A STUDY OF THE EFFECTIVENESS OF USING AUDIO-VISUAL AIDS WITH RETARDED CHILDREN

A thesis written in partial fulfillment of the requirements for the Degree of Master of Arts.

Carole W. Conrod
Saint Mary's University
School of Education
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PREFACE

Because of this author's interest in children of low intelligence, a spark was ignited in respect to how these children could be helped to learn better. Having taught retarded children for two years, it has been obvious to me that these children need every effective method and device available to help them help themselves. Since it has been found in the teaching of children of at least average intelligence that there is an increase of learning when audio-visual aids are used in the classroom, I propose to discover whether the same effect occurs when such aids are used in the teaching of "slower" children. In order to understand the effectiveness of audio-visual aids with children of sub-normal intelligence, we must first evaluate the use of such aids in a normal classroom situation, with children of average intelligence. Involved in this discussion are the points of why and how audio-visual devices are used.

In what must of necessity be a far from exhaustive study of retarded children, I propose to examine the I. Q., types of retardation, causes of the retardation and effects of such a handicap upon children. I will then become more specific and describe, by short case studies, the particular children we will be dealing with in the experiments.

In the last section of the paper, the results of lessons taught with audio-visual aids will be compared with the results of similar lessons taught without such aids. In the Autumn of this school year, 1967/68, some lessons were taught with the use of audio-visual aids and some without. The day following each lesson, the children were questioned individually to determine the amount of recall. In the Spring of 1968 the process will be reversed and those lessons taught with audio-visual aids in the Autumn will be taught orally and those taught orally in October will be taught with audio-visual aids in March. Again, the children will be tested the following day to discover how much they remembered from the day before. The same question's that were used in the Autumn will be employed in the Spring.

This method of direct comparison depends for its effectiveness on the poor level of retention of slow-learning children. Should this assumption be erroneous, then it will be obvious in the testing and so further investigation will need to be made. Many writers have noted that the mentally retarded forget easier than those individuals of average intelligence, but, I have not been able to document this point. Ebbinghaus, for example, does not signify what level of intelligence he is referring to in the description I quote below but it is assumed that he is thinking about those that are classified as of average intelligence:-

> This shows that there is a rapidly accelerating early decay of memory during the first twenty-four hours or so after learning, followed by a very much slower drop so that what can be remembered after five to ten days shows exceedingly little further decline for long periods. Other experiments have since shown that, in the statistical sense, memory for many kinds of meaningful material follows the same general course, though the initial loss may be less rapid and the subsequent decay more prolonged.[1]

We shall attempt to see if this theory carries over to children of sub-average intelligence.

I wish now to acknowledge the assistance given to me in the preparation of this paper by my thesis director, Professor L. Scobbie. For his guidance and aid, I am most grateful.

I would also like to thank those who offered suggestions and advice on various points. Special thanks goes to my mother whose aid proved invaluable in the construction of this paper.

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[1] "Memory", Encyclopedia Britannica, 24th ed., Vol. XV, p.234.

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CHAPTER I

A BRIEF HISTORY OF AUDIO-VISUAL EDUCATION

Throughout this paper, the term "Audio-Visual Aids" will be used frequently, and so I think it would be wise for us to accept at the outset a definition of the term given by Cross and Cypher, namely: "An audio-visual aid is a means or device which brings together in a controlled situation, a combination of audio experiences and visual experiences."[2]

As they imply, the term is very broad - audio-visual devices supposedly are any tools that through the media of sight and/or sound (especially) assist in the teaching-learning situation. These "tools" can be extremely simple or involved and may include everything from the blackboard to a T. V. program.

I am using the term "audio-visual" rather than "instructional aids" or "scientific aids" because these titles include the use of the other three senses - touch, smell, taste. These senses, although having their own place in the reception of sense impressions, are of less importance in the classroom than the eye and ear.

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[2] A. J. Foy Cross and Irene F. Cypher, Audio-Visual Education (New York: Thomas Y. Crowell Co., 1961), p.7.

The idea of learning through the senses is not new for in the seventeenth century, Comenius wrote: "Commencement of knowledge must always come from the senses."[3] Later Rousseau said: "Why not begin by showing him (the learner) the object itself, so that he may know at least what you are talking about."[4]

It was not until the nineteenth century however, that the concept of learning through the senses, came into prominence. At that time the dominant philosophy was that of "empiricism" or "sensationalism."

> It was believed that man ... obtained his knowledge and his mental ability through sensory processes. Education, therefore, was aimed primarily at sense and muscle training.[5]

This type of philosophy suggested to educators and physicians a method of sense training. The early explorers in this area conceived programs of a formal and set nature. Although they developed the senses, materials, exercises and games had little connection with real things or situations. It was felt that by developing and sharpening "the receptors of knowledge" one could learn more and better.

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[3]Ibid., p.8.

[4]Ibid.

[5]S. A. Kirk and G. O. Johnson, Educating the Retarded Child, (Massachusetts: The Riverside Press, 1951), p.85.

Strict sensory training was the cry of most educators. They were not concerned that the training seemed artificial or without meaning as long as reasonable results were attained.

The trend shifted towards training through life activities (experiences). Of course the senses had to be utilized in this learning but the emphasis was now placed on sense training via real situations that could be comparable to actual situations in which the child would eventually find himself. Meeting the needs of the students, drawing upon the experiences of the children, and making learning real became the methods that still today form a large part of our educational philosophy. In order to see the development of these philosophies, let us now examine some of the exponents of these ideas. Itard, Seguin and Montessori, the advocates of "learning through sensory processes," were the catalysts that spurred on such people as Dewey, Decroly and Descoeudres, in their theories of occupational education and "learning by doing."

Jean Marc Itard

Itard agreed with the belief that man had unlimited possibilities and that education and environment were the factors that determined one's mental development.[6] In pursuit of this ideal, Itard attempted to restore "The Wild Boy of Aveyron" to normalcy. He felt that the child was wild and

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[6] Edward Goldstein, Selective Audio-Visual Instruction for Mentally Retarded Pupils, (Illinois: Charles C. Thomas, 1964), p.10.

untaught because of social and educational neglect, and attempted to train all of the child's senses through placing more emphasis on those of touch, hearing and sight.

To develop the sense of touch, the child was exposed to extremes in temperature, given concrete things such as money, metal letters and keys to feel. A considerable degree of success was achieved in this area.

To train the boy's hearing, Itard used bells and drums at first and then verbal sounds. (Victor did learn the sounds of A and O).

Visual training began with the contrasting of sizes of objects and then progressed to printed words. The "wild boy" did learn to read and write a few of the words, and associate them with the appropriate objects. "In addition to giving impetus to the work with the mentally deficient Itard demonstrated the application of psychological principles to problems of learning."[7]

Edward Seguin

Seguin, being a student of Itard's, believed that muscle and sense training was the answer to the "learning" question. From educating the senses one would go to general notions and from there to abstract thought and finally to morality.

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[7]Kirk and Johnson, p.74.

Seguin stressed the sense of touch to quite a degree, for he felt that handwork incorporated not only physical skills but mental as well. Goldstein says of Seguin, that he felt of the hand as "helper of the eye".[8]

This implies the relationship Seguin saw between the hand and the eye. He used various colors, shapes and sizes to co-ordinate these two faculties, so that a child would not just observe a red cube but would handle it and examine it closely and so, receive an accurate concept of the object.

At the same time Seguin did not neglect the auditory sense for he used music to introduce speech training, as well as converting the cries of a child into a voice. Upon saying a new word Seguin would show the child the object and let him become familiar with it.

Teachers today use this method in teaching new words since it is assumed that seeing the object or a picture of the object that the word names, creates a more lasting impression than just hearing the word.

Maria Montessori

Montessori followed the trend in placing the emphasis on sense and muscle training. Instead of a tightly controlled training, she advocated the "self-Teaching" method by which children were given "didactic materials" to

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[8]Goldstein, p.20.

manipulate and learn from. These materials were of a simple and yet exact type. Children handled, fitted and built with objects of various shapes, sizes and colours. Wooden pegs, blocks, balls, ropes, rings and household utensils, such as dishes, irons, pots and pans, were the types of tools that Montessori used in her teaching of mentally defective children.

She found in her observations of children with this didactic material that there was an unbelievable amount of interest and attention shown. The concentration and time spent working did not seem to tire the children but caused them to become refreshed and tranquilized.[9] They, on their own, tried new types of materials and kept on working with them until their interests were directed elsewhere.

Montessori, like her predecessors, did not concern herself with the senses of taste or smell. She felt that more learning came through the other three senses.

O. Decroly and Alfred Binet

Decroly and Binet were involved in the transition from the strict sensory training of Itard, Seguin and Montessori, to the more modern philosophy of training of the senses through real life experiences. They tried to incorporate into their philosophy the concept of the whole child and his needs.

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[9] "Maria Montessori," Encyclopedia Britannica, 24th ed., Vol. XV, p.761.

Decroly introduced many educational games to develop sensory discrimination and to train the observations of likenesses and differences. These games were to be utilized in a natural setting.[1] In fact everything about his theories imply his desire to make the child self-sufficient, ready to cope with his occupational and social life.

Binet's primary purpose was to study measures to show the benefits of instruction for defective children; therefore, he made his contributions to education in the diagnostic line. He examined and tested children of different ages and tabulated the results, and so determined statistically what the majority could and could not do at a certain age. From this he constructed the "age scale" to test intelligence. Binet also wanted a program in the schools for the mentally retarded so that they could some day take their place in society. He felt that empiricism had had its time and should now make way for scientific methods in education.[10]

Modern Educators.

Alice Descoeudres, Christine Ingram, and John Duncan continued the "experience" method by relating subject matter to the interests of the students.

Descoeudres combined the Dewey system of teaching through experiences with traditional classroom techniques. She adopted Dewey's idea of "learning by doing", by the use

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[10] Kirk and Johnson, p.82.

of games, matching exercises, and handwork skills, such as paper folding, cutting, sewing, knitting and woodwork. These activities were designed to develop the senses as well. For example, in many of the games, children had to discriminate shapes, sizes, colours and position of objects which aided in visual training. To improve the sense of hearing, children had to identify various sounds without seeing the objects that were making the noise.

In a way, Descoeudres could be compared with Montessori in her interest in the sense of touch, since she felt that children learned much more through it than through sight. She especially emphasized that activities in school should be concrete and within the child's experience and comprehension. She would use these objects and activities to build upon and then incorporate them into the academic subjects.

Ingram continued with the "experience method". The classroom must be an active, real and interesting place - that is, work should arise from real life situations and the childrens interests. But the unit of work should not be one that is confined to the classroom - it should develop an interest in out-of-school activities.

Duncan, having found that slower children did better on tests that measured concrete intelligence, felt that the curriculum should use things that would draw upon the senses, and use handwork as a basis to build upon for academic

subjects. Children would perform exercises with concrete materials and then the exercises would progress towards abstractness until the child would do a reasonably complex assignment. This slow, step by step process, going from the concrete to the abstract is accepted today as good educational technique.[11]

We have seen that there were various theories and methods as to how best educate the child. Although we do not follow any one of them today "in toto", we have adopted and adapted many of the ideas suggested by these educators.

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[11] Kirk and Johnson, pp.86-100.

CHAPTER II

LEARNING AND AUDIO-VISUAL DEVICES

Let us now see what is involved in the learning process. It must be remembered that we still know very little about the human mind and how it operates. There have been as many theories about learning as there have been psychologists and educators interested in the workings of the human mind.

It seems that the key word in discussing learning and education is "communication." One prerequisite of a good teacher is that she have the ability to communicate well with her students. Learning is a two-way process of reaction and inter-action and it is only when there is an atmosphere of mutuality and sharing of experiences that real learning can occur. Children often complain that they don't know what teachers and parents are talking about (and vice versa), and it would seem that, somewhere along the way, the bond that existed or should have existed, is gone and the two parties are on different "wave-lengths" and really don't know what the other is trying to convey. If a teacher loses this communication with her students, she may as well leave the profession since if one cannot "relate," (cannot convey her thoughts and ideas), how can she ever hope to help her students learn.

