsible for their development, is contained in Appendix D to this report. The study, of which this report is a component, was supported by U.S. Office of Education Contract No. OEC-0-70-4892, entitled "The Evaluation of the Impact of Educational Research and Development Products." The overall project was designed to examine the process of development of "successful educational products."

This report represents a relatively unique attempt to document what occurred in the development of a recent educational product that appears to have potential impact. The report is based upon published materials, documents in the files of the developing agency, and interviews with staff who were involved in the development of the product. A draft of each study was reviewed by the developer's staff. Generally, their suggestions for revisions were incorporated into the text; however, complete responsibility for interpretations concerning any facet of development, evaluation, and diffusion rests with the authors of this report.

Although awareness of the full impact of the study requires reading both the individual product development reports and the separate final report, each study may be read individually. For a quick overview of essential events in the product history, the reader is referred to those sections of the report containing the flow chart and the critical decision record.

The final report contains: a complete discussion of the procedures and the selection criteria used to identify exemplary educational products; generalizations drawn from the 21 product development case studies; a comparison of these generalizations with hypotheses currently existing in the literature regarding the processes of innovation and change; and the identification of some proposed data sources through which the U.S. Office of Education could monitor the impact of developing products. The final report also includes a detailed outline of the search procedures and the information sought for each case report.

Permanent project staff consisted of Calvin E. Wright, Principal Investigator; Jack J. Crawford, Project Director; Daniel W. Kratochvil, Research Scientist; and Carolyn A. Morrow, Administrative Assistant. In addition, other staff who assisted in the preparation of individual product reports are identified on the appropriate title pages. The Project Monitor was Dr. Alice Y. Scates of the USOE Office of Program Planning and Evaluation.

Sincere gratitude is extended to those overburdened staff members of the 21 product development studies who courteously and freely gave their time so that we might present a detailed and relatively accurate picture of the events in the development of some exemplary educational research and development products. If we have chronicled a just and moderately complete account of the birth of these products and the hard work that spawned them, credit lies with those staff members of each product development team who ransacked memory and files to recreate history.

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LIST OF FIGURES

PRODUCT DESCRIPTION

Product Characteristics

Name

Materials and Activities for Teachers and Children--The MATCH Program.

Developer

The Children's Museum, Boston, Massachusetts.

Distributor

The American Science and Engineering Company, Inc., of Boston, Massachusetts is distributing the product.

Focus

The MATCH program is a system of materials and activities in the form of kits which are used by a class of students and a teacher. The focus of the MATCH program is on non-verbal learning and the acquisition of skills that are not unique to any one subject matter area. The program emphasizes the development of thinking and feeling skills learned through direct experiences and events with authentic materials.

Grade Level

Kindergarten through grade 6.

Target Population

The target population consists of all students, kindergarten through grade 6. The nature of the objectives is such that they are not confined to any geographic, demographic, or racial-ethnic subpopulation.

Rationale for Product

Long-Range Goals of Product

The long-range goal of the MATCH project was to explore ways of communicating non-verbally through the use of various types of media. The developers believed that objects can often be more effective than words as a means of teaching certain ideas and concepts. To illustrate this they combined various materials with classroom activities in the form of kits designed to teach specified instructional objectives. Sixteen such kits, the MATCH boxes, were developed and teachers in the field tests found them to be valuable teaching aids. Three of the boxes are now commercially available.

Objectives of Product

Each MATCH box is designed to meet certain objectives. There are three main types of objectives: subject matter, skills and processes, and self-awareness. The subject matter objectives deal with the facts and concepts that the child should learn; the skills and processes objectives pertain to the development of critical thinking skills and problem solving abilities; the self-awareness objectives encourage the child to learn about himself and his capabilities. The objectives are not behaviorally stated, but rather are general statements on the purpose of the kits and expected outcomes.

Philosophy and Theory Supporting Product

The MATCH units were created to demonstrate that self-contained multi-media kits could be designed which would enable elementary teachers and children to communicate and learn by non-verbal means. The developers operated with the premise that words are very limited as mediators of learning, particularly at the elementary level, and that objects and activities are needed in great variety to expand and improve the learning of many subjects. It was felt that a non-verbal fact could be transmitted by a single object or medium, but in order to convey a non-verbal principle or concept, patterns of media or objects were needed. The developers wanted to investigate ways to combine media that would allow meaningful communication between teachers and pupils in subjects having highly non-verbal characteristics. They explained:

> "MATCH units are based on the idea that much of what we would like children to learn is essentially non-verbal--that is, it cannot be communicated through words, but is mediated instead through things and through what the learner does. Non-verbal learning takes place when the child is meaningfully engaged with some physical thing--be it a model, an ancient artifact, a pair of chopsticks, a lump of clay, a film, or perhaps another child."
>
> (Children's Museum, 1970)

Description of Materials

Organization and Content of Materials

Sixteen prototype MATCH units have been developed and tested. The objectives, materials, and activities for each unit are combined to form a MATCH box. The boxes are used to supplement regular classroom instruction in

the elementary grades and are designed to be used for two or three weeks. Each MATCH box is independent of the other boxes and they can be used in any order or combination. Half of the boxes deal with social studies topics and the other half deal with topics from other subject matter areas. The sixteen MATCH boxes are:

Grouping Birds
The City
The Algonquins
Seeds
A House of Ancient Greece
Houses
Animal Camouflage
Netsilik Eskimos
Musical Shapes and Sounds
Rocks
Japanese Family 1966
Medieval People
Waterplay
Imagination Unlimited
"Paddle-to-the-Sea"
The MATCH Box Press

Appendix A contains descriptions of each box; these descriptions include: name of box, grade level, objective, media, characteristic activities, a general comment, and a rating. The ratings were made by the developer and appear by the name of each box. The symbol (*) represents least elegant, (**) moderately elegant, and (***) most elegant.

Each MATCH box was meant to be self-explanatory. Each box contains a Teacher's Guide to enable a teacher to make effective use of the box without special training. Typically, they include:

- what the box is about
- what it contains: lists and pictures of materials
- an overview of the general approach and structure of the lessons
- individual lesson plans detailing objectives, materials, classroom arrangements, procedures, possible pitfalls, and assurances
- background information
- ideas for extending the unit
- information about the project, the people who made the box, material sources, and packing instructions

(Kresse, 1968, p. 40)

Each MATCH box contains enough materials for a class of 30 children to use for two or three weeks. Units are designed to circulate from class to class; in one school year they can be used by at least ten classes or about 300 students. Each unit can be used over a two to three grade range.

Format of Materials

The MATCH boxes are large and range from 30 pounds to 100 pounds. Usually two or three separate cases were required for each box. The materials in each box are organized in a way that is relevant to the unit and sometimes the packages themselves are fundamental parts of the unit.

The 16 MATCH boxes contain many kinds of things, including these listed in the Final Report (Final Report, 1968, pp. 48-49):

Real objects: 2300-year-old Greek pottery shards, chopsticks, navagator seeds, starfish, whale's tooth, Algonquin arrowheads, seal skin, beaver-chewed log, stuffed owl, old purse, Netsilik bow drill, clarinet, lead type, deerskin, bones, steel drum, harpoon, map measurer, pumps, syringe, buckets, mops, hammers, goggles, pipes, funnels, psaltery, stethoscope.

Reproductions: falconry lure, medieval clothing, Japanese photo album, Greek coins and statues, Indian leggings.

Models: city buildings, igloo, mud house, lock model, birchbark canoe, sea ice at Pelly Bay, folding rock strata, figure "4" trap.

Films: filmstrips, film loops and slides; and photographs of almost everything.

Recordings: a Netsilik woman telling a story in the Eskimo language, a medieval shrew recounting her experiences at court, bird calls, songs of the voyageurs, reminiscences of a Great Lakes captain, an Eskimo myth, an Algonquin's dream.

Equipment: tape recorders, various projectors, screens, extension cords.

Soft ware: charts and diagrams, floor plans, worksheets, maps, bird stickers, sort cards, word cards, recipes, student guides, character books, reference books.

Supplies: cinnamon, olive oil, seal oil, geodes, dry mud, cranberries, ink, paper, chemicals, diorama kits, soapstone, magnetic tape, parched corn.

Cost of Materials to User

As previously noted, only three of the 16 MATCH boxes are commercially available. The costs to user of these units are:

The City (complete with 16 mm. color sound film)	$557.00
Without film	357.00
A House of Ancient Greece	525.00

Japanese Family (complete with 16 mm. color sound film)	$770.00
Without film	495.00
Additional teacher's guides for each unit	4.00

If each box is used by ten classes a year for five years, the cost per student using the kit would range from approximately 25 cents to 50 cents.

Procedures for Using Product

Learner Activities

The learner activities are nearly as diverse as the materials. The Final Report lists these activities: making things like a mud wall, or books or "nokake," an Indian food; using tools like the bow drill; assembling models and musical instruments; role playing; writing; telling stories, making presentations to the class; playing games; trying to solve a problem by "reading" objects; discussing things; sorting pictures.

The activities were designed together with materials and always with the objectives of the unit in mind. Activities were selected if they were "real" to the children and relevent to what they were supposed to learn. The developers suggest in the teacher's guide how to "combine activities so that the whole box experience comes alive." They say that each activity should lead to the next, building toward some kind of climax and resolution for the whole unit.

The developers also state, quite emphatically, that the single most important characteristic of learning activities is that they place the responsibility for learning in the child's own hands so that he becomes the agent of his own learning. In this way, provisions for motivating and providing feedback to the students are built into the unit. Many of the activities are done in small groups of from four to six children. In all cases the lessons are organized in such a way that all the students in a class are involved in an activity.

All units are designed to be used for one or one and one-half hours a day over a period of from two to three weeks.

Teacher Activities

MATCH units were designed to require a minimum of teacher preparation. To help accomplish this, a comprehensive teacher's guide, discussed earlier,

was prepared for each unit. Initially, it was assumed that a careful reading of the guides prior to introduction of the units to the class was all that was necessary in the way of teacher preparation. The developers of the MATCH units have learned, subsequently, that teachers are more comfortable using the boxes after an orientation session or a more structured workshop.

In each unit, the teacher tends to become involved in activities--"a co-learner, rather than the person apart who explains the activities."

The developers describe the student-teacher involvement in the following way:

> A MATCH Box - in its fullest sense - is not the sum of its media, objectives, and activities. It is not a thing. It is more truly the experience, the happening, that occurs when the children and teacher encounter the Box (Kresse, 1968, p. 52).

Provisions for Parent/Community Involvement

While no provisions for parent/community involvement were indicated by the developers, the MATCH units could lend themselves to parent and community involvement.

Special Physical Facilities or Equipment

No special facilities or equipment are required for utilizing the product.

Recommended Assessment Techniques for Users

No assessment techniques, other than teacher observation or student self-assessment, are recommended to the user.