De Kieffer and Cochran mention three steps in the learning process - experiencing, understanding and thinking.[12]

Experiencing, as these authors state, is the most direct and closest contact that an individual has with reality. It is vital for subsequent processes in learning.

> Concepts cannot be learned without some relevant experience with the phenomena to be conceptualized.[13]

It seems logical to say that the person who has a wide variety of background experiences to draw upon, should be reasonably effective in his thinking.

> Our understanding of events, places and objects is a direct outgrowth of our ability to perceive. Our perception of things depends on our senses. As individuals we gain an understanding of our surroundings through the interplay or interrelationships of our own sensory perceptor organisms.[14]

The blending of these experiences into "meaningful conceptual groups", is the next step - understanding.

Understanding is a complex process. One has to draw upon his past experiences, his sensations and perceptions of reality, and form a concept of the subject. It is just not from seeing one flower that a person gets a concept of flowers in general but from seeing and perceiving

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[12] R. E. de Kieffer and L. W. Cochran, Manual of Audio-Visual Techniques, (2nd ed.; New York: Prentice-Hall Inc., 1963), p.3.

[13] Frederick J. McDonald, Educational Psychology (California: Wadsworth Publishing Co., 1966), p.168.

[14] Walker Arno Wittich, and John Guy Fowlkes, Audio-Visual Paths to Learning, (New York: Harper and Brothers Publishing Co., 1946), p.47.

flowers and realizing that there are differences in their colours, shapes and sizes. Discrimination is vital to concept formation.

The highest level in the learning process is reasoning and thinking. This is when we have our experiences organized and can see associations among them. Any new knowledge or experience is easily incorporated and we can see how this new experience is related to past ones. Let us suppose that we discover a new type of flower (or one new to us) - we recall all that we so far have understood about flowers and, although this certain one does not fit the specifications exactly, we see that is has basically the same qualities as the others and so we classify it in the "flower" category.

> To learn, a person must be able to classify his experiences and be able to generalize them; he must be able to translate objects and actions into concepts which will allow him to reason, to formulate attitudes and convictions.[15]

The method of using audio-visual materials to aid learning follows an analysis of the learning process by Neal Miller of Yale:

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[15]John W. Backman, How to Use Audio-Visual Materials (New York: Association Press, 1956), p.5.

Drive (motivation) - the student must want something.

Cue (stimulus) - the student must notice something.

Response(participation) - the student must do something.

Reward (reinforcement) - the student must get something he wants.[16]

Motivation is necessary to arouse the child to action. As Tredgold says: "The child is inert, and must even be stimulated to play; until this is accomplished and some interest is aroused, any further training is impossible."[17]

(It should be noted that Tredgold is referring especially to the mentally deficient but unless there is a need or desire for something, unless there is some stimulus, no child will attempt any action, physical or mental.) As children engage in an activity, their curiosity and interest should cause them to go on to learn and to discover more and more.

The raw material for mental activity, may come from three types of source, of which we have already discussed the first - direct sensory experiences. Since the individual learns first through his sensory channels, such learning is usually the most natural and so the easiest.

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[16] F. B. Freedman and E. L. Berg, Classroom Teachers Guide to Audio-Visual Material, (Philadelphia: Chilton Co., 1961), p.8.

[17] A. F. Tredgold, Mental Deficiency (Amentia), (London: Bailliere, Tendall and Cox, 1920), p.454.

The second source of knowledge may come through mechanical representations of reality (representations or reproductions of the original). This vicarious learning is the type of learning we are interested in, for it is learning through audio-visual materials.

The third source is learning through words or other abstract symbols. It must be remembered that symbolic representations are not valuable unless the teacher and student have a similar knowledge or experience of the topic. Words must have as close to the same meaning for both parties if any learning can take place. Sometimes in order to explain a concept, many words and statements must be employed thus providing many opportunities for error, misinterpretation and misunderstanding.[18]

We have just mentioned some failings in learning by symbols and words but learning through experiences is sometimes impossible or undesirable. For example, it is not desirable to have first-hand contact with disease, accidents or fire, nor would it be feasible to have direct experience in examining Eskimo life. Sometimes the original may be too complex, too big or small, too fast or slow, too inaudible, or too loud, to be successfully experienced first hand. It is in times like these when a

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[18] H. C. McKown and A. B. Roberts, Audio-Visual Aids to Instruction (New York: McGraw-Hill Book Co. Inc., 1949), p.7.

replica or representation (an audio-visual aid) is desirable. Let us now see how effective these aids can be in the learning process. Backman says:

> Essentially audio-visual materials can be helpful because of one basic characteristic: they can provide sensory experiences. Whether they are offering a new experience or recapturing a forgotten one, they may convey through eyes and ears a more realistic and vivid impression than words alone are likely to create or recollect.[19]

They "dress-up" instruction and therefore drive home important concepts. Facts become related, and have meaning, because one has been dealing with the concrete which is easier to understand and to master than is the abstract. One can use with understanding only what he has learned with understanding.

> People can interpret things only in terms of their own background of experiences; consequently it is possible and quite probable for a group of learners to form entirely different ideas about the same thing as a result of a verbal description.
>
> It is amazing the number of errors which result from verbal instruction unaided by concreteness.[20]

Audio-visual materials provide a "common denominator" for students for they overcome to some extent the limitations of restricted personal experience of the pupils.[21]

They provide a jumping-off point for learning,

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[19] Backman, p.3.

[20] G. C. Weaver and E. W. Bollinger, Visual Aids, Their Construction and Use, (Toronto: D. Van Nostrand Co. Inc., 1949, p.7.

[21] James S. Kinder, Audio-Visual Materials and Techniques, (New York: American Book Co., 1950), p.59.

since, for some, experiences are recaptured or felt for the first time by those who have never been exposed to them. By doing this, they are helping students communicate with each other and the teacher, because everyone is experiencing and perceiving the same object or activity at the same time.

Generally, audio-visual materials give correct, real and complete initial concepts. They therefore help prevent stereotyped ideas and impressions, since they provide an objective view in the study of delicate or controversial subjects. Feelings, attitudes and values can be formed or changed much easier than through oral instruction.

Through audio-visual aids, students get the impression that they are close to a real-life situation. Their social and physical environment takes on new meaning to them. It is hoped that knowledge or experience gained in one situation would carry-over or transfer to another. Transfer will be better if in learning, the students can discover relationships for themselves and can have practice in applying the principles to more than one situation.

One of the greatest values of audio-visual material is that they aid in remedying the problem of motivation. Because of their attractiveness and appeal to the senses, they cause a child to focus his attention directly on them. It is because they are real that children become motivated and stimulated by them. They satisfy a child's <u>immediate</u>

curiosity but do not do so completely - they interest the child so much that he wants to go on. After awhile students tend to take over the leadership in exploring and learning new knowledge, leaving the teacher the position of guide and advisor. It is when the student forms his own abstractions and generalizations that true learning has occurred.

Because audio-visual aids are of such a variety, there are many ways that learning can be approached. Children like the idea of novelty and freshness in learning and they become enthused just by the varied ways lessons can be begun. Aids get and hold the attention of children through a change of pace as well for they keep students alert and interested in what is coming next.

Freedman and Berg state that one reason for the success of audio-visual aids is that learning is made pleasant because of them. (Pleasure has been proved an incentive to learning and so we seek activities that excite and satisfy us).[22]

Children like being free and able to develop without always being restrained and restricted. Audio-visual aids do this, they let the child grow and expand without having to worry about formalities. This relaxed atmosphere makes it easy to draw a child out for he forgets

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[22]Freedman and Berg, p.6.

about himself and becomes involved in the material.

Audio-visual aids provide integrated experiences which vary from the concrete to the abstract. They provide a point of departure and a point of return for the learning process-

> Learning is a process in which the concrete and the abstract interact. We move from the concrete to the abstract and back again to the concrete. It is a shuttling back and forth in which generalizations help us to understand new concrete experiences and the concrete experiences in turn help us to enlarge or refine our generalizations.[23]

Aids help train the senses as well as relying upon them to convey impressions to the mind. This training is bound to make the senses sharper and more accurate and therefore more susceptible to other experiences and situations.

In all learning a certain amount of drill or repetition is required in order to ensure that learning is made permanent. To make drill enjoyable, audio-visual aids can be used for they can reinforce an idea without tedious, formal drilling.

It must be remembered that audio-visual aids are not an end in themselves but means by which effective learning can be obtained. They improve the quantity, quality and enjoyment of learning but they cannot do it by themselves, they must be taught, they are aids to a lesson, not the lesson in themselves. Audio-visual aids,

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[23]Backman, p.7.

like most tools or devices, are only as good as the person using them. As we have already seen, audio-visual materials can be used at any part of the lesson: in the introduction, to arouse interest, to provide a common experience or to review a past lesson; in the body of the lesson, to convey information, illustrate concepts, to provide practice in skills or to reinforce learning; and at the end of the lesson as a review or summary or as an evaluation.

It is understandable that the teacher must have a good knowledge of psychology and her students, an ability to select and use materials, an understanding of what the objectives of her lesson are and a good plan to follow in order to attain these goals. A learning experience that is somehow related to past experiences, that is both emotional and intellectual, that partly satisfies some need or interest of the students, that students respect and understand will have more appeal and effect than one that does not.

Pupils must be aroused and informed as to why this material is being used, how it is related to the subject studied, and what to look for in its presentation. Of course the best physical conditions possible are desirable to ensure that attention is not lost due to some discomfort.

A logical progression of events, with the material

woven into the lesson will help form a pattern and relationships in the childrens minds. Too much material or specimens and demonstrations that are not positive in nature will confuse and bewilder the students. A forceful presentation, one that emphasizes understanding and comprehension instead of memorization will be more successful.

By a good follow-up, in the form of a discussion or summary, important points can be observed and clarified, errors corrected and newly gained information related to past knowledge and other subjects so that relationships and generalizations can be made.

From discussing methods and devices used in the learning process, let us now examine another important constituent of the teaching-learning situation, the student.

CHAPTER III

THE MENTALLY RETARDED

The type of children we will be dealing with has already been suggested in the previous section. Itard, Seguin, and Montessori carried on much of their work and experiments with mentally handicapped children. In many cases it was mental retardation that sparked an interest in developing devices and materials that aid not only "slower" children but those of average mental ability as well.

Let us now examine the type of child that is described as mentally retarded "or" mentally deficient, by noting a statement by Heber:

> Mental retardation refers to sub-average general intellectual functioning which originates during the developmental period and is associated with impairment in one or more of the following: 1) maturation, 2)learning and 3) social adjustment, and is associated with impairment in adaptive behaviour.[24]

These "impairments" are closely related and intertwined, and it is obvious that if one of them is hindered, the other two will be effected. For example, if a child is not mentally mature enough to begin academic

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[24]Rick Heber, A Manual on Terminology and Classification in Mental Retardation, A Monograph Supplement to the American Journal of Mental Deficiency, (September, 1959), p.98.

work, then the amount of learning that is achieved will not even be discernible. What will be obvious, will be the fact that the child will find himself with children who are his age chronologically, but are superior to him mentally. Because he cannot keep up with his peers, he will become frustrated and unhappy. He may try to compensate for this lack of ability to compete with others by showing aggressive tendencies or withdrawing from any relationship with others.

The "sub-average general intellectual functioning" includes those in the I. Q. range from 0 - 75 approximately. For educational purposes, mental retardates are classified under one of three categories - custodial, trainable or educable.

Those in the lowest I. Q. range, that of the "custodial," score between 0 - 25 on intelligence tests. Such individuals cannot talk nor take care of their bodily needs. They are totally dependent upon others and so are found under the care and supervision of more responsible persons.