ORIGINS

Key Personnel

Fred Kresse, who was director of the MATCH project, and Michael Spock, director of the museum, were the two key personnel. Michael Spock had experience in museum work and, before coming to the Children's Museum, had done research at Harvard on how exhibits communicated to viewers. He wanted to develop new types of exhibits which would allow children to discover through the manipulation of materials. Fred Kresse was intrigued by this approach and by the idea of non-verbal learning--learning mediated by things

instead of words. He had a master's degree in psychology and had worked as a civilian for the U. S. Air Force in designing training devices. While working for the Air Force, Kresse had applied certain methodologies based on the work of Gagné and others to learning problems and had experience in developing task analysis and designing training requirements for specific tasks. He drew on this approach in designing a conceptual framework for designing the MATCH boxes. He also had experience in the Air Force in monitoring contracts and reviewing proposals, which helped him in preparing the proposal for the MATCH project. Kresse did not have any formal training in education, but was a practically-oriented psychologist who was interested in the learning process.

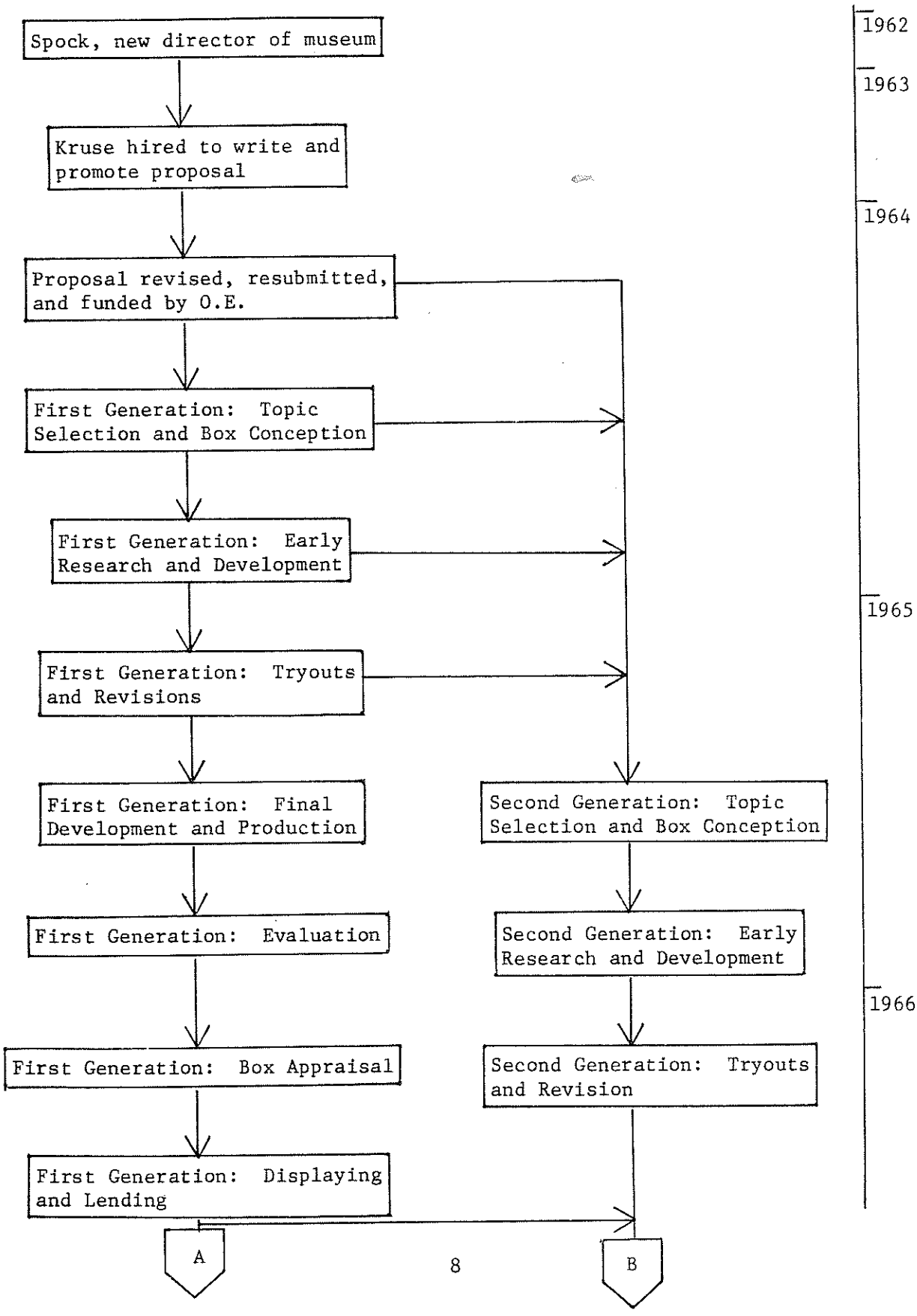
The remainder of the staff consisted primarily of talented young people with B.A. or master's degrees. They were enthusiastic about the project and were willing to work for the low wages paid by the museum. They had backgrounds in a variety of subject areas and about 25 percent had some teaching experience. Throughout the project the staff relied heavily on teachers and other consultants to help them in the areas where they were deficient. Ten staff members worked during the first phase of the project, 14 during the second phase, and six to seven during the third phase. A total of 24 people were involved in the development, ten of whom worked on more than one box. The staff members were expected to remain with the project until the box they were developing was complete.

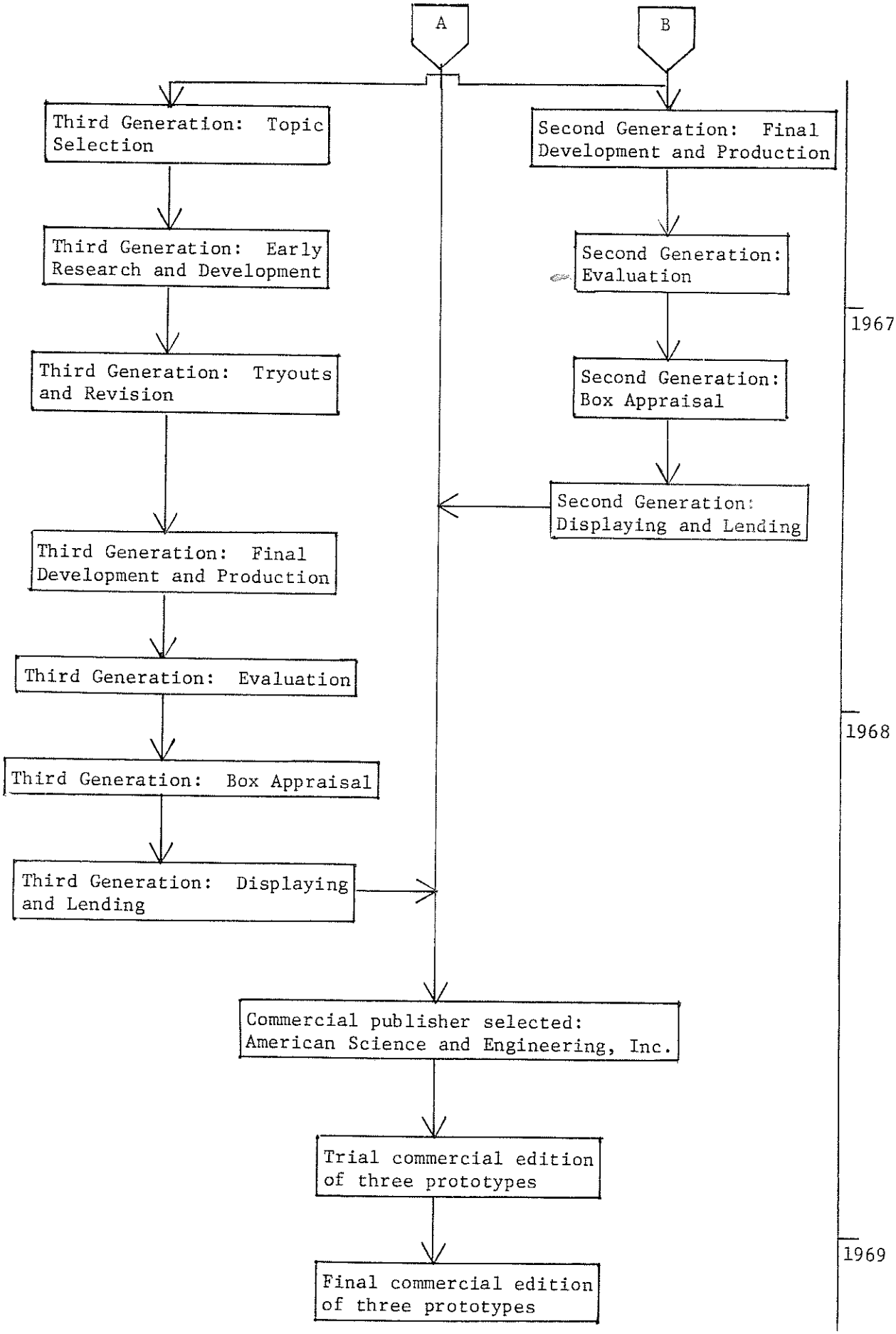
Sources and Evolution of Ideas for Product

The Children's Museum has circulated boxes of materials to schools in the Boston area since the 1930's. Generally, the boxes were assembled from surplus items from the museum's collection and often contained a set of cards with a small artifact or picture fastened onto each card and some larger objects which the teacher could pass around the class or put on exhibit. These boxes were popular with the schools and by the early 1960's about 5,000 were circulated in the Boston area each year.

In 1962 Michael Spock became Director of the Children's Museum and set a new, dynamic direction for the institution. (See Figure 1, beginning on the next page, for a history of the major events of the product.) At this

Figure 1. Major Event Flow Chart




A
B
Third Generation: Topic Selection
Third Generation: Early Research and Development
Third Generation: Tryouts and Revision
Third Generation: Final Development and Production
Third Generation: Evaluation
Third Generation: Box Appraisal
Third Generation: Displaying and Lending
Second Generation: Final Development and Production
Second Generation: Evaluation
Second Generation: Box Appraisal
Second Generation: Displaying and Lending
Commercial publisher selected: American Science and Engineering, Inc.
Trial commercial edition of three prototypes
Final commercial edition of three prototypes
1967
1968
1969

time, the museum was housed in an old mansion and used the carriage house for an auditorium. Although the museum had introduced some progressive practices in the past, it had remained static for many years. Its small staff of 17 employees was about the same size as when the museum was founded in 1914; and the museum was dependent on local foundations, endowments, and fund raising events for its $85,000 per year budget. While some other museums in the area had diversified into educational programs, the Children's Museum maintained primarily traditional display-type exhibits.

When Michael Spock became director, the museum staff began to examine the questions: What is the purpose of the museum? Is the museum meeting the needs of children? What can the museum do to better meet these needs? They undertook to adapt the museum more to the needs of children, and over the next several years the museum underwent some radical changes. The old carriage house was remodeled and was reopened in 1969 as an exciting new type of museum where children are free to explore, to handle objects, and to learn from their environment. A child can put on Indian clothing and sit cross-legged in the frame of a life-size wigwam; he can rock on a rocking horse like the one his grandparents rocked on in "Grandmother's attic"; or he can discover the principle of animated cartoons by drawing his own frames and watching them move through the slits in a revolving cardboard cylinder. The museum provides an informal, unstructured environment designed to interest children and involve them in active learning. As the children explore, adults are on hand to offer help or make suggestions.

The changes in the museum began gradually, and the staff started by improving already existing projects such as the exhibits and circulating boxes. Michael Spock, recognizing the potential of the boxes, wanted to develop them further and proposed collecting and assembling materials into a package designed to meet specific needs rather than making boxes with what was on hand. Furthermore, he wanted to design the units with the purpose of allowing children to learn from objects through non-verbal means. In 1963 he hired Fred Kresse, a psychologist, to work on writing a proposal for a project to develop such boxes and on funding the project. This was risky, since it was not clear that money would be available for such a project and it was a major investment in terms of the museum's limited resources.

Fred Kresse first wrote a proposal for a one-year pilot study with a budget of $23,000. His major task over the next year was to contact government agencies and private foundations to interest them in the project. A Boston group, the Committee for the Permanent Charity Fund, contributed $10,000 toward the project, which provided the funds needed to support Kresse's efforts until additional funds were obtained. Title VII of the National Defense Education Act authorized funds for media research and dissemination, and the MATCH boxes seemed appropriate for this purpose. The Office of Education, which administered these funds, became interested in the project and suggested that Kresse revise the proposal into a larger project. A revised proposal for $188,000 over two years was resubmitted and was funded by the Office of Education under Title VII of the National Defense Education Act.

This revised proposal for the MATCH project was developed jointly by Kresse and Spock. Together, they defined the MATCH box project. There was little literature which was directly related, so the two relied heavily on their own experience and hunches. Kresse would draft a copy of the proposal, discuss it with Spock, and then rewrite it to reflect their evolving concept of what the MATCH boxes should be and do. The goal of the project was to examine the role media can play in learning and to establish a means of combining various types of media into a system.

Funding for Product

The original proposal was for $188,000. A series of budget and time extensions were received and the cost of the project (using a 15 percent overhead rate) totaled $392,513. The overhead rate settled on was 40 percent rather than the 15 percent rate used in the project, and the eventual cost of the project was $477,806.

The total funds for the MATCH box project from 1 July 1964 through 31 May 1968 can be broken down as follows:

1.	Salaries, wages, benefits	$215,910
2.	Travel, supplies, etc.	125,380
3.	Overhead	136,516
	Total	$477,806

No breakdown of funds by development, evaluation, and diffusion was made.

PRODUCT DEVELOPMENT

Management and Organization

The museum provided office space, resources, and services for the MATCH project. In turn, the project, which was almost as large as the museum itself, enabled the museum to expand its staff and resources. The project had a major impact on the museum's operations, and there were difficulties in establishing a satisfactory balance between the museum and the project. The museum staff did not want the museum to be overshadowed by the MATCH project and several steps were taken to minimize this problem. All the staff recruited to work on the project were considered to be part of the museum staff and worked at least one-fifth time for the museum. This arrangement integrated the project with the museum's other operations, but at times there were conflicts between the staff's responsibilities on the project and their museum duties. Another means used to minimize the disruption of the project was to gradually increase and decrease the size of the staff. The project staff numbered about 10 the first year, 14 midway through the project, and was down to only six or seven during the last year. By the end of the project, the museum was involved in other activities and some of the MATCH staff were able to stay with the museum in various other capacities. Even though an attempt was made to reduce the staff gradually, the museum still had some difficulties in adjusting the overhead operations downward when the project ended.

The museum's administrative office efficiently handled the accounts for the project. When the proposal was submitted, the museum was not able to predict the overhead costs for such a project and it was agreed that a 15 percent overhead rate would be charged during the project and an audit would be conducted at the end of the project to determine the actual rate. Eventually, an overhead rate of 40 percent was settled on.

Original Development Plan

The project proposal was short--only about 13 pages in length. The name MATCH boxes was derived from the title, Material Aids for Teaching Children. The proposal contained a statement of the problem, an outline of the tasks for developing and evaluating the kits, a time schedule, and a matrix to serve as a framework for organizing the kits.

The proposal included this statement of the problem and the purposes of the project:

> Much of learning is non-verbal. Instead of being mediated by words it is mediated by things. Because they lack time and money, most teachers--even the ones in over-privileged schools--do not possess the vocabulary of things they need to communicate effectively with their pupils. And so certain crucial experiences never occur in the classroom, others occur only partially, while still others are so abstracted that distortion sets in. The result is that some things are not learned at all, others only superficially, and some are probably mis-learned. This lack of appropriate media with which to convey knowledge and to develop skills and attitudes is particularly acute at the elementary level where the proportion of non-verbal learning is high. A non-verbal fact, such as the warmth felt in an Eskimo parka, may be conveyed by a single object or medium--in this case the parka. But patterns of media and activities are usually required to communicate non-verbal principles, concepts and relationships. For example: to convey a real sense of Navajo life may require a film, various artifacts, recordings, and activities for children to engage in. Though many media are recognized as valuable in furthering the dialogue between teacher and learner, very little is known about how to combine them for this purpose.
>
> The problem, then, is to find out how to combine media in a way that will permit teachers and students to communicate with each other on topics having a high proportion of non-verbal content. This project is directed at solving this problem. It proposes to do so through the systematic development and evaluation of a series of multi-media kits of teaching/learning materials designed for the elementary grades.
>
> (Children's Museum, 1964, p. 1)

The project was intended as a two-year project, beginning in July 1964. The first year, Phase I, would be a period of exploration as the staff developed and evaluated four prototype kits. During the second year, Phase II, 12 new kits would be developed based on the experience gained in Phase I. A status matrix (see Appendix C) was to be filled out for each kit to provide a record of the development. The matrix included these variables:

- Information to be communicated.
- Media that communicate the information.
- Activities that communicate the information.
- Supplies that support the activities.

- Equipment necessary to present the media and carry out the activities.
- Instructions to the teacher.
- References for the teacher and children.
- Package in which the materials are loaned.

Certain criteria were outlined for evaluating entries in the matrix.

Modifications of Original Development Plan

When the project began, the staff planned to gather together and assemble commercially available materials to use in the boxes. It soon became obvious that available materials were not appropriate and that special materials needed to be designed for specific purposes in order to construct an integrated unit. For example, in a first generation box on birds the students classified birds according to specific characteristics. The staff planned to use a commercial set of cards with pictures of birds, but often the cards did not show the desired aspect of the bird or did not include the picture of a bird they wanted, and they had to develop their own set of bird cards. The staff found that they had to design almost everything from scratch and that developing a box was more complicated than anticipated. As they planned further, they also found that the three copies they planned to make of each box was not sufficient for demonstration and evaluation purposes.

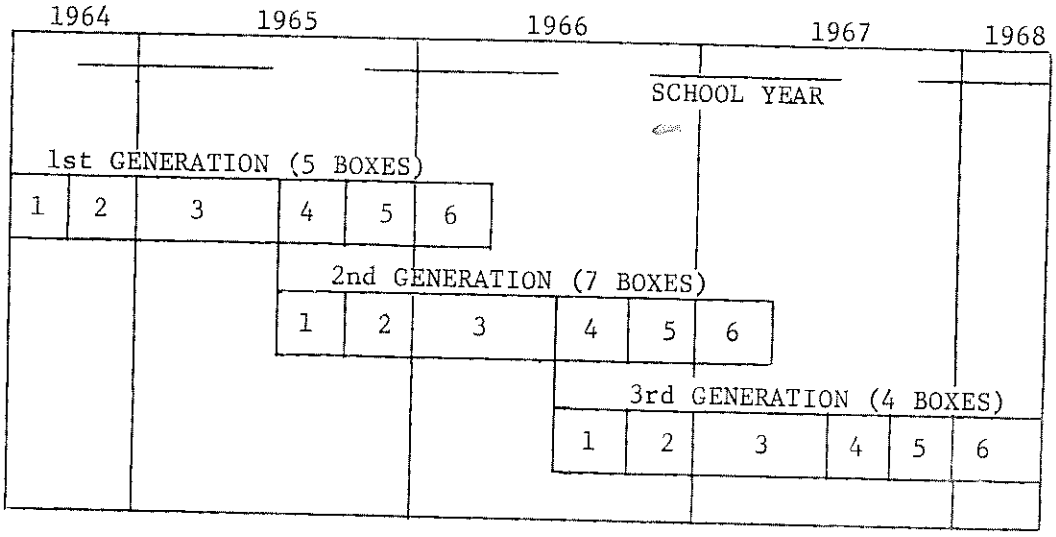
Six months into the project they contacted the Office of Education to notify them of these difficulties. The original plan to develop 16 boxes in two stages with three copies of each box was modified to developing 16 boxes in three stages with nine copies of each box. The boxes were to be done in stages or generations. The project was extended and the 16 boxes took four rather than two years to develop and evaluate.

Actual Procedures for Development of Product

Development

Generations of development. The 16 boxes were developed in three stages or generations. Five boxes were developed during the first stage, seven during the second stage, and four during the final stage. Each generation of boxes underwent a development and evaluation cycle and the evaluation of boxes overlapped with the development of the next generation of boxes. The

Project Final Report gives this chart (the numbers 1-6 refer to developmental stages) illustrating the overall project plan and the life cycle for each generation:



(Kresse, 1968, p. 13)

The life cycle for each generation was approximately 21 months long and divided into six stages:

1. Topic selection and box conception (3 months)
2. Early research and development (3 months)
3. Tryouts and revision of materials and activities (6 months)
4. Final development and production of the prototype kits (3 months)
5. Evaluation in schools (3 months)
6. Data analysis and box appraisal (3 months)

The cycles were planned so that early development, tryouts, and evaluation fell during the school year, while final development and production took place during the summer months.

The boxes developed were:

Title	Intended Grade Level
First Generation Boxes	
Grouping Birds	K-2
The City	1-3
The Algonquins	3,4
Seeds	3,4
A House of Ancient Greece	5,6

Second Generation Boxes

Houses	1-3
Animal Camouflage	2,3
Netsilik Eskimos	3,4
Musical Shapes and Sounds	3,4
Rocks	5,6
Japanese Family 1966	5,6
Medieval People	5,6

Third Generation Boxes

Waterplay	Nursery-2
Imagination Unlimited	3,4
"Paddle-to-the-Sea"	4-6
The MATCH Box Press	5,6

Team approach. The project staff worked in teams to develop the boxes. A team of two staff members were designated as co-leaders and consulted with teachers, subject matter specialists, artists, and technicians to produce one box. The co-leaders were allowed a set amount of money which they could spend for materials and consultants.

The procedures used in developing the boxes varied over the three generations. The Final Report points out these differences between the three generations:

> The First Generation was used to explore a wide variety of topics and media problems, to establish development and testing methods, and generally to find out what it is like to make MATCH Boxes. The Second Generation was used to consolidate ideas, refine techniques and pursue interesting aspects of what we had learned from the first Boxes. In the Third Generation we had planned to manipulate specific media-combining variables, but these Boxes were used mainly to further probe and extend the range of MATCH Box possibilities (Kresse, 1968, p. 14).

The team approach was an effective organizational structure for developing the MATCH boxes. The two co-leaders were matched according to personal preference, experience in constructing MATCH boxes, time available to work on the project, and educational background. For example, an experienced and an inexperienced staff member might be paired, or an English major who could do an excellent job of writing the teacher's guides might be matched with someone with background in a content area such as anthropology. Most co-leaders worked effectively together, although there were exceptions. Generally, the interaction of the two co-leaders was an important part of the development process

as they shared ideas and supported and sustained each other. In retrospect, the staff concluded that they should have given one leader the final responsibility and decision making power since teams sometimes faced an impasse if the two co-leaders disagreed. It was also felt that the entire staff would have benefited from some group process and problem solving training. The teams primarily worked independently of each other; although the entire project staff did generally meet once a week. Kresse frequently reviewed each team's progress, but they had wide latitude in deciding how to develop their box. And, the units did become "their" boxes. The co-leaders became very involved in their work and proud of the kit they had developed.