The next level, the "trainable," have I. Q's. ranging from 25 - 50. These people can learn to speak, can develop self-care skills and perform simple tasks when shown how. Therefore, they are semi-dependent for they can look after their own bodily needs and learn routines, yet they require supervision and care throughout their lives.

The highest level, the "educable," have I. Q's. that range between 50 - 75. As the term implies, they can be educated, to a degree, in the academic skills of reading, writing and arithmetic. Through a basic education and employment in a routine, simple, rewarding occupation, such an individual can become a self-supporting citizen.

These brief descriptions of the mentally retarded cannot convey an accurate or detailed concept of the mentally retarded condition, a point well made by Ingram:

> It is difficult to generalize from individual cases, as every mentally retarded child is an individual and must be studied and provided for as such. The group is in no sense homogeneous. So many hereditary and environmental influences are operative that no two children of any age are alike, and individual variations and combinations of traits increase the further we go from the average.[25]

The retardate does have the same general personality characteristics as the average child, but as Ingram implies, these characteristics may be exaggerated because of the situation in which the child finds himself. For example, retarded children are often found to be frustrated, aggressive and laden with feelings of rejection, persecution and inadequacy. These feelings have been caused by parents, teachers and the child's peer group who have not understood

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[25]C. P. Ingram, Education of the Slow Learning Child (New York: Ronald Press Co., 1935) p.17.

his "handicap." Often, because the child cannot "keep-up" with others of his age level, he is rejected and so he isolates himself, becoming agressive or resorting to immature behaviour, just to get the attention he craves. Because of his failures, his desire for security and need to belong are very strong. He needs to be "one of the boys." The mentally retarded child is not slow with regard to the feelings of those around him for he can sense very quickly if the atmosphere is friendly or hostile to him.

Retardates, like all children, need to feel capable of accomplishment, they need to feel adequate. It is probably because they have been placed in situations where demands were made upon them that they could not accomplish that they desire to achieve, to show their worth. Equally, security is as important to the child of low-intelligence as it is to the average or above-average individual - he needs to feel adequate, to be a part of the group, and to feel the self-respect that his friends do.[26]

The retarded child's limited intelligence affects his ability to make sound, moral judgments. He can see only the immediate result of his actions - he cannot assess the ultimate consequences that a "spur of the moment" decision might bring forth. Because of his poor reasoning

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[26]Kirk and Johnson, p. 324-326.

ability, the mentally handicapped child cannot always tell the difference between right and wrong, and so he has to be shown what things are acceptable to society and what are not. This lack of ability to learn from experience and the inability to determine the importance of situations, hinders the child in the academic area as well as in social situations.

Because the creative and imaginative abilities of a retarded child are quite limited, he is not generally the initiator of ideas but the follower of other people's plans. Once someone has set the pattern, he is ready to follow - it is a matter of imitation, rather than creation. It is because of his low intelligence that he is found with children of his mental age instead of his chronological age.

Kirk states that most mental retardates equal "normal" children in height and weight.[27] It has been found though that these children have more handicaps of speech, vision, hearing and motor co-ordination than average children. Whether the cause is due to brain damage, malnutrition, cerebral palsy, rubella or the blood factor, is not always easy to ascertain.

One of the most obvious points about the mentality of the retarded child is his short attention span. It is

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[27]Samuel A. Kirk, Educating Exceptional Children (Boston: Houghton Mifflen Co., 1961) p.109.

very difficult to get the child's attention to begin with and perhaps even harder to hold. Tredgold found that there does not seem to be any great power of concentration or will, capable of any sustained mental effort, in the mentally handicapped.[28] The less interest a child has in an activity, the more easily he becomes distracted. Materials and situations must be at the child's level of interest and comprehension; they must be geared to his short attention span and within his ability to complete with a reasonable feeling of satisfaction. It follows from the short attention span and lack of concentration, that the retarded child does not participate readily and so must be stimulated in order to become motivated in the desirable direction.

Perhaps following from this point is the fact that the mentally handicapped individual has a low frustration - tolerance level. If a child begins some activity that is too difficult for him, he will become disillusioned about it very quickly and want to give it up. Unless satisfaction is derived immediately, then the child loses interest in the project.

Many retarded children have language limitations; they do not see details and so their language is confined to simple words without very many descriptive ones included.

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[28]Tredgold, p.169.

They must be shown likenesses and differences, colours, sizes, distances, etc. because they tend to skim over these points and so never learn any terms to describe them. In ordinary situations their language and speech are adequate to enable them to communicate their thoughts.

As has already been mentioned, these children have a very limited imagination. Everything must be presented directly and completely because they cannot "fill in the gaps" in a presentation that tends to skim over "minor" points. They cannot imagine or grasp the meaning of abstract terms or ideas without very obvious clues or aids.

The "generalizing" ability of retarded children is very low. They are not very adept at seeing the common element (s) in various objects or situations. They need someone to help them abstract the common characteristics of the various objects so that they can be formulated into some generalization.

> The mentally retarded child finds it difficult to apply separate qualities to the solution or problem. They have difficulty in making a transfer of learning from one area to another.[28]

This of course is bound to limit the use of concepts the handicapped child has at his disposal, for if he cannot draw upon old concepts, he cannot relate them to new ones. Because of his limited imagination, he cannot

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[28] M. D. Garton, A.M., Teaching the Educable Mentally Retarded (Illinois: Charles C. Thomas, 1967) p.22.

conceive other concepts than those he already has had.

Related to the point regarding the judgment of the retarded, they do not have the ability to evaluate their own efforts. They can complete some activity and although everything may have gone correctly and smoothly, they will ask, "Is that right?" Unless there is someway that they can see immediately whether they are right or wrong, they cannot evaluate the procedure they followed.

Whether it is because of their intelligence or background, the mentally handicapped child has a very narrow range of interests. This must be broadened if the child is going to have the experiences and concepts that he will need for further growth. He seems to be satisfied with a few interests and must be encouraged to go on to others.

The retarded child, like most children, is not ready to begin academic work until he is about six years of age mentally, which makes him between the ages of 8 and 12 chronologically. This is because he develops mentally from one-half to three-quarters as fast as an average child and so he can only be expected to progress at such a rate throughout his life. For example, if he begins to read at the age of 10, he will probably only gain three or four grades in the next six years. By the age of 16, the retarded child should be able to master

between the second and sixth grade subject matter.[30]

It is extremely difficult to determine the causes producing mild levels of retardation because there may be several factors that could influence the child's intelligence. Often these factors are combined so that it is difficult to separate them and decide what defect is brought about by what cause. Because of the difficulty in classifying these causes, we shall follow Wallin's method and group the factors into three categories: hereditary, environmental, and mixed (heredo-environmental).[31]

Hereditary implies that the cause of the defect was present prior to conception. As yet, geneticists have not been able to determine to what extent mental deficiency is inherited, since environment greatly influences the development of one's intelligence.

It is thought that the mental defect may be transmitted by a defect or taint in the genes, or through elements in the germ plasm. Drugs, alcohol, and diseases, have been cited as other possible causes.

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[30] M. E. Frampton, and Elena D. Gall, Special Education for the Exceptional Mental and Emotional Deviates and Social Problems, Vol. III, (Mass.: Porter Sargent Publisher, 1960), p.435.

[31] O. E. Wallin, p. 199.

> The evidence indicates that some conditions involving mental retardation are probably understandable as the result of heredity factors - amaurotic familial idiocy, tubero-sclerosis, and phenylpyruvic oligophrenia, are examples.[32]

Studies have also indicated that some pathological conditions are attributable to the presence of a single recessive or dominant gene in one or both parents.

Environmental factors include brain damage done before, during or after birth. The damage and deterioration produced by some causes (for example, hemorrhages) may reach a point and then not progress any further, while in other cases the deterioration will continue until death (for example, untreated syphilis).

The most common pre-natal factors are: maternal diseases such as typhus, rubella; toxins caused from drugs, nicotine; glandular disorders; maternal nutritional deficiency and the Rh. blood factor. Falls and unsuccessful abortions, account for a smaller proportion of cases of mental defect.

Natal factors such as anoxia, ruptures of superficial blood vessels, hemorrhages, twisting of the cord, breech births, premature or precipitate deliveries, improper use of anesthetics, brain injuries by means of forceps,

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[32]Max L. Hutt, The Mentally Retarded Child, (Illinois: Charles C. Thomas, 1964) p.128

prolonged labor and difficult deliveries may not show their results immediately but in the majority of cases, symptoms become apparent a few weeks or months after birth.[33]

Postnatal factors are of importance chiefly during the early years of life. Infectious diseases such as meningitis, encephalitis, and childhood infections and poisonings are the main offenders in this division. Glandular dysfunctioning (thyroid deficiency especially), and epileptic seizures may be included here as well. It has also been found that malnutrition after birth, causes further retardation in those individuals of lower intelligence.

The last category, "heredo-environmental" is Wallin's method of pointing out the relationship between nature and nurture. Our intellectual, emotional and other behavioral reactions are in some means dependent upon our environment.

> Although only the minority of parents of mental defectives are themselves mentally defective, numerous surveys by means of standardized tests of intelligence and educational achievement have shown that the average mentality of the offspring correlates positively with the average socio-economic status of the parents, which also correlates more or less closely with their intellectual capacity.[34]

The question arises - are the children retarded due to characteristics they inherited from their parents

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[33]Wallin, p.221

[34]Ibid., p.240

or because of the culture they are in. In an atmosphere of constant bickering, disapproval, rejection, a child is not liable to develop healthy attitudes about himself or his outside world. He will try to compensate for his misfortune by one of many defense mechanisms which may make it more difficult for him to reach his potential. Any child, but especially a handicapped child, must be made to feel his worth. He must know that others are interested in him and his accomplishments and that even if he is not as brilliant as his peers, he can still succeed. Many parents of retarded children, whether from feelings of guilt or shame, close their children off from them. Others just do not care.

Children of low intelligence have often been placed in homes and in environments that are conducive to good mental health and growth. It has been found that in these conditions their performance in tests, school work, and that their attitudes in general, have improved to a considerable degree.

Mentally retarded children have been found to be more prone to illnesses than other children of their age group. Whether this is caused by a weakness they have inherited, or whether it is from a poor diet and health habits, or lack of medical attention; or a combination of such things, is not always easy to ascertain.

From discussing mentally retarded children in a general sense, we shall now examine the children that have been used in my classroom experiments.

CHAPTER IV

CASE STUDIES

The children that have aided in this endeavour come from the lower socio-economic group of our society. Many of them are children born out of wedlock, some are living with only one of their parents, while the remainder live in homes that could hardly be termed conducive to healthful development.

The chronological age range of this Junior Auxiliary Class is (as of September 1967), 7-11 years, whereas the mental ages are only those of children 5-7. Most have repeated either the primary or first grade. A few are "old-timers" in the educable class, although the majority of this group are in their "freshman" year. It was not arranged so, but all the pupils are boys.

Because of their schooling and home environment they have similar backgrounds, attitudes, and interests. But yet, each is different and has a personality of his own.

In order to become somewhat more familiar with these children, let us now examine each individual in more detail.

Subject I.

The first child we shall study is a boy of 8½ years who has the mental age of a 6½ year old. On a recent Stanford-Binet Intelligence test, he scored 77. This is his fourth year of schooling - two years were spent in Primary and two in Auxiliary.

It is difficult to determine the cause of this child's retardation since he comes from a family of three children; two of them by the man that now lives with the mother, the other by a "forgotten" party. This boy and his full-brother both have almost "Mongoloid" features and are very immature for their ages. They are out of touch with reality and live in a make-believe world. It would seem, because of the similarity of these two brothers that they have inherited much of their low intelligence from their father. (Since the boy by the other man is a high-school student and appears reasonably intelligent).

The homelife is very poor, what with drinking and fighting being the normal pastime of the adults. The father does not have any steady work and is in and out of jail quite often. The boy tries to imitate his father by acting rowdy and tough. He imagines unbelievable stories about he and his father capturing criminals, wild animals and space trips to the moon. Although he is treated badly around home, he stands up for his parents and will not let anything be said about them.