The co-leaders were responsible for all aspects of the box, including:

- the original conception of the box
- forming a development team and managing its operations
- technical and educational integrity of the box
- planning and organizing work on the box
- budgeting material and consultant costs
- finding suppliers of materials, specifying and ordering materials
- arranging and conducting tryouts
- writing the teacher's guide
- supervising production of the box
- preparing special questionnaires
- observing and evaluating boxes
- analyzing and interpreting data
- writing a final report on each box

(Kresse, 1968, pp. 14-15)

Each team had a budget of $1,200 for consultants and $5,000 for materials and supplies ($1,000 to develop the first box and $500 for each copy). The teams had their own account to bill to and were responsible for remaining within their budget.

Topic selection. A period of two or three months at the beginning of each generation was spent in topic selection. The specific procedures varied over the three generations, but they all involved staff review and discussion of ideas. They sought topics:

- that had relevance to the elementary curriculum
- that implied a variety of media

- that suggested the use of real objects
- that suggested worthwhile and interesting activities for the children
- that would be feasible to use in an ordinary elementary classroom
- that would work for even the less-than-average teacher
- that would be portable and loanable and not pose insurmountable maintenance problems
- that required 2-3 weeks of class time
- that could probably be developed with the time and resources that were available
- that were of interest to the staff and to which a pair of co-leaders would commit themselves

(Kresse, 1968, p. 17)

During the first year no systematic procedures had been established for selecting topics, and decisions were largely made through informal group discussions. They sought topics which would be diverse in topic, grade level, approach, and type of media in order to learn about various types of kits. Preference was given to topics which might be expanded on in later kits. They did not restrict themselves to social studies topics and two of the first generation units, Grouping Birds and Seeds, are science related. Some topics were selected to test what could be done. For example, it was decided to develop a unit on seeds which had to be restocked after each use to test the feasibility of replacing components. Another unit, Greek Man (which later became "A House of Ancient Greece"), was selected because of the interest of one of the staff members in the classics.

Selecting topics for the second generation boxes was done more systematically:

> . . . selection of the Second Generation topics was done more systematically using a Criteria List that reflected our emerging conception of MATCH Boxes as such, and the Project as a whole. Seven topics were chosen from an initial list of 150 ideas. After the field had been narrowed by the staff as a whole, staff members interested in particular topics would present and defend these to the staff. The proposed Box would be discussed, critiqued, and finally rated on the pre-established criteria. Boxes that met most of the criteria were cleared for development. Topics with apparent weaknesses were either dropped or presented again with modification. . .
>
> And a new criterion--elegance--became important. An elegant Box was one in which the proposed objectives,

> media, and activities held together in a believable conception. It would be simple, direct, and uncontrived.
>
> Preference was given to social studies topics. Our staff was more qualified and interested in working in this field, and it was clear that materials and innovative approaches were more urgently needed in social studies than in science.
>
> (Kresse, 1968, pp. 18-19)

Presenting a defense of a topic was a difficult task, but it forced the co-leaders to clarify their plans and informed the staff on what the other teams were doing. Sometimes, however, the teams seemed to become overcommitted to a topic after defending it and would not change it even if it was not working out.

Selecting topics for the third generation was an informal process. All but two of the staff members had helped develop earlier boxes and they relied on their experience and familiarity with the criteria in selecting topics. The staff wanted to do boxes unlike earlier ones and did not limit themselves to subject matter topics. They felt comfortable about selecting a topic without specifying all the details of the box and used their intuition to select topics which would allow a box to emerge in the development process. For example, the topic "Poetry Box" became "Imagination Unlimited" and the topic "Basic Sensory Experiences and Skill Development" became the box "Waterplay."

In all three generations, the topics remained tentative and the co-leaders could change topics if they did so in a purposeful way. For example, one topic selected for a third generation unit, "Hats," was dropped. The co-leaders had not been able to design a kit around hats which fit together and met the criteria of elegance, and so, when they became aware of the problem of head lice in the schools, they dropped the idea entirely. In another case, a team changed the organizing theme of a box from Japanese festivals to the Japanese family.

The approach used in each of the three generations seemed appropriate for the situation. During the first generation the process was exploratory; during the second generation the staff found that applying a set of criteria in a structured manner provided a basis for decision making; and during the third phase the staff felt comfortable with an unstructured task and relied more on their feelings and did not restrict themselves to subject matter topics. Over the course of the project there was a shift from a cognitive

approach to an emphasis on affective considerations, as the staff realized the potential effectiveness of the kits in the affective areas and felt more confident of the importance of affective objectives.

Early research and development. After selecting a topic the co-leaders spent the next few months planning the kit. The teams began to consult teachers, subject matter experts, photographers, artists, and other specialists in this task. Each team was responsible for locating their own consultants, although the staff often shared consultants and helped each other contact appropriate people. The number of consultants varied between groups, but most groups had about three regular consultants, at least one of which was a teacher. The ideal was for the co-leaders to form a close working relationship with their consultants and meet with them regularly. However, the funds available for consultants was limited and most teams operated on an occasional consultation basis. The teachers were paid $5 an hour for their help and university faculty were paid standard consultant fees.

The status matrix was intended as a tool in the development process, but was not used as much as planned. The matrix consisted of a chart with columns headed: objectives, media, activities, supplies, equipment, instructions, references, and package. Appendix C shows a sample of a status matrix filled out for part of one unit.

The Final Report gives this explanation of the role of the matrix:

> "Working" the matrix involved working out interrelationships between entries in the various columns. Initial entries in the matrix showed the Box as first conceived. During development, entries were rearranged, discarded, and new ones introduced. Whole columns might change. Whole rows might be removed or replaced. As more and more of the interrelationships between media and activities and objectives were worked out, the pattern of the prototype kit emerged.
>
> The matrix was intended to serve a number of functions:
>
> 1. to help teams keep track of what they had done
> 2. to reveal choice points, alternatives to be considered, information gaps and problem areas
> 3. to provide members of the development team with a common referant and focal point for their efforts
> 4. to make the assumptions, choices and intentions of the kit developers explicit.
>
> (Kresse, 1968, p. 15)

Early in the first generation a matrix was prepared for each kit and hung on a big board in the co-leaders' office to show the status of each unit. The teams found it a chore to keep them up to date and the charts were soon abandoned, but they did provide a basis for analyzing the units and a vocabulary for discussing the variables. Developing a kit was a creative process and the teams approached the task in different ways. Some teams would start by formulating an overall framework and objectives for their box; other teams would start with an interesting object or an idea for an activity and build from there.

Teams would select media and activities for their box which would reinforce each other. Perhaps they would start with an object like a Grecian urn and then pick other media which related to the urn in some way, such as a poem mentioning an urn or something shown in the picture painted on the urn. The aim was to pick materials that fit together and the team would explore various approaches as they tried to get a "handle" for the unit which would make it an integrated whole. For example, the unit on Greece began as a study of classical man. Then someone hit on the idea of using an archeological approach to the unit and this provided the slant which made the whole unit fall in place.

Kresse frequently met with the co-leaders to discuss their progress. A major task was to focus the team on their objectives. At this time the notion of behavioral objectives was just gaining popularity and the developers did not attempt to define objectives in behavioral terms. The objectives were basically a statement of the purpose of each lesson and included goals in the areas of subject matter, skills and processes, and self-awareness. An example of a subject matter goal is:

- To learn how archeologists find out about ancient life.

A skills processes goal is:

- To bring pieces of evidence together to make larger inferences.

A self-awareness goal is:

- To give the children experience in working in small groups.

All the boxes include these three types of objectives to some extent.

During the early research and development stage the team began to gather and design media for the kit. They wanted to include interesting objects which were as authentic as possible and which would be effective teaching devices. The teams faced several constraints. The materials had to be obtainable and within their budget. The materials also had to be durable to minimize the danger of damage. And the kits had to be portable. Some excellent ideas were not practical. For example, it would be exciting to set up a life-size Indian tent in the classroom, but it just wasn't feasible in terms of size and weight.

The staff was resourceful in obtaining authentic objects. A consultant for the Japanese box had recently arrived from Japan and she ordered typical Japanese household objects through her mother. One team visited Indian craft shops to trace down Algonquin Indians who still knew how to make some of the artifacts they wanted to include in the kit. They were able to obtain Indian clothing, arrowheads, a string of wampum, a squirrel medicine bag, and an Indian pin and cup game. The team developing a box on the Netsilik Eskimos contacted a French missionary in Canada. The missionary explained to the Eskimos the objects the MATCH staff wanted and the Eskimos made them. This box included authentic seal hunting tools, boots, and other Eskimo artifacts and some films of these same Indians using these objects. Other boxes included equally interesting objects.

The developers quickly found that materials only were not enough, but that they also needed to develop activities for using the materials for them to be most effective. As noted earlier in the Product Description section, the activities developed were nearly as diverse as the objects and media.

Tryouts

When the materials and activities for a box took form, the co-leaders tried them out in the classroom. These tryouts, discussed more extensively under the following section on formative evaluation, provided valuable feedback for the developers and were an integral part of the development process.

Final development. Once the tryouts of a box were completed, the stage was set for final development and production which took place during summers. The summer was a period of intense activity as the boxes were completed. The Final Report gives this description of the activities in this stage:

> During this stage then, design of the Boxes was completed, Teacher's Guides were written, edited, and printed; materials or components were specified and ordered; packaging designs were evolved for each Box and the packages made; graphics were designed; and finally the Boxes were assembled. The Boxes and many of the things in them were designed and built at the Museum (Kresse, 1968, p. 21).

The boxes needed to be finished by the time school started for the evaluation, and some of the most creative work was done during this push to meet the deadline.

The teams did write some instructions for the teacher during the tryouts, but these were generally sketchy and most of the writing of the teacher's guides was done in the summer. The staff made the decision early in the project that the units should be self-contained and include a detailed teacher's guide which would allow the teacher to use the box without special training. The guides were to serve as a vehicle for communicating to the teacher how the kits should be used. The staff attempted to be clear and direct in the guides and aimed the instructions at 90 percent of the teachers not just the exceptional teacher.

During the summer the boxes were packaged. They had to be portable, and some objects were eliminated at this stage because they were too heavy or too large. Most units were packaged in two cases to make them easier to carry, but even so, each case weighed from 40 to 100 pounds each. The boxes were packaged so they would appear orderly and so it would be self-evident how to use the materials. They generally included everything which was needed for the unit except for large equipment, such as a projector, and one box even included a tape recorder. Each unit was packaged to reflect the individuality of the unit and packages included cardboard containers, baskets, suitcases, plastic trays, and wooden boxes. Packages were selected for durability and lightness. Plastic containers were found to be most satisfactory.