Physically he is about 2-3 years retarded. His eyesight is fair but his hearing is poor. He is very susceptible to colds and, like most children, is careless about good health habits to keep himself warm and dry.

Academically, this boy is just ready to begin his educational career. He knows a few of the basic number facts and can print legibly. He has a reading vocabulary of about 25 words and can spell half of them. His retention level is very low and it is only words and experiences that are meaningful that he can handle with any ease and ability.

Subject II.

This boy is 7½ years old and has a Stanford-Binet I. Q. of 76 making his mental age that of a child 5½-6. His size is that of a 6 year old as well. He has spent his two years of schooling in the Primary grade and is experiencing an Auxiliary class for the first time. In the past he had trouble communicating verbally but that difficulty now seems to have disappeared.

This individual comes from a very large family, all of whom have some degree of slowness. He is one of the brightest, since two of his brothers are in "trainable" classes and another in a training school. Every other child of school age is in an "educable" class.

Besides cultural deprivation; these children are suffering from malnutrition. It has been noted in the past few years, the children are receiving more and better food- this is evidenced in the fact that those children at home now are more healthy and alert than their school aged siblings. As one adult was heard to say, "That family is retarded in a bright way." Each individual does have a retardation problem but he is quick to catch on to correct answers and good at figuring out problems.

As has been implied, the homelife of this boy is far from desirable. The father is a barber and receives a fairly decent salary. The mother stays at home and supposedly cares for the children. (Often the child comes

to school minus socks, mitts or in filthy clothes). Although they live in one of the low-cost housing areas of the city, they manage to own a coloured T. V. and have a supply of liquor on hand.

This boy has good vision and hearing and is quick at visual and auditory discrimination exercises. His co-ordination is only fair, since he has difficulty keeping letters and numerals on a straight line. He is an alive, excitable little fellow, who can be very mischievous at times but is generally a good pupil.

Subject III.

Subject III is a brother to the previously described child. He is 10½ years old but only has a mental age of a 6 year old. On his most recent Stanford-Binet test he scored 58. His previous schooling has consisted of training in one of the City's "trainable" classes. This year is his first year at tackling "academic" work.

This little boy, because of the malnutrition mentioned earlier, is only the size of a 6 year old. His movements are not co-ordinated well and any pencil work he does ends up as a diagonal pattern on the paper. His reading vocabulary consists of a half-dozen words, but his speaking vocabulary is adequate for a child of such low mentality.

Since he has been associating with children of average intelligence in school, he is more outgoing and playful. But the insecurity still remains, for when he is reprimanded verbally for tardiness, he bursts into tears. He is very excitable and so it does not take anything very different to get him "bubbling with joy." When he becomes upset, he gets so carried away with himself, that he will throw himself around and roll on the floor. This is not a fit or a tantrum but just an uncontrolled emotional reaction that is stopped as soon as he is told to behave himself.

Subject IV.

This boy is 8 years old, but has the mental age of 6 years. To date he averages around 75 on the W.I.S.C. intelligence tests he has had. He spent his first two years of schooling in Primary classes where he could not succeed at all. This is his second year in auxiliary and he is working now on a Primary-Grade I level.

It is believed that this child suffered some injury at birth (lack of oxygen) that has caused the retardation he shows. He is not a physically strong child and so is prone to colds and minor diseases. His hearing is very poor but has improved considerably since his tonsils have been removed. At one time his speech was impaired but no physical defect was found and today he speaks clearly and distinctly.

This little boy and his older brother live with their mother. The parents have been separated for the past three years and although the mother tries her best to make the home environment as natural and normal as possible, this child desperately misses his father. He tries to compensate for this void in his life by imagining all sorts of wonderful exploits that he and his father have done. The child does not realize that these "stories" are fictitious; for him they are as real as his everyday experiences. Only once did he seem to analyze his thinking in this line and he said, "you know teacher, I have been telling you a whole

lot of lies." When he was told that the teacher knew his stories were "made-up", he dropped the subject. The stories continued.

His behaviour is very good and it is only when he lets others lead him on that he gets into trouble. He has many friends and is quite easy to get along with. In the classroom he does good work and is always ready to take part in discussions and projects. At times he seems to be thinking intently about the subject under discussion, but then will come out with some statement that does not have any bearing on the topic whatsoever.

Subject V.

Subject V is an emotionally disturbed child. He is 8½ years old and has a mental age of 6½ years. On a Stanford-Binet test, he scored 78 points, but on an Otis test for the Grade I level, he scored 70. Having spent two years in primary and one in Grade I, he was transferred to Auxiliary with the hope that in a smaller class he would receive more attention, and so progress better. The cause for his retardation is not known.

He has been adopted into a home that certainly cannot be described as healthy. The foster-father is unemployed, the son of the couple is in a reformatory and the neighborhood is not very stimulating for a developing mind. The foster-mother does show concern about the child but she does not know how to cope with him.

Subject V is doing Primary-Grade I work but is not very interested in any academic studies. His attention span is very low - for example, he may ask a question about the subject under discussion and then, in the next breath mention something about a squabble he and another child had. This is a child who does not take pride in his accomplishments, or get any satisfaction from seeing his work done well. If he is singled out and praised to the heights, he will try, for the moment, to live up to the acclaim.

As might be expected, he is a discipline problem, in and out of the classroom. He is an instigator and a tease. It is difficult to say how much of his behaviour is caused from his retardation and how much from emotional problems. For example, his bedwetting could be caused by his lack of security or his mental handicap. It would be of value if this child underwent a psychiatric study to determine the cause of his defects.

Subject VI.

This is another boy that I feel is emotionally (as well as mentally) disturbed. He is 11 years old, scored 77 on the most recent Stanford-Binet test we have on him and so has a mental age of 8½. This child began school when he was 5 years old, but due to a traumatic experience in the classroom, he had to be placed in a mental institution for nearly a year. He came out of the institution and was placed in an Auxiliary Class for two years. When the family moved to another part of the city, the child was placed in a Grade II class, where he met with failure. This year he is experiencing Auxiliary Class work again.

This boy comes from a family of low-intelligence. The mother, a half-breed Indian, who, although she does not have a strong will or an average intelligence, tries her best to make the home as interesting and healthy as possible. The father, a janitor, likes to tinker with machines and mechanical devices. Although the family is not wealthy financially, they are the richest of any of the families of the children in this class. The children are very close and will earn money to buy each other clothing and presents. The parents try to encourage their children in their school work and they buy them as many materials and books as they can afford.

This boy can do work on a GradeI - Grade II level,

but he is very moody and does not always do as well as he could. When he is reprimanded, he sulks and holds a grudge for the remainder of the day. The child finds the work dull and colourless and although it is attempted to make the lessons as interesting as possible, it is only things that deal with machines and outdoor life, that attract and hold his attention.

Subject VII.

Subject VII is a boy of 10 years of age with the mental age of a child 7-7⅓. On two Stanford-Binet I. Q. tests he has scored 70 and 74. Having failed primary in his first year of school, he was placed in Auxiliary Classes so that now he is a four year veteran. Although he should be doing work on a Grade II level (according to his mental age) he works best at a Grade I level.

It is not possible to state the cause of this boy's retardation. He has a brother in this class with him, yet he has two younger sisters who are in Grades I and II and do well. An older brother was also an Auxiliary Class graduate. The father does not live with the family and so the unnatural environment may cause this child to fail in attaining his potential. The mother, although she does her best to meet the physical needs of the children, does not have any closeness with her children. They are a burden on her and they know it.

Subject VII's co-ordination is good and he is somewhat athletic. He is left-handed but this does not interfere with his writing, although it may be the cause for his below-standard reading ability. He tends to read some words backwards and stumble over simple sentences.

He partakes readily in classroom discussion and is very good on general knowledge. Singing is a pure joy for him and he becomes quite enthralled with the record player

or a class song.

With regard to behaviour, he is an average student inclined sometimes to be mischievous but never any problem. He will not be led on by others but makes up his own mind.

Subject VIII.

This boy is a brother of the previously described child. He is 11 years old with a Stanford-Binet I. Q. score of 51, making his mental age that of a 5½ year old. He spent two years in Primary Classes until he was placed in a Junior Auxiliary Class. This is his fourth year in Auxiliary.

From such a low I. Q. it may be gathered that this boy is barely capable of Primary work. Even after five years of doing the same type of work, he only knows his number concepts up to 4 and the half-dozen vocabulary words in his first reader.

He is protected by the other children in the family for they realize that he will do silly and dangerous things if not watched (for example, eating glue, ink or paper). This "protectiveness" does get carried too far at times since he is not allowed to tackle problems and obstacles that the other children consider too difficult for him. This hinders him from becoming independent and self-reliant.

He is a very well-behaved and well-mannered child. He has quite a knack for making good-natured teasing comments about his classmates or the teacher and although he does not intend them as humorous, they generally bring a smile from someone. He is quite sensitive and whenever anyone speaks harshly or cruelly to him, he goes into a shell and broods. This does not last long and soon he is back to his normal, cheerful self.

Subject IX.

This boy is 8½ years old but is mentally the age of a 6½ year old. On A Stanford-Binet test he scored 83 points while on a W.I.S.C. and Frostig test he scored only 75. He spent two years in primary, where he could not succeed, and then was placed in Grade II where he remained for half a year before being transferred to an Auxiliary Class. The child did not learn to do any reading at all during these early years.

He has perceptual difficulties, since on the Frostig test he showed a Perceptual Quotient of less than 65. It has been recommended that the child receive an intensive perceptual training program but to date this has not been achieved.

This child suffered an injury at birth. Forceps that were used to aid in the delivery caused the child's head to become marked and pushed out of shape.

The homelife is not any aid to the child's development, since the mother has many "suitors" calling upon her. The father of the children has deserted the family and they are living on welfare. The mother does not care very much for the children. She does only what she has to, to meet their physical needs. This child is sensitive to her attitude towards the family and is

building up a resentment that is influencing his generally bright outlook.

He is working on a Primary level, capable of a little reading and number work. He takes part in classroom discussions and does have some very worthwhile bits of news and information to contribute at times.

Subject X.

This child has an emotional handicap besides his mental one. He is 10½ years old. On two Stanford-Binet tests he scored 81 and 77 giving him a mental age of 8 years. He repeated the Primary and First grades of school and is now in his second year of Auxiliary.

Again, it is not known just what is the cause of this child's handicap. The other children of the family, although not brilliant, are in regular grades in school or else out working and supporting themselves.

The parents are not an especially good influence on the children. The mother has to go out to work in order to support the family. The father, a one-time carpenter, is a hypochondriac and uses his illness to get out of working. This boy is not shown any attention or affection around the home. He wanders about everywhere and is out all hours of the night without anyone showing any concern about his whereabouts.

He is capable of doing Grade I - Grade II work with ease. He reads well and can spell all the words that are used in his reader. Having a reasonably good memory and background of experiences, he partakes with ease in classroom discussions.

Emotionally, he is not very stable. Whenever he has to be reprimanded, he rebels. He craves attention and becomes aggressive and moody if he does not receive it.

Subject XI.

Within the past two years this 10½ year old boy has had two Stanford-Binet intelligence tests on which he scored 78 and 66 points. The first score seemed rather high in relation to his achievement in class and so a second test was given. The second result does seem to be a more accurate estimate of this child's I. Q. His mental age is much closer to that of a 7 year old than an 8 year old. (Even on the last testing, he missed such things as copying patterns, drawing opposite analogies and memorizing digits on an age 7 level).

This boy failed and repeated the primary grade and was placed in an Auxiliary Class. This is his third year in the Junior class. At present he is working on a Grade I - Grade II level. He is not a very hard-working child and must be stimulated constantly.

The child's family tend to be very slow and lackadaisical. The mother permits the children to eat any types of foods they want for their meals - the result being a large consumption of pop, chips and candy. The boy comes to school asleep on his feet because of the late hours he keeps. The other children of the family suffer from these home-conditions as well. A sister and a brother are in Grades I and III, but they do very poorly in class. The mother is at home all the time, while the father is at sea on a "dragger." Neither one of them takes very much

interest in their childrens accomplishments. They feel that once they have met the physical needs of their offspring, their duty is complete.

With regard to behaviour, this boy is no problem. He is agreeable and co-operative. He is not easily led and will think for himself. Even in play, he is not forward or forceful. He likes strenuous games and exercises, but even tackles them in a mild, quiet manner.

Subject XII.

This little boy is 8½ years old with a Stanford-Binet I. Q. score of 70. He therefore has a mental age of a 5½ year old. He has just entered the Junior Auxiliary after having failed two years of Primary.

His whole family are very slow mentally. The oldest girl is now in a training school and a brother has just left such an institution. The father and mother are both Auxiliary Class graduates and hardly what one would classify as "ideal" parents. The financial standing of the family is very low. The father works part-time as a cook, but often draws upon welfare. The family lives in one of the city housing developments since they cannot find decent lodgings elsewhere to house the nine of them.

This boy is doing Primary level work. He can add a few basic number facts and can read a few simple sentences. He is very poor at problem solving and concept formation. Everything must be drawn out very plainly for him.

He is not a very happy child. At home he does not receive very much attention or affection and so he feels insecure and unsure of everything. When a situation arises that confuses him, he either rebels and refuses to co-operate or else cries. When he is confronted with a wrong-doing, he will not deny it, but instead reluctantly admit to having committed the "crime."

He has some perceptual difficulties, for it is not uncommon for him to write a word or numeral backwards. At times he has difficulty seeing the direction objects are facing. He requires a program of perceptual training, but as yet this has not been begun.

Subject XIII.

This 9½ year old boy has a Stanford-Binet I. Q. score of 63 points, giving him a mental age of 6 years. I do not feel that this is an accurate estimate of this child's ability since he is working on a Grade II level, which would imply his mental age must be that of a 7 - 8 year old. He repeated Primary and spent two years in Grade I. This is his first year in an Auxiliary Class.

This child is the only one in his family to have been placed in an Auxiliary Class. He has a brother in Grade III who is an average student. The remainder of the family have steady jobs and seem to be settled. It is possible that this child may have suffered from some birth injury but this is not known for certain.

The home life of this individual is rather upset at the moment. The mother has been in and out of the hospital for the past few months and the child does miss her greatly. The father, a fisherman, is not at home very much and so the child misses a lot of the father-son relationship that is so necessary to a young boy.

This boy is doing Grade II Arithmetic quite well. He is a reasonably good reader and can spell all the words in his reader. His co-ordination has developed to the point where writing is now being attempted with success.

His behaviour is average for this type of

intelligence. He commits acts without seeing the inevitable results. Easily led, he is often the "scapegoat" for the pranks of others. He does not learn from his mistakes though. For example, having been punished for talking in the halls, he forgot the incident and an half-hour later was again being disciplined for the same "offense."

If this child's emotional needs were met, he would do much better in his academic studies since he seems to be troubled and "on edge" much of the time.

CHAPTER V

TEST RESULTS AND COMMENTS

The classroom experiment that was carried out to determine the effectiveness of audio-visual aids with retarded children consisted of ten lessons that covered subjects in the fields of "science" and "social studies". In the Autumn, lessons were taught on lobster fishing, insects, cotton, magnets and the sun without the aid of any materials or devices excepting the teacher's voice. At the same time lessons were taught on fire, plants, wool, coal, and the moon, with the aid of such tools as films, demonstrations, real objects, experiments and projects. In the Spring the process was reversed and the lessons that had been taught with audio-visual aids in the Fall were then taught orally and the lessons that had been taught orally were taught with the aid of audio-visual tools.

Although the questions posed and the correctness of the responses of the students are all found in the appendix of this paper, I feel that a commentary on the results of the lessons is necessary. Let us begin with the lessons that had been taught in the Autumn without the use of audio-visual aids, and contrast the results with the same subject matter covered in the Spring with the assistance of audio-visual tools.

In the experiments it was found, that the majority of the (chronologically) older boys had more knowledge at

their "finger tips" to begin with than did the younger children. This would be due to their having lived longer and thus having had more opportunities for gaining information through experiences inside and outside of the school.

With many of the lessons, even the younger children had had some experience with the subject previously. The lesson on magnets was such a topic; although all of the children had seen magnets and knew that they "pulled" certain things, many did not know such things as from what these "attractable" objects were made or where the "pull" of the magnet is greater. Because of the limited imagination of these children, few had ever experimented with magnets to see that they could attract objects through water, wood, paper or glass. Those that had were the boys who were chronologically and mentally older and so had an interest in discovering and exploring the unknown.

The problem arose of discouraging the "getting" and "bringing" of magnets to school. From our discussion in class of the workings of the magnet, the children wanted to test it out and see if it could do all the things it was claimed it could do. Of course, they had to be "put-off" by promises of experiments with all sizes and shapes of magnets "in a little while."

Because of the subject matter being novel and

therefore interesting, the children were easily motivated in partaking in the classroom discussions. Their attention did wander when the more " scientifically minded" boys attempted to answer such questions as "What part or a magnet is the most powerful?" and "How do the opposite ends (poles) attract?"

In the Spring, various types of magnets were examined and used in experiments. The boys saw a film on how magnets work and were permitted to bring their magnets, of all types, to school.

Tests were performed to see what objects the magnets would and would not attract. Eventually the children arrived at the conclusion that the "attractable" objects had to be composed of iron or steel. This generalization was reached with the aid of the question, "From what are these objects made?" The boys had had enough practice with the visual material to draw the obvious conclusion.

The children were amazed to see magnets exerting their force through wood and glass. A bit of creative thinking was done when they were trying to think what else they could try to get the magnet to pull through and one of the younger boys suggested his skin. They tried and failed to get it to work through their hands, so I suggested they try some other part of their bodies that was not so thick. They tried every part of their faces before they discovered their ear lobes. By putting the

magnet on the back of the ear and a piece of metal on the front the boys found that the metal would stay on the ear. I then showed them a woman's magnetic earring and they were surprised that they had made the same discovery as someone else. Words cannot describe the pleasure and satisfaction derived from these observations.

Although the retarded child cannot be generally expected to pay attention much longer than 5-10 minutes, the boys for this lesson, concentrated nearly 30 minutes. The following day they were ready to continue the discussion and experiments and a week later the boys were still bringing to school magnets of every size possible to "try-out".

This lesson led to further lessons on the role of magnets in industry and in machines around the home. The boys saw a magnetic crane at work and so devised one out of building blocks and a magnet. From this work, the subject of electricity was introduced and we examined a simple bell and the operation of a telephone.

The most important thing about the whole lesson with audio-visual aids was the fact that they stimulated learning and helped clarify and teach some very difficult concepts.

TABLE I

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON MAGNETS

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after Traditional Presentation	Percentage of Questions Answered Correctly after Audio-Visual Presentation
70 - 80	6½-8	9½-11	60%	80%
75 - 80	6 -6½	8 - 8½	40%	60%
50 - 70	5½-6	7½-11	30%	50%

In November, a lesson was also taught on the sun. This topic was not of any real interest to the boys and it was difficult to get them to partake in the lesson. Their attention wandered throughout the oral presentation of the material in which I gave them some information and led them to answer questions regarding light and the sun's relation to the earth.

The concept that the sun was a ball of fire was difficult for the boys to grasp. They could not understand why the fire did not go out. (They had been experimenting with fire and they knew that when the fuel, that the fire is fed on, eventually disappeared, the fire went out.)

The concept of day and night was incomprehensible without audio-visual aids. The children did not even "take in" what was said about the position of the sun and earth for the various times of day. The concept was altogether too abstract and involved for "slower" children to grasp. Even with the use of audio-visual aids later, it was only the more scientifically minded students that could answer the questions on night and day correctly.

Such a lesson indicates how little retarded children know about the world around them. It is only when pertinent questions are asked that they examine and begin to "see" things that go on around them all the time.

For example, the question on "What makes your shadow?" caused many children to stop and think before they decided it was the sun's position in relation to their body. The children with lower I. Q's. did not realize that they only saw their shadow when the sun was shining.

However when such devices as a lamp (representing the sun) were used later and the children could make shadows on the wall with their hands, they realized that the sun acts as a "giant lamp" outdoors to cast our shadows on some surface.

Although a film strip was shown on the sun, it helped only the more intelligent children to see that the sun is the center of the universe, and that night and day depend upon the position of the earth in relation to the sun. The younger children paid attention to the film but were unable to answer such questions correctly. The film strip did convey the idea to them that the sun gets its light from itself and that it gives the earth heat and light.

The audio-visual aids in this lesson then, did help to clarify and introduce new concepts and make them more interesting and real.

TABLE II

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON THE SUN

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after Traditional Presentation	Percentage of Questions Answered Correctly after Audio-Visual Presentation
70 - 80	6½-8	9½-11	60%	80%
75 - 80	6 -6½	8 - 8½	40%	70%
50 - 70	5½-6	7½-11	30%	50%

Some of the older boys have fathers who are fishermen and so they have had first hand experiences with boats and fishing equipment. This, of course, enabled them to answer correctly most of the questions that were posed after the oral presentation of the lesson on lobster fishing.

The children who were mentally younger were "left out" of the lesson when the "experienced" children began telling about how their father's caught lobsters and what happened to them after they were taken from the water. A few children thought lobsters were caught with a fishing line and could not visualize the trap or "pot" that was used instead.

Questions that required any reasoning were poorly answered. For example, only one child was able to explain why lobsters are "pegged". Even when they were told that lobsters were all put in a bag or container together, the remainder of the class could not see that they could cause injury to one another if they were not "pegged" and thus prevented.

Since they did not know very much about the subject and therefore could not offer anything to the conversation the mentally younger children quickly lost interest and were bored with the whole discussion.

When pictures and filmstrips were shown to the

children, interest was aroused and they became anxious to talk about the subject of lobster fishing. But what really focused attention on the lesson was a real lobster "pot." The appearance of the trap really convinced me that pleasure (happiness) is a great incentive to learning.

The concept of what the trap looked like and how it was used became clear to the boys. They were able to name the divisions of the trap and show how the lobster entered and got caught inside it. This concept led on to a discussion of what sort of bait attracted the lobster and what the fisherman did with the lobsters after they were taken out of the trap.

From the film, the boys saw the lobsters being "pegged" and then put in containers and finally meeting their end in a pot of boiling water. This left its effect on most of the children since they thought it was so cruel to even kill them, let alone put them in boiling water. Even when it was explained to them that the lobsters did not suffer, many of the children were still horrified and skeptical. They were then asked how they thought other fish and animals were killed so that we could eat them. Many of them had never connected the idea of the meat they ate coming from an animal. This of course, led to lessons on from what animals our various types of meat and fish are derived, and how they are killed. An erroneous idea of some of the boys was corrected when it was discovered that they felt one waited for an animal to die naturally

before taking its meat.

Through two "lobster" cushions, one green, the other red, the boys were shown the "before" and "after" process. This "transformation" aroused a considerable degree of interest as well. The children offered many explanations for this change, with good reasoning behind their answers.

Not often do retarded children offer suggestions in the academic vein but as the lesson was drawing to a close, one of the boys asked if the class could draw a picture of the trap and show the lobster getting caught. An appropriate closing to a very satisfactory lesson.