Formative Evaluation

As their box began to take form, the co-leaders arranged to try it out in classrooms. The purpose of the tryouts was to "test activity ideas, materials, the structure and organization of lessons, lesson sequences, classroom practicality, the attitudes and reactions of teachers and children (Kresse, 1968, p. 20)." A project staff member made initial contacts with

school systems in the Boston area to locate people willing to participate in tryouts and then the teams made specific arrangements. Tryouts were spread over the period between January and June. Teams were encouraged to begin tryouts early in this period, although the tendency was to delay tryouts until the box was well along. The teams started out by using one or two activities and objects and gradually added pieces until they tried out the entire box. A different teacher with a fresh class was generally used for each tryout. A total of about 115 teachers and their classes participated in the tryouts. Most of the activities were tried out in classes three or four times, but some were used only once and others not at all. Sometimes a co-leader conducted the class, but generally the teacher directed the class while the co-leaders observed and gathered information which they used as a basis for later revision. Sometimes they would get an idea for a new activity by watching the children use the materials. Sometimes they would decide to change an activity because it did not work well in the classroom. The tryouts provided valuable feedback for the co-leaders and were an integral part of the development process. They were used more during the third generation than during the earlier ones. The staff felt that the early development stage could be merged with the tryout stage in order to begin tryouts earlier and that they could have benefited from more training on how to make the best use of tryouts. The teachers were happy to cooperate in testing the boxes. However, they needed to be reassured that it was the boxes and not them which were being evaluated.

When the project began the developers were not sure how the boxes would influence the classroom. Through the classroom tryouts, they became aware of the impact of the boxes. The children were excited. They came to class early, stayed late, and gave up recess to use the MATCH box. Many children who did not respond in class took an active part in the MATCH box activities. And there was a change in the behavior of teachers. Teachers with a directive teaching style found that they did not have to be the source of all the information and that with appropriate materials they could be comfortable in a situation where most of the student activity was self-directed. And as the children and teachers interacted with the materials, they interacted with each other. One teacher who had used a box in the fall said: "This has taught me about my kids. I now know my kids as well as I usually know them in April."

Through the course of the project there was a shift in the attitudes and viewpoint of the developers, largely because of the formative evaluation findings. They became increasingly concerned with the affective goals of the boxes. They also changed the name of the project. Originally, the name was Material Aids for Teaching Children. During the project they changed the name to Materials and Activities for Teachers and Children, keeping the same acronym, MATCH.

SUMMATIVE EVALUATION

Evaluation Staff

The original plan was to have the evaluation planned and conducted by a special group of staff members working independently of the development staff, but this was not done. Rather, the general staff planned the evaluation during the summer through a series of staff meetings. The staff decided what information they wanted, developed questionnaires for the teachers, planned other evaluation procedures and trained people to use them and made arrangements with the schools for tryouts.

Field Test of Prototypes

Purpose

After the MATCH boxes were complete, each box was tested in 15 to 22 classrooms. These field tests were conducted as a summative evaluation of the effects of the prototype kits in the classroom. Later, when the decision was made to commercially prepare three of the boxes, the results from the field test were used in deciding which boxes to produce and in revising those selected for production. The results of the field test can be applied to a large extent to the commercial kits since the overall theme and activities remained very similar to the prototype.

The field test addressed itself to this question: What are the effects of the MATCH boxes? The boxes did not specify any behavioral objectives and the evaluation was not designed to measure any specific behavior on the part of students. Rather, the field test sought to find out what types of behaviors emerged when the MATCH boxes were used in classrooms.

Subjects

A total of about 330 teachers and 10,000 children used the MATCH boxes during the three generations of summative evaluation. From 15 to 22 teachers used each box. The sample included schools in urban, industrial suburban, wealthy suburban, and semi-rural areas. About two-thirds of the sample was drawn from the Boston area, but 53 teachers from Salinas, California, tried out the second generation boxes and 48 teachers from Somerset County, Pennsylvania, were in the tryouts for the third generation boxes.

Arrangements for the evaluation were made through the school administration and teachers either volunteered or were selected by a supervisor or principal. The schools were very cooperative and the schools in California and Pennsylvania made their own arrangements for the evaluation, supplied observers, and replenished the boxes between uses.

Treatments

No control groups were used because it did not seem meaningful since the MATCH boxes were so different from any program it would be compared to. Thus, the only treatment was that given to the students who used the MATCH boxes.

Measures

Part of the purpose of the evaluation was to discover what were some of the outcomes of using the kits in the classroom, and the evaluation instruments included many open-ended questions. Standardized tests were not used because the goals of the product were not of the type measured by standardized tests. The staff decided to rely on the responses of teachers and observers for feedback, although they would have liked to have also obtained more direct feedback from students. The major efforts of the staff were devoted to the development of the boxes, and no extensive development work was done on the evaluation instruments. The specific data gathering techniques varied over the three generations, but the general approach was to obtain daily data from teachers, a final appraisal form from teachers, and reports from observers. Following is an explanation of the techniques used:

Five types of data were gathered:

from teachers--

1. written questionnaires or logs concerning individual lessons

2. written Final Appraisals of the box as a whole

3. verbal comments and reactions to the box

from observers--

4. written anecdotal records of their classroom observations

5. written summaries of their overall impressions

Teachers' daily responses and final appraisals (1 and 2 above) constitute our main data and our analyses are based on these. The other three kinds of data were gathered sporadically and have been used to give depth and balance to the teacher data and to spot specific design improvements that the teacher might not have recognized. Teachers were asked how well the box suited the curriculum and the children's capabilities, what their own reactions were, how the children responded, what difficulties they encountered. They were asked to compare teaching with the MATCH box to techniques that they were used to, to judge what the children got out of the experience, to suggest improvements, to comment on the evaluation itself. Observers were asked to study interplay of the materials, the teacher and the children, to attend to the entire situation. No data were gathered directly from the children, though there are many vivid reports of their behavior from the teachers and observers.

(Kress, 1968, p. 23)

Different questionnaires were used in each generation. During the first generation the teacher filled out a daily questionnaire. The staff found that this questionnaire placed too much emphasis on the teacher and classroom facilities and took a long time to fill out. For the second generation, they developed a daily checklist for the teacher to mark. The checklist was long and too cumbersome, but it did include some relevant questions. For the third generation the staff developed separate questionnaires for each box because the boxes were all so different. The questionnaires included more specific questions about lessons, materials, and the approach.

Procedures

Generally, the evaluation procedures were explained to the teachers through a letter, although some of the teachers received special briefing before using the boxes. Thus, most of the teachers did not undergo any special training before using the kits. The teachers used the box for two or three weeks, depending on the box, and typically used it for one hour of

class time each day. Teachers were asked to follow the teacher's guides, but were encouraged to make adaptations when they thought it would be appropriate and to report these changes on the questionnaire. The teacher filled out a questionnaire or a log after finishing each lesson and a Final Appraisal form on the entire box when she had finished the unit. Many teachers were involved in "debriefing" sessions about a month later in which they discussed the boxes and their effects.

Observers visited many of the classes where boxes were used. They were assigned to two or three classrooms and visited each class from one to four times during the evaluation period. They did not observe the entire box being used, but rather observed a sample of lessons in different classes. The observer watched the total happening in the classroom, the interaction of people and materials, and did not focus on specific behaviors or events. The information they gathered supplemented the results from the questionnaire.

Data Analysis and Box Reports

The project Final Report presents this summary of the data analysis:

> First generation data was analyzed by the individual co-leaders as part of the task of preparing final Box reports. Data for the second and third generation was first reduced before being turned over to the co-leaders for use in preparing their reports. Most of the analyses were done with respect to particular boxes; relatively few are devoted to cross-box comparison or generalization.
>
> Data analyses were simple and of two basic types. For questions with fixed alternative answers, a tabulation was made and percentages calculated. Answers to open-ended questions were analyzed, coded, and grouped into categories. In this process very little was done to "reduce" what the teachers were saying to a set of general statements. Instead, we carried the teachers' actual phrases through the analysis.
>
> . . . The final reports prepared by the co-leaders analyze individual lessons and overall response to the Box. They also list recommended changes, and record sources of materials. These reports were written with two purposes: (1) to record what the box was about and what was learned from it, and (2) to serve as a guide to anyone who might want to develop the Box further.
>
> (Kresse, 1968, p. 25)

Summaries of the box reports are included in Appendix A. The complete box reports are part of the project archives and are at the Children's Museum.

Results

Because of the purpose and design of the evaluation, few overall conclusions can be drawn on the effectiveness of the MATCH boxes. Although the study produced valuable information on each box, the overall evaluation cannot be briefly stated or summarized. Tabulations were made of responses to the fixed answer questions, but cross-box scores were only determined for the second generation boxes. Even for the second generation boxes reports of responses to the open-ended questions are lengthy. In Appendix B are examples of the types of questions asked and the responses received. In Appendix A, under the "Comment" section for each box, are the summary evaluations of each box based on the response to the questions asked.

The developers summarized the results of the field test as follows:

> Teachers and children were overwhelmingly enthusiastic about the units and this form of teaching. Teachers judged class interest, attention, participation and learning to be greater than usual. They delighted in having such rich material to work with. Children who were previously unresponsive participated, often for the first time. Many children surprised their teachers with what they could do. The units altered the relationship between teacher and children, making it more collaborative rather than teacher-directed. Teachers said they could see what the children were learning and therefore didn't need special tests.
>
> (Kresse, 1968, p. 7)

They also pointed out that much work still needs to be done in the summary evaluations of the boxes. Many things were found wrong with the boxes; for example, most were too heavy and some required more time than allotted. Many suggestions on ways of improving lessons and lesson sequences and modifying media were received.

There was an overlap of about nine months between the evaluation of one generation of boxes with the development of the next set. The staff felt this was a disadvantage because they were not able to incorporate what they learned from the evaluation to designing the next set. Also staff members tended to become so interested in the new box they were developing that it was difficult to prepare a final report on the previous box. In retrospect, the staff would have preferred a schedule in which they completed one set of boxes before beginning the next set.

An original purpose of the project was to establish a "grammar" for combining media. No definite set of rules emerged, but the staff did state some general principles which evolved:

> Media can only be combined with respect to some purpose, and some learner in a particular setting. The materials need to be set in a context of real activities.
>
> Media can be combined to offer contexts for each other so that learning has a place to go. Two or more items can give meaning to each other: for example, the real seal hunting tools add dimension to the film that shows them being used, etc.; a volcano film and chemical volcanoes that can be fired off in class provide feed back to each other; the various tools and techniques used in printing are already so well related that one barely notices how they provide mutual meanings.
>
> With respect to a class, media combinations need to have variety in order to reach many different children, and sustain various and interrelated forms of participation by both the teacher and the children.
>
> (Kresse, 1968, p. 51)

The staff felt that it was more powerful to start with specifics, with facts or objects, and let the student draw his own conclusions rather than teaching generalizations. As the project progressed, they became increasingly aware of the relationship between verbal and non-verbal communication. At first, they stressed non-verbal communication, but they realized that they could not ignore verbal communication and became sensitive to how words and objects and events interacted and the role words could play as symbolic statements of events and objects.

DIFFUSION

Agency Participation

Major diffusion activities have been conducted by the Children's Museum, the developer, and the Educational Division of American Science and Engineering, the commercial publisher of three of the boxes. Diffusion activities conducted by the developer have involved all of the MATCH boxes, while those conducted by the commercial publisher have focused on the three units that are commercially available.