TABLE III

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON LOBSTER FISHING

			Percentage of Questions Answered Correctly after	
I. Q.	M. A.	C. A.	Traditional Presentation	Audio-Visual Presentation
70 - 80	6½-8	9½-11	80%	90%
75 - 80	6 -6½	8 - 8½	50%	70%
50 - 70	5½-6	7½-11	30%	60%

The subject of cotton was not one that the children knew much about or had any real interest in. They had never had any experience with raw cotton and so did not know where or how it grew. They realized it came from a factory but did not have any idea from what it was manufactured. The processes involved in the manufacturing of the cotton were too abstract and involved for the majority of the class to grasp. When I attempted to explain as simply as possible what "ginning", "spinning", and "weaving" were, the childrens' attention lapsed completely. The concepts had no meaning to the boys since they had never even seen a spinning wheel or loom and so could not visualize what these words attempted to convey.

Although the children knew a song about the "boll weevil" and were told that this was the insect that caused so much trouble to cotton growers, they could not recall the name of the insect the day following the lesson.

The audio-visual devices that were used in the Spring were a display film, and a picture-book story of cotton. The display, showed a cotton plantation with machines picking the cotton and ginning it. A factory with its modern machines for spinning and weaving was depicted by cartoon-drawings and this was contrasted with the old "machines", the spinning wheel and loom. The cotton in its various stages was examined as well.

From a distant, unreal, vague idea of the

manufacture of cotton, the children received a more meaningful, real picture that stayed with them for sometime.afterwards. When they began to realize that their shirts and underclothes had come from a plant, they were quite amused. This led to a discussion of from where other pieces of their clothing originated. They assumed that their woolen sweaters and the nylon in their socks came from plants as well and so we had to delve into their "origins" in order to correct the misconceptions.

Since there were various steps in this lesson, the audio-visual aids helped connect the various concepts and make them fit together. The children felt quite proud of themselves when they were able to tell "in their own words" and with their own descriptions how raw cotton was made into the finished product.

TABLE IV

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON COTTON

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after Traditional Presentation	Percentage of Questions Answered Correctly after Audio-Visual Presentation
70 - 80	6½-8	9½-11	60%	80%
75 - 80	6 -6½	8 - 8½	40%	70%
50 - 70	5½-6	7½-11	30%	50%

The lesson on insects again proved to me that retarded children do not notice details unless they are brought to their attention. For example, in our discussion of insects (without the use of audio-visual aids) many of the children did not know that insects had "feelers". When this point was made, the children asked to what part of the insects body these "feelers" were attached. I turned the question back to them and asked where they thought the antennae would be - although the majority suspected it was the head, the "slower" children thought they would be attached to the sides of the insects body like wings.

Although most of the boys could name insects that flew or crawled in order to travel, it was only the mentally older students who knew how many legs an insect had. The powers of observation of the younger boys just have not been developed and trained enough yet.

The names of the parts or the insects body and the stages of its development proved to be too difficult for the class as a whole. A few of the children managed to recall the parts or stages that were common words but any unfamiliar terms completely baffled them.

Because they could not correctly "picture" what an insect looked like at the various stages in its development, the boys conceived faulty ideas of its

development. When I attempted to "clear up" the misconceptions, some of the "younger" boys attention strayed and they did not grasp what was said. The "scientifically minded" students tried to imagine the cycle of growth but they continuously omitted one stage or another and so became frustrated.

Teaching the lesson with audio-visual devices alleviated some of these obstacles. For example, when we discussed the parts of an insects body, we examined an artificial bee and saw (although we still could not remember the names of the major parts) of what the body was composed. The children had the opportunity of seeing, on a film, the birth and growth of a grasshopper. Afterwards they were able to draw the stages and tell what was happening in each. This of course, was done in a very crude, general way but it was accurate.

The film made the children think and draw conclusions. It depicted the destruction caused by the boll weevil and locust, but yet it showed the bee unintentionally carrying pollen grains from one place to another. The children, with the aid of a few questions came to the conclusion that some insects are harmful to us while others are helpful.

Of course having models of real creatures, sparked interest in the subject immediately. The children were motivated to study about other insects and one boy managed

to bring to school a "fly collection", while another brought in a picture of bees in a hive.

These audio-visual lessons acted as an introduction to the study of butterflies and moths. When the stages in the life of the caterpillar were reviewed, the children felt familiar and confident with the material, since they had previous experience backing them.

TABLE V

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON INSECTS

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after	
			Traditional Presentation	Audio-Visual Presentation
70 - 80	6⅓-8	9½-11	70%	80%
75 - 80	6 -6⅓	8 - 8½	30%	60%
50 - 70	5⅓-6	7½-11	30%	50%

As mentioned earlier, lessons were taught in October and November with the aid of audio-visual devices. The same lessons, without any teaching aids whatsoever, were again taught in March. Because there had not been any review or drill during the intermediate period, there was no rise in the number or questions the boys answered correctly after the oral presentations in March (in comparison with the results from the other oral presentations). Therefore, it would be accurate to say that there was very little, if any, carry-over of knowledge from the audio-visual lessons in the Autumn to the oral lessons in the Spring.

One of the first lessons that was taught with Audio-Visual aids was that of "coal". The class were shown photographs and a filmstrip on such points as where coal comes from and how it is made. Then some real "chunks" were examined and the children could see pieces of wood being changed into coal. An experiment was performed to show what was left of the coal when it was burned. The children could see how dirty the coal was but, being boys, this point did not bother them. They were shown bottles of medicines, dyes, and plastic toys, and were told that coal helped produce such things.

Although a map was used and the names Springhill and Glace Bay mentioned continuously, the children could

not recollect the names of the towns where coal is mined. A few of the "mentally older" boys were able to point out the places on the map but just could not recall the names that belonged to them.

To ensure that the children knew the process of coal production we dramatized the mining of coal through the aid of boxes (representing elevators) and murals, (showing the walls of the mine). One of the boys brought in a wagon and so this was loaded with coal and hoisted up the track (two wooden planks) to the surface of the earth.

The enthusiasm for the whole lesson was unequalled by any of the other lessons. For weeks afterwards the boys brought in bits of coal or pictures from magazines. They illustrated on the black board, on drawing paper, in the sand box and with clay the many concepts they had grasped from our studies.

In the Spring, before the oral lesson was ever taught, the boys were "quizzed" to see if they recalled any of the concepts from the audio-visual lesson in the Fall. Being satisfied that there was not any noteworthy amount of carry-over from the audio-visual lesson, the oral lesson was taught.

Many of the boys, after the oral lesson, could not remember how coal was made. Even though we had had quite a discussion on its origin, they thought it was cut out of

rock in mountains. Their attention wandered as the discussion went along and many did not grasp the point regarding the uses for coal.

With the audio-visual lesson, the boys were able to tell all the steps in the mining of coal. But not so with the oral lesson, even after we discussed them in class and went through them carefully, many of the children could not recall the stages. In fact, they were not even interested in doing so.

There was no "follow-up" on the children's part for this lesson - no coal was brought to school and no drawings or discussions of coal mining attempted. The majority of questions the children answered correctly were those that they knew from experiences they had had, (T. V. programs and books).

Audio-Visual aids in this case sparked interest in the subject and made the concepts clear and easily understood. They succeeded where the oral presentation failed.

TABLE VI

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON COAL

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after	
			Traditional Presentation	Audio-Visual Presentation
70 - 80	6½-8	9½-11	70%	80%
75 - 80	6 -6½	8 - 8½	40%	70%
50 - 70	5½-6	7½-11	30%	50%

The audio-visual lesson on plants was an appealing one. We planted seeds and roots, (in the sun and out, with and without water, and with and without air), a few weeks previous to our lesson and then examined their growth. The class could see that the seeds had grown and they knew which ones had survived and under what conditions.

Although the children could see, by pictures, that some plants are indoor and some are outdoor, many had difficulty in remembering this when asked. Another example of words, abstract symbols, being difficult to grasp, even when aided by instructional tools.

We viewed a movie on how plants grow in Nova Scotia and this way the boys were able to see various types of plants and their development throughout the year. The movie showed the plants "resting" in the ground and "awakening" in the Spring, but the children misunderstood this and thought the plants had died and were brought back to life. Although I attempted to correct this erroneous idea, many of the children had the idea impressed in their minds and it was not changed.

The children again provided much of the follow-up material. They cut out every picture of plants they could find and brought every type of weed possible to school for us to plant.

During the oral lesson, it was obvious that some of the slower children were only thinking of flowers as plants. They had forgotten that vegetables and trees were included under the same category. They had to be led very slowly to discover what plants need in order to grow and even then, some of the boys did not grasp the answer.

The children were interested in the subject and so partook in the discussion quite readily, but, they did not concentrate as long for this lesson as they did for the one with the audio-visual aids.

As with most oral lessons, the boys had only a "hazy" idea of what the whole lesson was about. They could not seem to connect the various concepts together. This caused them to become frustrated and bored. It is no wonder they were not anxious to continue the discussion next day.

Thought provoking questions, such as the vegetable and fruit plants we grow in Nova Scotia proved to be too difficult for them to figure out. Even though they were in contact with them everyday, the connection was not made. Only if the object is in front of the class at the time of the discussion does there seem to be any effect on learning.

TABLE VII

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON PLANTS

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after Traditional Presentation	Percentage of Questions Answered Correctly after Audio-Visual Presentation
70 - 80	6½-8	9½-11	90%	90%
75 - 80	6 -6½	8 - 8½	60%	70%
50 - 70	5½-6	7½-11	40%	50%

The lessons on fire had the benefit of the childrens' experiences to make the concepts interesting, clear and meaningful. From a T. V. program that stresses safety and caution with fire, the children knew how to put a fire out and how to handle various situations. (This does not mean that they would behave in the appropriate manner, since they panic very quickly and have difficulty in thinking what is the best solution to an emergency). The aim of the lessons was to discover why we follow certain procedures in controlling fire. The boys knew that they should roll on the ground if their clothing caught on fire, but they did not know why.

For the audio-visual lesson, we performed an experiment of placing three different sized bottles over three similar sized candles. The children were able to see which candle went out the first. They offered various reasons why the candle under the smallest bottle died the quickest but had to be led to draw the correct conclusion that the air was used up.

We also had a little demonstration on how to get a fire burning again once it had nearly gone out. This added to the concept that fire needs air in order to burn. Various methods were shown as to how fires could be extinguished - sand, fire extinguisher, water and smothering

the flames. The children illustrated these concepts and a bulletin board display was made of their work.

When the audio-visual lesson was taught in March the boys had forgotten the concept of air being necessary to fire. We discussed an imaginary set of three steel boxes of different sizes with fire burning inside of each. The mentally younger children thought that the fire would have more room to spread in the larger box and so would go out first, because it would be stopped by the sides of the box. The older boys realized that the air in the smaller box would be consumed and so the fire would go out quicker.

The concepts of "fanning" a fire to get it started and suffocating a fire with sand proved to be somewhat of a problem as well. The "younger" children did not grasp the concept, for their attention had waned. They were anxious to discuss fire they knew about and personally experienced. It was difficult to re-focus their attention on the subject under discussion.

The main concept that I wanted to convey (that is, that fire needs air in order to burn) was not indented in the boys minds, and so the lesson did not fit together well.

TABLE VIII

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON FIRE

			Percentage of Questions Answered Correctly after	
I. Q.	M. A.	C. A.	Traditional Presentation	Audio-Visual Presentation
70 - 80	6½-8	9½-11	90%	100%
75 - 80	6 -6½	8 - 8½	50%	70%
50 - 70	5½-6	7½-11	40%	50%

The audio-visual lesson on the moon was taught with the use of plastic models suspended from the ceiling representing the moon's position in relation to the planets and stars in the universe. We also viewed a movie on the moon's travels and saw what it would be like to set foot on its surface.

Most of the class grasped the points that the moon is smaller than the earth and travels around it. Some of the mentally younger boys missed these concepts since the narrator on the film did not stress the point enough.

One concept that proved very difficult was that of how much of the moon we ever really see. Even with the globe and a ball "sun", the boys had difficulty with this idea. It involved too much concentration and reasoning for them to see that because of the earth's and moon's position and motion, we only see one side of the moon. Again it was the more scientifically minded students who succeeded with this type of question.