Diffusion Strategy

Diffusion activities were not planned by the developers. No strategy was ever specifically specified, although the possibility of commercial production and distribution of the kits was considered early in the project.

Actual Diffusion Efforts

Diffusion activities conducted by the developer and/or the commercial publisher include the following:

1. Circulation of boxes to schools on a rental basis.
2. Display of boxes at the museum's resource center for teachers.
3. Demonstrations and workshops.
4. Development and circulation of Mini-MATCH boxes.
5. Distribution of teacher's guides and the project Final Report.
6. Responding to requests by sending information and brochures.
7. Obtaining a commercial publisher.

When the prototype MATCH boxes were complete, eight sets of each were turned over to the Children's Museum for circulation to schools on a rental basis, one set was put on display at the museum's resource center for teachers, and one set was designated for use in demonstrations and workshops outside the museum.

Each year the boxes are circulated to roughly 700 classes through the museum's lending department. The average rental cost for a two week period is $30. Following its use, each box is returned to the museum for checking and replenishing. The boxes have proved to be quite durable and there has been little deterioration in the boxes.

There have been several presentations and exhibits on the MATCH boxes at educational and museum conventions and conferences. The museum has sponsored over 100 workshops for teachers which have mentioned or focused on the MATCH boxes. American Science and Engineering continues to sponsor workshops.

The tryouts and field tests exposed teachers to the MATCH boxes and as a result cooperative relationships were established with several of the

school systems. One school system sponsored a semester course for teachers on the development of their own multi-media kits based on the MATCH box model. Three colleges have sponsored MATCH box presentations for student teachers and one college developed a course on development of multi-media units.

The museum has also developed and circulated smaller, less complex versions of the MATCH boxes, such as Mini-MATCH boxes, which contain fewer objects and activities, and Discovery Boxes, with only one or two objects and instructions for their use with a small group of children. These boxes include some of the most successful MATCH box activities, including scraping skins from the Algonquin box and a soapstone carving from the Eskimo box.

About 6,000 copies of the Teacher's Guides and 500 copies of the project Final Report were distributed to teachers, school systems, libraries, social studies curriculum groups, and others. These documents are now available throughout the ERIC system at a low cost. Articles on the MATCH boxes have appeared in several educational journals, and the boxes are referred to in many documents on innovative educational products. The project sent information in response to hundreds of requests. Contrary to what might be expected, however, other museums have not expressed much interest in circulating the boxes or in developing their own boxes.

Many publishers expressed an interest in the boxes and early in the project the staff began to consider the possibility of continued development through commercial channels. When the MATCH box prototypes were complete, the staff held a conference and invited representatives from a number of publishers to inspect the materials. The publisher representatives were enthusiastic about the materials, but generally were not willing to commit themselves to the development of such complex materials. The Educational Division of American Science and Engineering (AS&E) had developed several science kits and felt they had the technical know-how to produce the MATCH boxes. They decided to produce three of the boxes on a trial basis in a limited quantity to determine if there was a market for such a product. If these trial boxes sold well, they would produce a commercial version of these three boxes and, if they were successful, perhaps produce additional boxes. Meanwhile, the museum agreed to discontinue circulating these three boxes to the schools. AS&E decided to produce the boxes on Greece, Japan,

and "The City." These were among the most successful boxes, but were not the easiest to manufacture. AS&E produced 50 copies of each box in a trial edition which closely resembled the prototypes. These boxes were quickly sold and AS&E began to develop a commercial version. The trial edition came out in the fall of 1968, and the commercial edition was released about a year later. During the next two years the sales of the kits did not meet the anticipated sales projection. Roughly a couple hundred copies of each box have been sold.

Product Characteristics and Other Factors Affecting Diffusion

A major problem in marketing the materials has been the cost of the kit which, as noted earlier, averages about $500.00. Some school systems have not wanted to spend this amount of money on such materials, other school systems could not afford to. The cost of the boxes seems reasonable when you consider that each kit can be used in more than 10 classes each year with 30 students in each class. Fred Kresse compared the cost of the MATCH units to alternative classroom activities and found that the MATCH units cost about 4.5¢ per pupil hour of involvement. A social studies textbook program costs about 1.4¢ per hour, but a bus trip costs almost 15 times as much as the MATCH units. Kresse states "The question is one of values (certainly school systems have enough money to buy the new materials if they choose) . . . Myself, I think the new materials are a bargain . . ." (Kresse, 1970, p. 1).

Another major problem was that, although the MATCH boxes had already been designed, AS&E had to make a large investment in terms of money and effort to redesign the boxes for commercial production. AS&E cooperated with the MATCH box project staff and strove to retain the quality and authenticity of the original units. But the original boxes were not developed with eventual commercial production as a constraint, and it was difficult to obtain many of the materials. Often AS&E had to find a new source for items, use a different technique for producing the item, or substitute a new item for an old one. For example, knuckle bones were part of the Greek boxes. For the prototype boxes one of the staff visited a slaughter house to get the bones and then boiled them in her kitchen. For commercial production AS&E used resin to make the bones.

Obtaining materials for the boxes was a major task, and many compromises had to be made in the process. The task was especially difficult because it had to be done twice--once for the trial edition and again for the commercial version. The process of redesigning the box forced the staff to further clarify their purpose and to justify including certain objects. Designing packages which would be light, yet durable, was another problem. A strong cardboard case with a wire frame was finally selected. The packages are divided into smaller units for convenience in finding and storing items. A great deal of effort went into producing the commercial version of the boxes.

ADOPTION

Extent of Product Use

The developers indicated that the MATCH boxes have been used in a number of schools all over the United States for about three years. It is not possible to accurately state how many schools have adopted the MATCH boxes. What can be stated is this: Roughly a couple hundred copies of each of the three boxes that are commercially available have been sold, and each year about 700 classes borrow copies of the other boxes from the museum.

Installation Procedures

No unusual physical arrangements or classroom organization is necessary. The developers learned that teacher training is important and American Science and Engineering conducts workshops.

FUTURE OF THE PRODUCT

The developers would like to see all 16, rather than just three, of the prototype boxes commercially available. Possible extensions of the work on the MATCH box project were suggested by the developers. They included: units for substitute teachers, grade starter kits, units designed for special education, special subject units, units focusing on self-awareness, teacher training at all levels, a media mobile to distribute units, combinations of units with other media, foreign relations units, religious education, and research.

Presently, boxes are not being developed or revised. It is unlikely that more prototype boxes will be made available commercially. Most of the new directions recommended by the developer are not becoming a reality because of the lack of financial resources.

CRITICAL DECISIONS

The following events are a good approximation of crucial decisions made in the seven-year developmental history of Materials and Activities for Teachers and Children (MATCH). For each decision point, the following types of information were described: the decision that had to be made, the alternatives available, the alternative chosen, the forces leading up to choosing a particular alternative, and the consequences resulting from choosing an alternative.

Although an attempt has been made to present the critical decisions or turning points in chronological order, it must be clearly pointed out that these decisions were not usually made at one point in time, nor did they necessarily lead to the next decision presented in the sequence. Many of the critical decisions lead to consequences that affected all subsequent decision making processes in some important way.

Decision 1: To Give the Museum New Direction

While the Children's Museum had introduced some progressive practices, by 1960 it was ready for a new direction. Some museums had diversified into educational programs, but the Children's Museum maintained primarily traditional-type exhibits. When Spock became director of the museum in 1962, he and his staff reexamined the purposes and policies of the museum. At that point they decided to adapt the museum to better meet the needs of children, to make the museum a place where children are free to explore, to handle objects, and to learn from their environment. This shift in direction coincided with Spock's interest in developing boxes of materials designed to allow children to learn from objects through non-verbal means. The stage was set for the MATCH box project.

Decision 2: To Develop and Promote a Small Scale Proposal

It was clear that money would be needed to develop new units or MATCH boxes. In 1963 Spock hired Kresse to write and promote a small scale proposal to develop these new units. This was risky as it was not clear that

money would be available and it was a major investment in terms of the museum's limited resources. The risk proved to be worth taking. The Office of Education, which administered the NDEA funds for media research, became interested in the small proposal and suggested that Kresse revise it into a larger project. The budget for the small scale proposal was about $23,000; it was about $188,000 for the revised and funded proposal. Funding for the total MATCH project approached a half-million dollars. The decision to develop and promote a small scale proposal was the first critical step to obtaining this type of large scale funding.

Decision 3: To Develop Boxes in Generations

In the proposal, the developers indicated their intentions to develop the MATCH boxes in generations. The decision was made for two reasons. First, since funding was always uncertain, the developers felt that they should take on only the number of units that they could complete with a given amount of guaranteed funds. Secondly, they wanted to use the findings obtained during the life cycle of one generation to improve development of units in subsequent generations. The first concern proved to be no problem for the developers, as they obtained sufficient funds to develop 16 prototype units. Planning to benefit from the findings obtained through completing early generations of boxes proved very worthwhile. The staff was able to move from an exploratory process in the first generation to a very structured process in the second generation and to an unstructured but purposeful process in the third generation.

Decision 4: To Specify Statements of Purpose for Each Box

At the time the MATCH boxes were first being developed, the notion of behavioral objectives was gaining popularity, but the developers did not attempt to define objectives in behavioral terms. They did, however, decide to write statements of purpose for each lesson and to include goals in the areas of subject matter, skills and processes, and self-awareness. This decision to include such objectives, that at least suggested general intent, proved to be very critical in the selection of materials, the development of activities, and the evaluation of the boxes.

Decision 5: To Design and Collect New Materials

Originally, the MATCH project staff had planned to gather together and assemble commercially available materials to use in the boxes. They quickly

learned that available materials were not always appropriate and that special materials needed to be designed for specific purposes in order to construct an integrated unit. Their alternatives were to modify their statements of intent, make units that were not fully integrated, or design and collect materials that were not commercially available so that they could proceed as planned. They chose the last alternative and soon found that they were designing many things from scratch and that developing a box was much more complicated than anticipated. However, the staff proved very resourceful and they were able to include interesting objects which were as authentic as possible and which were in accordance with the statements of intent for each box.

Decision 6: To Develop Activities for Using the Materials

The developers learned quickly that materials alone would not make a unit that would be effective in the classroom. They could have assembled boxes of materials and hoped that, with the statements of intent, teachers could develop appropriate activities. Instead they developed comprehensive teacher guides that specified, among other things, lesson plans detailing objectives, materials, and activities. This was a critical decision, as the developers learned that even with the guide teachers have some difficulty and often require training.

Decision 7: To Proceed Through Development Without a Detailed Plan for Diffusion

Diffusion activities were never considered a part of the MATCH box project. Most diffusion activities occurred after most of the prototype boxes were already developed. Consequently, insufficient consideration was given to making the MATCH boxes commercially attractive. The costs to the commercial publisher to produce the boxes, due to the myriad of unique materials, has increased the cost to the user. Users have responded by indicating a preference for borrowing rather than buying the boxes. In turn, the commercial publisher will probably not choose to make commercial versions of the remaining 13 prototype units. In short, a very interesting, and perhaps very effective, program or collection of units may never impact the schools with its full potential because a detailed plan for diffusion was not specified early enough to affect the nature of the final program.

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The Children's Museum. About the MATCH program. Mimeographed paper. August 1970.

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Kresse, F. H. Materials and activities for teachers and children: A project to develop and evaluate multi-media kits for elementary schools. Final report, Volume I. USOE Contract #OE-4-16-019. Boston: The Children's Museum, May 1968.

Kresse, F. H. A reply to "The supplement asks: Are new program materials too expensive." Mimeographed paper. November 13, 1970.

APPENDIX A

DESCRIPTIONS OF 16 MATCH BOXES

Following are the descriptions of each box which appear in the project Final Report, Volume I, pages 28-39. The symbol nest to the name shows the rating given by the developer. The symbol (*) represents least elegant, (**) moderately elegant, and (***) most elegant.

* Grouping Birds (K-2)

Objective: To teach young children the rudiments and purposes of classification by using birds as the things to be grouped and sorted.

Media: Nine mounted birds in plexiglass containers; film loops of the feeding and nesting habits of these birds; projector and screen; pictorial data cards; bird stickers; flash cards; reference and story books.

Characteristic Activities: Grouping and sorting games based initially on the physical characteristics of the birds and later focusing on their behavioral patterns; collecting behavioral information from film loops; and using it to assemble a data chart for each bird.

Comment: The relationships among the media (birds, data cards, loops, stickers) are especially well worked out in this Box. The idea of teaching classification by means of such multi-dimensional media as birds is an innovation. However, the teacher and children tend to learn more about birds than classification. That is, the media and activities did not lead directly to the stated objective. One is reminded of MacLuhan's phrase that the "medium is the message."

** The City (1-3)

Objective: To introduce young children to the concept of "cityness" and to give them an appreciation for the relationship that exists between the cities men build and the lives they live in them.

Media: Many wooden model buildings used with a magnetic chalkboard; films on Chicago and Stockholm; record of city sounds; several books, 36 mounted photos of various aspects of city life; large aerial photo of Boston, etc.

Characteristic Activities: Creating a city with model buildings; using photos to make up a story about the city; making maps; role-playing in an accident situation; matching city sounds and images; analyzing aerial photograph; and solving city planning problems, etc.

Comment: This Box deals with a popular topic and offers an alternative to the community helpers approach. There are 17 relatively independent lessons for the teacher to draw from--some very ordinary, some quite engrossing. The magnetic model is versatile and useful, and the picture pool demonstrates how a picture set can be designed so that games of various sorts can be played with it. Lessons, however, require a good deal of verbal structuring by the teacher. It is not clear whether the relatively independent lessons "add up" to give children a reasonable image of what a city is. Probably too difficult for first graders.

** The Algonquins (3, 4)

Objective: To teach about the life of the Algonquin Indians of Massachusetts and Rhode Island by showing how they lived their daily life, how they saw the natural world and themselves.

Media: Reproductions of Indian artifacts (clothing, arrowheads, string of wampum, squirrel medicine bag, pin and cup game); maps; photographs; record of Indian stories; film loops on arrow making; etc. Extensive background information on the Algonquins is also included.

Characteristic Activities: Scraping dried deerskins; hafting an arrowhead to a shaft; preparing and tasting an Indian food, Nokake; assembling a model trap; acting out stories of spirit help; playing a sorting game with pictures representing the Indians' environment.

Comment: "The Algonquins," one of our first "culture" Boxes, demonstrates how intrigued children are by doing real things with real materials. The data suggests that through the power of doing what the Algonquins did, the children came to believe that the Indians really existed, and were not just story book or T.V. figures. When the children are involved with the real materials, learning is largely non-verbal and successful. In the lessons on myth and belief, the media need much teacher explanation, and are less successful. The attempt to give an overview of the whole culture in two weeks did not work.

* Seeds (3, 4)

Objective: To learn about seeds and seed dispersal through examining and experimenting with fruits and seeds.

Media: Eight basic common fruits in classroom quantities for use in dispersal experiments; data charts; pamphlets; magnifiers; cups; earth for experiments; etc.

Characteristic Activities: Examining and dissecting peanuts and beans; growing seeds; experimenting with floating seeds.

Comment: This Box is best described as ordinary. The materials are definitely useful to teachers and appeal to children, but the approach is rather standard. The Box did not go beyond presenting the children with a variety of seeds for rather simple examination and experimentation. This is the first unit to make extensive use of expendable materials.

*** A House of Ancient Greece (5, 6)

Objective: To introduce children to the everyday life of an ancient Greek household by having them "excavate" the Villa of Good Fortune in Olynthus, Greece; to acquaint children with archeology as a tool for learning how people lived long ago.

Media: Authentic ancient artifacts (coins, pottery sherds); reproductions of Greek statues, pottery, and metal objects; photos of the Villa of Good Fortune; maps; filmstrips; etc.

Characteristic Activities: Examining artifacts from an excavated house in ancient Greece; watching filmstrips of the excavation of Olynthus; doing some activities the ancient Greeks did--grinding cinnamon, trying on Greek clothing, lighting a Greek lamp; etc.

Comment: We consider this one of our most successful Boxes. The major activity--an archeological dig--is an uncontrived and real task to the children, and does achieve the Box objective. This Box first showed us the potential for learning in small, student-directed groups, and in role-play. It displaced the teacher from her traditional role as repository and dispatcher of knowledge and freed her to give individualized help to the children and to be a co-learner with them. There is a careful, dramatic building

of lessons toward the climax of figuring out what the ancient Greeks did in each room of the villa. The final lessons do not give as comprehensive a picture of the restored villa as we would have liked.

* Houses (1-3)

Objective: By comparing an Eskimo Igloo with a Nigerian mud-and-thatch house, children learn that different physical surroundings call for very different kinds of houses and ways of life.

Media: Scale models of an Igloo and a Nigerian hut; samples of real building materials (untanned deerskin, bamboo, mud, palm fronds); environmental photographs; films; picture pool showing houses and house building; books and stories; etc.

Characteristic Activities: Assembling a model igloo; scraping deerskin; constructing a mud and bamboo wall; grouping and sorting pictures; playing with the house models.

Comment: The models and the mud wall were very interesting, but somehow neither teachers nor children saw the idea of the Box--the concept of houses being an expression of, and hence an avenue by which one can understand, the interrelation between environment and culture. The Box comes across as being about two houses, or about Eskimos and Nigerians, while the larger point is missed. Again the power of the media are evident. They, more than the developers' intentions, determine what a Box is really about.

* Animal Camouflage (2, 3)

Objective: To teach about various kinds of camouflage with emphasis on color matching, pattern matching, counter-shading, and disruptive patterning.

Media: Shadow box with various backgrounds and patterned overlays; model birds and animals; mounted insects; diorama kits; slides of camouflaged animals; slide projector; etc.

Characteristic Activities: Hiding and finding insects and animals against various backgrounds; sorting model birds to match them with various backgrounds; camouflaging a mythical animal to protect him from his enemies; making dioramas to camouflage an object.

Comment: This unit has a number of mechanical difficulties; the shadow box does not work well, magnets do not hold the animal models to the backgrounds, the slide projector overheats, melting the plastic housing. The media are all rather abstract and too contrived. They do not deal with camouflage in a direct way, so that the Box requires considerable verbal accompaniment. The best liked lesson involved a simple showing of slides of real animals spectacularly hidden against real backgrounds.

*** Netsilik Eskimos (3, 4)

Objective: To put children in touch with the traditional Netsilik Eskimos by focusing on their life during the part of the year when they hunt seals. Netsilik hunting technology, spiritual beliefs, social relations and leisure activities are shown, all as they relate to seal hunting.

Media: Authentic Eskimo artifacts and materials--(seal hunting tools, boots, seal skin, drum, amulet); three films showing seal hunting, setting up camp, etc.; model ice board and figures; Netsilik Book; record; etc.

Characteristic Activities: Recreating the seal hunt using the hunting tools; experimenting with everyday activities of Netsilik life; hearing the story of Nuliajuk, the Sea Spirit; watching and performing the drum dance.

Comment: This culture Box is highly specific. It is a carefully programmed unit with concentration on limited objectives, and strong reliance on real objects and images. It taught us to use films for their resolving quality after children have studied, explored, and speculated about materials--rather than as an introduction, which can rob objects of their interest for the children. A highly successful Box.

* Musical Shapes and Sounds (3, 4)

Objective: To study real musical instruments; to begin thinking about their sizes and shapes, the variety of sounds they make, and how these are related.

Media: A violin, clarinet; snare drum with sticks and brushes; trumpet; extra reeds and mouthpieces; antiseptic; pamphlets; record; photographs; a Pete Seeger film about steel drums; tubes, reeds, connectors, etc. for constructing instruments.

Characteristic Activities: Taking apart and playing real instruments; matching pictures of instruments and their sounds; constructing experimental instruments, watching (on film) steel drums being made and played.

Comment: By dealing with science and music this was the first Box that didn't "fit" into one of the standard subject matter domains. Children and most teachers enjoyed the activities, but some teachers were put off by the Box because they couldn't see what the point was. For a Box to be successful, the teacher must be "in on" it, especially when she is being asked to do something new or when the topic is one--like music--about which teachers already may feel somewhat insecure.

* Rocks (5, 6)

Objective: To lead children to realize that the rocks they see were not always the same as they are today; and that the rocks contain clues to how they were formed, what life on earth was like thousands of years ago, and the forces that have been at work in nature.

Media: Rock and fossil specimens; two films on mountains and volcanoes; photographs; models; materials for various experiments; geologist's hammer; goggles and other equipment.

Characteristic Activities: Breaking down rocks; synthesizing sedimentary rocks; simulating rock metamorphosis; making fossil footprints; setting off a volcano; "reading" mystery rocks.

Comment: This unit deals with a difficult problem--trying to make vivid in the classroom processes which in nature take millions of years or occur at the molecular level. With the dramatic exception of the volcano these processes are "invisible" and must be inferred rather than directly observed. The children perform classroom analogies to these processes, but it is doubtful whether these analogies succeed in teaching about the real processes. The approach was fairly standard. Some innovative media such as a "crystal former" were created. Teachers felt they needed more information to make full use of the Box.

** Medieval People (5, 6)

Objective: To make Medieval people real and understandable through teaching about the daily lives of people in a fictional French medieval village, and through role playing to encourage the children to act out their responses to problems confronting the community.

Media: Costumes; props (falconry equipment, chess set, prayer book, coins, psaltery, wool carders, seed pouch); Character Books to describe the daily life of each of eight main characters; filmstrip and record; etc.; background information and references.

Characteristic Activities: Examining and demonstrating proper use of objects, acting out a hunting scene, creating and presenting a final episode in the medieval court.

Comment: This unit uses role playing as an approach to making history more meaningful. A series of smaller skits lead to class production of a trial and court scene. The main effect of the Box is to generate enthusiastic class involvement in production of the skits. Teachers found themselves drawn into a warm and insightful relationship with the children, but they wondered how much "history" was in fact learned. Children do seem to learn about manor life, living conditions, and role relationships. The "facts" of medieval history, in the history book sense, are not stressed.

*** Japanese Family 1966 (5, 6)

Objective: To present the suburban middle class Japanese family; its members and how they live together; its basic belongings; family manners; types of employment; recent history.

Media: Activity guides for five classroom "families"; role cards for each family member; film loops showing aspects of family life and a loop projector; real Japanese family album; household objects--religious articles, clothing, tableware.