The boys were very interested in seeing what it would be like to visit the moon. They noticed that the men had to breathe air out of tanks and that water had to be brought from earth. They were quite amused at seeing the difference in a man's weight on the earth as compared with his weight on the moon.

This lesson sparked interest in studies about the other planets and stars. Although the boys could not call the planets by name they were interested enough to learn that one planet had a ring around it and that others had five and six moons circling them.

With the oral lesson, the children could not visualize the size of the moon or decide if it was larger or smaller than the earth. Size is always a problem with young children, but when they cannot even see a representation of the actual object, their concept is very vague indeed. A few of the boys guessed at the correct answer but their reasoning was erroneous. They said that the moon was smaller than the earth because it did not look very big in the sky.

As with other oral lessons, the childrens attention span was very short and they were not very anxious to discuss the universe since it was not "close" to them and had no immediate connection with their lives. When any interest was shown in answering a question, it was because the topic was connected with some "outer space" story on television or in a comic book. Another way of saying that only concepts that have their basis in experiences can be meaningful.

TABLE IX

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSON ON THE MOON

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after Traditional Presentation	Audio-Visual Presentation
70 - 80	6½-8	9½-11	70%	80%
75 - 80	6 -6½	8 - 8½	40%	60%
50 - 70	5½-6	7½-11	20%	30%

One of the lessons that involved the use of direct contact with the subject under discussion was that of the topic of wool. The lesson was taught at the time of the "Halifax Winter Fair" and so the children had the opportunity of seeing the various types of sheep, their care, and a demonstration of shearing. Through a movie there also, they were able to see the processes wool is put through before it reaches its end as clothing. Two women demonstrated the "old" methods of carding, spinning and weaving the wool.

This "trip" caused the children to do follow-up work on their own. They borrowed story books from the library about sheep and the types of machines that are used to process wool. They made a blackboard mural, with a little direction from the teacher, and brought in bits and pieces of yarn and woolen material. For weeks afterwards I had to tell each child if the clothes he wore that day were made from wool.

The boys had difficulty in answering such questions as, "How long does it take the wool to grow back on the sheep?" and, "From where does most of our wool come?" The reason why the boys failed in their answers was because such questions were quite abstract and not founded in meaningful experiences. The boys had never seen the wool

being re-grown on a sheep or lived in the far distant land that supplies us with so much wool, so why should these concepts make any impression upon their minds.

After the lesson was taught orally, such questions were not answered correctly at all, for the boys did not even have the benefit of remembering a map or the pictures of a sheep in its various stages of re-growing its wool. Although we discussed the procedure of manufacturing wool, the boys could not seem to "keep straight" what process belonged to what name. As would be expected, attention began to lag until the lesson had to be brought to a close.

The children were not interested in discussing the lesson the following day. The concepts seemed to be too much for them and they did not want to try and fail again. Interest and enthusiasm were nil and only negative attitudes were formed towards the subject.

Audio-visual aids again introduced and clarified concepts and made learning enjoyable. Perhaps even more important is the fact that the students became motivated to learn more and broaden their knowledge.

TABLE X

RESULTS OF THE QUESTIONNAIRE

FOR THE LESSONS ON WOOL

I. Q.	M. A.	C. A.	Percentage of Questions Answered Correctly after — Traditional Presentation	Audio-Visual Presentation
70 - 80	6½-8	9½-11	70%	80%
75 - 80	6 -6½	8 - 8½	40%	70%
50 - 70	5½-6	7½-11	20%	50%

There has been considerable disagreement as to why audio-visual aids (films especially) are effective with children of lower intelligence.

Hoban feels that the difference in the reactions of "dull" and "bright" students to films is in the kind of materials to which the response is made, not in the kind of response. For example, slower students are frequently not responsive to books or verbal devices but may respond well to pictorial materials.[35]

> Because films are less abstract than words and because "dull" students by definition have less abstract ability than do bright students, it does not follow that films are better for "dull" than for "bright" students. They serve the same essential function of presenting visual data for observation and for interpretation.[36]

Wise, however, concluded that films were of a particular value to students of the lowest ability in gaining information and to students of highest ability in acquiring spirit or atmosphere.

Arnspiger's studies indicate that audio-visual materials are a means of bridging inequalities of pupils experiences, and to a limited extent, pupil ability. His research shows that sound motion pictures made distinct

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[35]Wittich and Fowlkes, p.14.

[36]Ibid., p.14.

contributions to the learning of pupils of below average intelligence. If films are wisely selected and properly used, he felt they could have important and far-reaching values for slow learners. Even such things as attitudes and behaviour patterns Arnspiger found to be greatly influenced.[37]

Other names such as Westfall and Consitt, join those of Wise and Arnspiger in the claim that pupils with a low I. Q. gain more information from seeing sound and silent pictures than pupils with a high I. Q. Wittich and Fowlkes feel that this is due largely to the casual and traditional methods of using motion pictures. They say that,

> Because of these methods the pupil with a high I. Q. has not been sufficiently advised or motivated, whereas the pupil with a low I. Q. has found the novelty of the situation and the freedom from being bound by reading inadequacies such an incentive that he has shown himself a superior observer.[38]

It has been found that where effectiveness is considered in terms of verbal response to information tests, films seem to be more effective for dull than for bright pupils. With regard to ability in making verbal generalizations and discriminations, bright pupils are better.[39]

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[37] Encyclopedia Britannica Library Research Service, Instructional Aids and Retarded Children, (Illinois: Encyclopedia Britannica Inc., 1967).

[38] Wittich and Fowlkes, p.66.

[39] N. B. Henry, Audio-Visual Materials of Instruction, Forty-eighth Yearbook of the National Society for the Study of Education, Part I, (Illinois: University of Chicago Press, 1949), p.269.

I am not going to quibble over the question of whether films are more beneficial for "bright" or "dull" pupils. The point is, that children with mental handicaps seem to learn more through the use of films than they would through traditional methods.

Most of the experiments to prove the effectiveness of audio-visual aids with retarded children have been done with films or film strips. Some educators from their personal observations and experiments, have found other devices to be of value.

In his comment upon the memory of the retarded, Tredgold said:

> In their tenacity of their memory for things which are really understood, I have been unable to satisfy myself that feeble-minded are at all inferior to normal children and many of them retain items of knowledge which have been demonstrated by concrete examples, as in object-lessons, remarkably well.[40]

Let us now attempt to explain why audio-visual aids are effective and indeed necessary for retarded children.

Wallin stresses the need for concrete, objective procedures, because, "Children who are seriously retarded are 'thing-minded,' 'eye-minded,' and 'ear-minded' rather than 'word-minded' or 'thought-minded.'"[41]

Therefore, he stresses that the child be given materials, demonstration experiences and projects, rather

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[40] Tredgold, p.170.

[41] Wallin, p.188.

than words, symbols, descriptions, rules and abstractions. As we mentioned earlier in this paper, the retarded are less endowed intellectually than the average and so their mental maturation process is impaired; this in turn causing their ability for abstract thinking to be limited. The approach for learning then must first be through the practical and concrete, progressing very slowly, step by step towards the abstract

> By means of suitable impressions through eye, ear, skin, muscle, nose and mouth, the range and delicacy of the sensorium is increased, the brain rendered more receptive; the power of discrimination as well as motor response, encouraged and a basis supplied for future thoughts and ideas.[42]

Concrete activities and materials hold the interest and attention of all levels of intelligence because they appeal to the senses. Retarded children are especially enraptured with them because they are simple and direct and easily understood. In the face of an incomprehensible abstraction, the children lose interest immediately because they do not have the slightest idea of the question under discussion. As Tredgold once noted:

> The whole object of the teacher is to reduce the environment of the child to a form which the deficiency of his mind is capable of assimilating; at the same time taking care that his mental pabulum is administered in an attractive shape.[43]

This "attractiveness" is very important in the

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[42]Tredgold, p.435.

[43]Ibid.

teaching-learning situation, since it focuses the child's attention upon the material to be conquered and so he becomes interested and motivated in beginning an inquiry into the project. Sands has said that audio-visual methods seem to "evoke the maximum response of the whole organism to the situation in which the learning is done."[44]

By providing memorable experiences, audio-visual aids cause material and situations to become indented in the child's mind. An exciting, stimulating situation, and/or one that the child can connect with his own experiences will make learning enjoyable and meaningful.

Verbal thinking is abstract, symbolic thinking. Words are symbols whose visual appearance and sound are unlike the things symbolized. But, by association, words come to represent the things they "stand for" and eventually they replace the concrete images. This process is very difficult for a child of average intelligence, but for the mentally deficient one, it is an almost insurmountable task. It is extremely difficult to associate the verbal symbol with its object. If the word is not associated with the things or process, then no definite meaning is conveyed or else the meaning is distorted or erroneous. Experiencing the object itself is the best way to ensure that a reasonably accurate concept is obtained.

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[44]Lester B. Sands, Audio-Visual Procedures in Teaching, (New York: Ronald Press Co., 1956) p.11.

Audio-visual devices, because they are directly experienced, present problem situations which the child can easily understand and which are a greater motivation toward achieving mastery than merely reading or guessing at possible solutions.

A child may be as satisfied with the solution 6 + 8 = 13 as with 6 + 8 = 14, unless a breakdown is produced in his experience for checking reality by means of some form of concrete experience.[45]

Audio-visual aids, if used properly help the retarded child progress from the known to the unknown, since the concrete materials aid in the faster understanding of more abstract facts. Presenting the knowledge by sequential steps, one idea at a time, prevents inhibitions as well.

Slow learning children have been thwarted and disillusioned so many times that they lack confidence in their ability to handle even simple tasks. By using audio-visual devices, such children are given material that is simple and understandable. Once they find success in dealing with a relatively obvious idea, a somewhat more involved concept can be added. This "building" process increases self-confidence and helps overcome or prevent other inhibitions. For example, a child, because he does not know his number concepts may not volunteer any answers as to the number of children in his class or the number of story books he has at home. Once he has mastered the

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[45]Wallin, p.189.

concept of "one" and "two", he feels as if he can learn the higher concepts. Audio-visual devices such as the abacus, spool-board, flannel-board, picture and numeral cards all could be utilized to help such a child get his "head-start."

Audio-visual aids help the retarded child to transfer knowledge from one situation to another. Perceiving and/or listening to materials will make the slower child more aware of the similarities of situations and so more adept at drawing generalizations and seeing relationships. If children see films of the various types of bears, they will eventually abstract the characteristics of a bear and be able to use these points as "guide-lines" to determine what animals are and are not bears.

Audio-visual aids are drill materials in themselves. Since a variety of experiences can be used to convey the meaning of a concept, the repetition of "the same thing said in different ways" will help the child grasp the idea.

Because retarded children are as individual and different from each other as "normal" children are, there may be certain devices, materials or situations that are appealing and comprehensible to some of the students but not to others. For example, some children may grasp the concept of "carrying" or "bridging" through the use of sticks, whereas others might find the "counting men" more understandable.

To ensure that there is as little chance as possible of misunderstanding or error, materials can be used to check

to see if the lesson and aids have made their point.

> Learning is reinforced through using a variety of sense modalities - visual, vocal, auditory and kinesthetic.[46]

Drill does not seem boring with audio-visual devices since they are attractive and interesting to the eye and ear. We do not mind repeating something that is enjoyable since satisfaction is still derived from it.

As a review and/or a drill method, audio-visual aids stimulate the somewhat "latent" minds of the retarded and give learning a chance to begin.

Many sub-average children live in "dream worlds" and do not see the way things really are. School instruction seems to be unrelated and distant from actual situations and experiences, and for this reason, retarded children have difficulty with connecting and adapting things "learned" in school with things in the outside world. Audio-visual "tools" add concreteness and realism to learning, thus helping to close this gap. Many of the materials are the actual objects or else replicas, and representations of the original, so that children begin to see the relationship of these devices with those similar objects or situations in reality.