Characteristic Activities: Role-playing in family situations; learning to behave properly with Japanese objects; setting up a Shinto-Buddhist alter, learning "shoe" manners, table manners, etc.; tracing family lines back 100 years.

Comment: One of our most successful units. Its elegance lies in the easy natural approach--through families--to modern Japanese culture. This approach builds on the child's own family relationships and makes the differences in Japan meaningful. There is an identity and cooperation built up among the children in their families--which is fun and also highly productive. The last few lessons on ancestors and history have a "tacked on" feeling about them and are still too teacher-directed.

** Waterplay (Nursery-2)

Objective: To give children the opportunity to experience, investigate, discover, manipulate, and to become more aware of what is around them--through the medium of water.

Media: Basic waterplay materials: bottles, cups, funnels, spray bottles, pumps; clear plastic tubing with fittings and spiral-shaped tubes; a set of water wheels, troughs, and fountains that can work in a system; recording of water sounds; movie; photographs.

Characteristic Activities: Free play with the basic waterplay equipment, the water system, etc. is the major activity; related secondary activities include listening to a recording of water sounds, watching a film of children playing in water, looking at photographs of children in water.

Comment: Waterplay is our only Box for the very young child, and it aims at sharpening his ways of investigating and manipulating his environment. It is our most non-verbal Box, requiring almost no description or direction from the teacher. The media were designed to speak for themselves, to suggest many things to do with water, or to present the child with a puzzle to be worked out. Waterplay is a child-centered Box, each child playing at his own experience and interest level. Children take to it very naturally and with pleasure. Teachers do too, though some wished the unit had more structure. The Box needs to be made more durable, less expensive, simpler.

** Imagination Unlimited (4-6)

Objective: To give school children opportunities to express and communicate to each other their unique interpretations, feelings, ideas concerning a stimulating set of materials.

Media: 17 unusual objects; 25 photographs; movies of a rainshower, one from the artist's view point and one from the weatherman's; a set of 72 illustrated word cards, tape recorder, etc.

Characteristic Activities: Free associating with words shown vividly on special word cards; describing an unusual object effectively so that another can picture it; making up stories based upon photos showing a variety of facial expressions; viewing two contrasting films.

Comment: This is a non-subject matter Box, innovative in that it aims at drawing out a child's thoughts, feelings and verbal associations--at developing individual points of view rather than helping children to know a particular culture or phenomenon. It includes some standard exercises and some distinct media innovations like the word cards. It was largely successful in producing an atmosphere of free expression. Activities in which children were called upon to be analytical and descriptive didn't work as well as the ones in which they were free to use their imaginations.

** Paddle-to-the-Sea (4-6)

Objective: To make the book "Paddle-to-the-Sea" more real through related objects and activities. The story is about a small carving of an Indian in a canoe which makes its way through the Great Lakes to the sea.

Media: A carved model of Paddle; charts and templates of the Great Lakes; ore and grain samples; models of a breeches buoy and a canal lock; seashore castaways; fur-trade artifacts; films about ships and logging; records; and brochures.

Characteristic Activities: Creating a large collage of the Great Lakes; rigging a breeches buoy; bartering trinkets for beaver; launching a class "Paddle", role playing, plotting and measuring Paddle's course, creative writing.

Comment: This unit is unique in that its impetus and structure derive from a story, and that it deals with the Great Lakes region as a totality, rather than separating it into history and geography, etc. The Box contains a rich assortment of both materials and activities which seem to work together in the framework of the story to maintain high class interest. There are certain media and procedural problems.

*** The MATCH Box Press (5, 6)

Objective: To print a book, and in the process to understand essentially how all books come into being.

Media: The film "Story of a Book"; a print shop, complete with press, brayer, ink and drying rack; compositor's equipment: type, galleys, proof press; illustrator's materials for making block prints.

Characteristic Activities: The class becomes the staff of the MATCH Box Press, a portable publishing company. The children write and prepare a manuscript for publication, they set the manuscript in type, design illustrations, and print 40 copies of their book.

Comment: This is also a non-subject-matter Box. It is the only unit in which the class as a whole works on a single enterprise. The Box has turned out to be very successful. It has a simple and direct line. Subject matter can be embedded in the book that is printed, but it is the process of producing the book that remains paramount. This unit makes very clear the potential of "class project" Boxes as a type.

APPENDIX B

EXAMPLES OF QUESTIONS ASKED AND RESPONSES RECEIVED
AS REPORTED IN PROJECT FINAL REPORT

1. Open-ended questions (effect on student):

Illustrate for us what your class got out of the Box experience by describing what happened with one or two particular children. Please use quotations and examples to show: what they really learned; whether their attitude toward the subject, or you, or other children was affected; how their interest may have shifted; how they used free time; what objects or activities they particularly enjoyed; what ideas they had; how their participation was affected; and, of course, what difficulties or confusions they may have experienced.

Responses:

"All the children were enthused when I opened the Box. Attention was excellent."

"The children used their lunch and recess periods to play with the models. They showed reluctance to leave the lesson to go home."

"Listening to the children talk, get excited and respond to the Netsilik kit - one would never realize these children are retarded."

"Brian - slow learner - finds school difficult - really found success through this unit - he could identify all rocks and fossils - it was the first time he showed much interest in anything."

"On the Eskimo work during Lesson 6 - 'This is hard! The Eskimo must be busy most of the time'."

"The play acting was new and a few shy and/or slow children had a chance to come forward and be counted for the first time."

"Several children spoke of enjoying the unit because it was as if I was there." (Japan)

"Written classwork was not up to standard during the period of the MATCH Box study."

2. Open-ended question (effect on teacher style):

If you see the MATCH Box as a different way of teaching and learning when compared to your normal approach and technique, please tell us what the difference is.

Responses:

"The difference is that the teacher is a resource person or aid, and not a lecturer. They are learning by doing, and not merely by reading or listening."

"What makes the approach different is the availability of materials in the MATCH Box. A complete kit is wonderful."

"The students are actively, vitally involved. Each one realizes he is important to the success of it. There was no pushing or prodding to get students to work."

"I don't see it as different from my way of teaching."

"In reading, for example, we introduce the story, go over vocabulary, read the story and then analyze it to death. Put a written exercise or test on top of this and I've lost 90% of the class."

3. Open-ended question (recommended changes):

Please tell us how you would change the Box. What would you omit or add? How would you alter the approach or lesson sequence? How could it better suit your curriculum?

Responses (suggestions for Houses):

"More skins to sew and scrape. More needles."

"Addition of a filmstrip on modern city life in Nigeria as well as country homes."

"I would definitely not recommend this Box for first grade."

"Allow more time for use."

"Integration of the materials to the reading, social studies, and language program."

4. Fixed response questions and responses:

Question: In terms of OVERALL SUCCESS, how would you characterize your experience with the Box?

Response:

Very Low	Low	Average	High	Very High	nr
1%	4%	15%	53%	23%	4%

Question: From an educational standpoint would you say that the learning outcome for the children is worth the time and effort resquired to use this Box?

Response:

Yes	No	Difficult to Judge	nr
84%	10%	4%	2%

Question: Compare the way your class responds to the MATCH Box to the way it generally responds to other similar units in your curriculum. Check the most appropriate reply to each item. Construct items of your own, if you wish, at the end of the list.

Response:

In general while using the MATCH Box	more than usual	same as usual	less than usual	nr
Class interest in subject	82%	14%	3%	1%
Apparent learning of subject matter	54	33	7	6
Spontaneous questions generated	59	34	4	3
Less verbal children involved	56	40	3	1
Children liked what they were doing	85	13	1	1
Number of children involved	50	42	3	5
Attentiveness	67	29	3	1

APPENDIX C

STATUS MATRIX FILLED IN WITH AN EXAMPLE FROM "JAPANESE FAMILY 1966"

Objectives	Media	Activities	Supplies	Equipment	Instructions	References	Package
HOW TO WORSHIP AT A JAPANESE BUDDHIST ALTAR — LIGHT INCENSE, RING BELL, SAY PRAYER	STATUE OF BUDDHA, ANCESTOR TABLET, BELL, INCENSE POT, INSTRUCTION CHART	MAKE CARD-BOARD BOX ALTAR, ARRANGE INSIDE, RING BELL, LIGHT INCENSE, SAY PRAYER.	INCENSE STICKS		SEE FAMILY GUIDES & INSTRUCTION CHARTS, USED BY CHILDREN— TEACHER SHOULD CONSULT THESE	FAMILY HISTORY	PLASTIC BOX
LEARN TO EAT WITH CHOPSTICKS & PROPER TABLE MANNERS	CHOPSTICKS, 3 DISHES, FAKE FOOD, SEAWEED SPRINKLES, FILM LOOP	PRACTICE EATING WITH CHOPSTICKS, SIT PROPERLY AT TABLE, WATCH FILM LOOP OF PEOPLE EATING	COOKED RICE	FILM LOOP PROJECTOR	SEE FAMILY GUIDES & INSTRUCTION CHARTS USED BY CHILDREN— TEACHER SHOULD CONSULT THESE	FAMILY HISTORY	PLASTIC BOX

(Kresse, 1968, p. 16)

APPENDIX D

LIST OF PRODUCTS AND DEVELOPERS

The following is a list of products for which Product Development Reports have been prepared.

Arithmetic Proficiency Training Program (APTP)
Developer: Science Research Associates, Inc.

The Creative Learning Group Drug Education Program
Developer: The Creative Learning Group
Cambridge, Massachusetts

The Cluster Concept Program
Developer: The University of Maryland,
Industrial Education Department

Developmental Economic Education Program (DEEP)
Developer: Joint Council on Economic Education

Distar Instructional System
Developer: Siegfried Engelmann & Associates

Facilitating Inquiry in the Classroom
Developer: Northwest Regional Educational Laboratory

First Year Communication Skills Program
Developer: Southwest Regional Laboratory for
Educational Research & Development

The Frostig Program for Perceptual-Motor Development
Developer: The Marianne Frostig Center of Educational Therapy

Hawaii English Program
Developer: The Hawaii State Department of Education
and The University of Hawaii

Holt Social Studies Curriculum
Developer: Carnegie Social Studies Curriculum Development Center,
Carnegie-Mellon University

Individually Prescribed Instruction--Mathematics (IPI--Math)
Developer: Learning Research and Development Center,
University of Pittsburgh

Intermediate Science Curriculum Study
Developer: The Florida State University,
Intermediate Science Curriculum Study Project

MATCH--Materials and Activities for Teachers and Children
Developer: The Children's Museum
Boston, Massachusetts

Program for Learning in Accordance With Needs (PLAN)
Developer: American Institutes for Research and
Westinghouse Learning Corporation

Science--A Process Approach
Developer: American Association for the Advancement of Science

Science Curriculum Improvement Study
Developer: Science Curriculum Improvement Study Project
University of California, Berkeley

Sesame Street
Developer: Children's Television Workshop

The Sullivan Reading Program
Developer: Sullivan Associates
Menlo Park, California

The Taba Social Studies Curriculum
Developer: The Taba Social Studies Curriculum Project
San Francisco State College

The Talking Typewriter or
The Edison Responsive Environment Learning System
Developer: Thomas A. Edison Laboratory,
a Subsidiary of McGraw Edison Company

Variable Modular Scheduling Via Computer
Developer: Stanford University and
Educational Coordinates, Inc.