Because retarded children in general have not had the advantages of a stimulating home and social environment,

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[46]Kirk, p.121.

they have a limited background of experiences. Their knowledge about the world and the lives of other people is very poor, and if it were not for television, such children would never even hear about such things as Indians, cities the size of Tokyo and New York, hydroplanes and space travel, since they do not have the initiative to go to libraries and demonstrations, to read and hear about them. The low intelligence of the retarded makes them happy and contented with the knowledge they possess thus they experience no need for further education. Audio-Visual aids show the "slow" child new things and help him have new experiences so that he can learn more and become motivated to carry his inquiries on further.

Retarded children, because of their difficulty with abstractions, find such things as chronology and sequence difficult to understand. Through such devices as films, visual games, series of pictures, the idea of one thing or event following upon another begins to be conceived. Gradually the child is led to the somewhat abstract concepts regarding time and order, such as what meal he has when he gets up in the morning and what one follows it. Later he is given more difficult abstractions, such as the order of seasons of the year, months, and what year came before another.

Audio-Visual devices are also an aid in "affective" learning. The attitudes, tastes and morals of the "mentally handicapped" are not always desirable or

acceptable to society. They can be shown through plays, movies and dramatizations the attitude of the law and society towards deviates. Films and demonstrations that do not point out the "crimes" of the young but show them how to behave and "fit-in" are much more profitable than those that always display the negative points of the adolescent.

Partly because of their background and partly because of their inability to reason and judge for themselves, the retarded are superstitious and easily indoctrinated into "wrong thinking." An unscrupulous person can easily lead an individual of low-mentality into a "life of crime." Retarded children cannot reason enough to see the "loop-holes" in fallacious agreements and so they go along with "wise" sounding advice. Films especially can indent in a retarded child's mind the "right" ideas and beliefs. Superstitions about races, certain religious or political groups, customs and the like can be explained and understood by examining the people or thing in close perspective through direct experiences, (for example, bringing a representative of the race into the classroom or by seeing movies and pictures about the lives and philosophies of the people),

The retarded child is sensitive to the problems of others - perhaps because he, more than an "average" child, associates himself with the person in distress. A child who is a petty-thief may think twice about his behaviour

when he sees a movie about the difficulty another child has with the same problem. Also because of this sensitivity, a retarded child can be aroused to help and fight for those who are incapable of helping themselves. Once a problem is realized, a retarded child will try his utmost to make the situation well again.

Basically then, Audio-Visual "tools" serve the same purposes for retarded children as they do for children of average intelligence. The difference lies in the fact that retarded children need such materials more if they are to learn.

CHAPTER VI

SUMMARY AND CONCLUSION

In this thesis, I have attempted to examine the effectiveness of audio-visual aids with retarded children. I have seen that the studies made by early educators in this field were accomplished through time spent trying to train and educate those individuals of limited intelligence. Even the pioneers in this area found that "slower" children learned more and better through materials and devices that called upon the senses of sight and hearing especially.

I investigated how people learn and the problems encountered in the teaching-learning process, and so it was endeavoured to show how audio-visual aids help make learning easier and more effective.

In order to understand the type of children I was dealing with, it was decided to give a general description of "mental retardates" and then a somewhat more restricted one of the children who took part in the classroom experiment. As was mentioned, all children are individuals and so different from one another. Retarded children are no exception to this "rule". They, perhaps more than "normal" or "average" children cannot be neatly categorized and classified. However, I attempted to show that because

of their low I. Q., retarded children have certain characteristics in common that enables us to roughly determine methods and materials for their use.

Such materials are the tools of learning called "audio-visual aids." They are designed for the "young" child since his powers of dealing with words and other abstract symbols have not yet been developed. The retarded child is "young" mentally since his mental age may be only that of a 5 or 6 year old. Through experiments with some lessons taught first with traditional methods and later with audio-visual devices and other lessons taught with aids and then with the oral method, it was found that retarded students learned more and remembered longer when they were added by audio-visual devices.

Children with I. Q's. between 50 and 70 (mental ages of 5½ - 6) answered correctly on the average, between twenty and thirty percent of the questions asked after the oral lesson. After the audio-visual lesson they answered between forty and fifty percent correctly.

Those individuals a little higher up on the scale with I. Q's. of 75 - 80 (mental ages of 6 - 6½) raised the percentage of questions they had answered correctly after the oral lesson from that of forty and fifty percent to averages of sixty and seventy percent, following the audio-visual lesson.

The "top" group of students, those with intelligence

scores between 70 and 80 (mental ages between 6½ - 8) averaged between sixty and seventy percent of questions answered correctly after the oral lessons. After the audio-visual lesson they generally scored between eighty and ninety percent correct.

It was found that the lower the childs I. Q., the more difficulty he had in answering thought-provoking and abstract questions. Because of his very limited reasoning ability, a child with an I. Q. of 50 cannot be expected to handle involved, general concepts. Everything has to be very simple and straight forward or else he becomes lost.

The converse of this is, of course, the higher up on the intelligence scale that an individual is, the more adept he is in analyzing problems and drawing conclusions. The boys who score between 70 and 80 on I. Q. tests draw more upon past experiences and try to incorporate this knowledge into the present situation than do the more "retarded" children.

With all of the boys, I discovered that the questions they were best able to answer after the oral lessons were those that had their "grounding" in personal experiences. For example, although all of the children had had different experiences with fire, they knew that fire could be a "good friend or a bad enemy" depending upon its use.

There seemed to be little carry-over from lessons that had been taught orally. The boys were not interested enough in the subject to desire any further investigations or lessons. On the other hand, when the same topic was taught with the aid of audio-visual aids, the children became interested and enthused and demanded more lessons on the same subject and related subjects.

Although it cannot really be proven, I feel that the attitudes and dispositions of the boys improved when the lessons were aided by audio-visual devices. Aggressions and frustrations "took a back-seat" when an appealing movie or concrete aid was under examination. The students became so interested and enthralled with the device and what it represented, they forgot their personal grudges and problems.

In past years I do not think that the children had been exposed to many teaching tools of the type I used, since they seemed so surprised and thrilled at their appearance. After the novelty of audio-visual devices had worn off (prior to any of the lessons used in the experiment) the boys began to take them for granted since they made learning so much easier and more enjoyable. When the oral lessons were taught without these "tools," the children were quite aware of the omission and tried to compensate for my "forgetfulness" by volunteering to draw pictures of the subject on the board or bring in samples or articles connected with the lesson.

Audio-visual aids then did prove to be an effective tool in learning for retarded children. We have seen by the questionnaire that they increased the quantity of learning. I think they also increased the quality of learning for the boys seemed to reach a greater depth in their studies of the various subjects and so seemed to develop more clear and precise concepts.

Audio-visual aids help children of "average" and "above average" intelligence to learn better. These individuals do not need such devices as much as the retarded child. His "concrete" mind and the concrete devices and experiences are well suited.

APPENDIX A

QUESTIONNAIRE ON MAGNETS[a]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What will magnets pick up?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
What are these things made of?	0	0	X	0	0	X	X	X	X	X	X	X	X
	0	0	0	0	0	0	0	X	0	0	0	0	0
Are magnets all the same shape?	0	0	0	0	X	X	X	X	0	X	0	0	0
	0	0	0	0	0	0	0	0	0	X	0	0	0
What will magnets pull through?	0	0	X	0	X	X	X	X	X	X	X	X	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
Are all magnets the same strength?	0	0	0	0	0	0	0	0	X	X	0	0	X
	0	0	0	0	0	X	0	0	X	X	0	0	X
Where is the pull of the magnet greater?	0	X	X	X	X	X	X	X	0	X	X	X	X
	0	0	0	0	0	0	0	X	0	X	X	0	X
How do magnets help at home?	0	0	0	0	0	X	X	X	X	X	X	X	0
	0	0	0	0	0	0	X	X	0	0	X	X	0
Are the ends of a magnet the same?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	0	X	0	X	0	X	X	X	X	X	0	X
Do the same ends or opposite ends attract?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	X	X	X	X	X	X	X	X	X	X	X	X
Where do you see magnets outside your home?	X	0	0	0	0	X	0	X	X	X	X	X	0
	X	0	0	0	0	X	0	X	X	X	X	X	0

[a]The first row beside each question designates lessons taught in November (without audio-visual aids), and the second row designates those lessons taught in March (with audio-visual aids). The "X" represents questions answered incorrectly, and the "0" those answered satisfactorily.

APPENDIX B

QUESTIONNAIRE ON SUN[b]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What star do all the planets travel around?	X	X	0	0	X	X	X	X	X	X	X	X	X
	0	X	0	0	X	X	0	X	X	X	X	0	0
Where does the sun get its light?	X	X	X	X	X	X	X	X	X	X	X	X	X
	0	0	0	0	0	0	0	X	0	0	0	X	0
What does the sun give the earth?	0	0	0	0	0	0	0	X	X	X	0	0	X
	0	0	0	0	0	0	0	0	0	0	0	0	0
What else does the sun give the earth?	0	0	0	0	0	0	X	X	X	X	0	0	X
	0	0	0	0	0	0	X	X	X	X	0	0	0
When do we have daylight?	X	X	X	0	X	X	X	X	X	X	X	X	X
	X	X	X	0	0	X	X	X	0	X	X	X	X
When do we have night?	X	X	X	0	X	X	X	X	X	X	X	X	X
	X	X	X	0	0	0	X	X	X	X	X	X	X
Is the sun larger or smaller than the earth?	0	0	0	0	0	0	0	X	0	0	X	X	0
	0	0	0	0	0	0	0	X	0	0	0	0	0
What causes shadows?	0	0	0	X	0	X	X	X	0	X	X	0	0
	0	0	0	0	0	0	0	X	0	X	X	0	0
How does the sun help us?	0	0	0	0	0	0	0	0	0	0	0	X	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
How does the sun harm us?	0	0	0	0	0	0	0	0	0	X	0	X	0
	0	0	0	0	0	0	0	0	0	0	0	0	0

[b] The first row beside each question designates lessons taught in November (without audio-visual aids), and the second row designates those lessons taught in March (with audio-visual aids).

APPENDIX C

QUESTIONNAIRE ON LOBSTER FISHING[c]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What does a lobster look like?	0	0	0	0	0	X	0	X	0	X	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
How is a lobster caught?	0	0	0	X	0	X	X	X	X	X	X	X	X
	0	0	0	0	0	0	0	0	0	0	0	0	0
What is a lobster "pot" like?	0	X	0	X	0	X	X	X	0	X	X	X	0
	0	0	0	0	0	0	X	0	0	0	0	0	0
What color are live lobsters?	0	0	X	0	0	X	0	X	X	X	0	0	X
	0	0	0	0	0	X	0	X	0	X	X	0	0
How are lobsters killed?	0	0	0	0	X	0	0	X	X	0	X	X	X
	0	0	0	0	0	X	0	0	0	0	0	X	0
Why are lobsters "pegged"?	0	X	X	X	X	X	X	X	X	X	X	X	X
	0	X	0	X	0	X	X	X	X	X	X	X	X
Where is the lobster taken after it is caught?	X	X	X	X	X	X	X	0	X	X	X	0	X
	0	0	0	0	0	0	0	X	0	0	0	0	0
What are lobsters used for?	0	0	0	0	0	0	0	X	0	0	X	0	0
	0	0	0	0	0	X	X	X	X	X	0	0	0
Could we catch a lobster from a wharf?	0	0	0	0	0	0	0	X	X	X	X	0	X
	0	0	0	0	0	0	0	X	X	0	0	X	X
Show me how big a lobster is?	0	0	0	0	0	0	X	0	0	X	X	X	0
	0	0	0	0	0	0	X	0	0	X	X	X	0

[c]The first row beside each question designates lessons taught in November (without audio-visual aids), and the second row designates those lessons taught in March (with audio-visual aids).

APPENDIX D

QUESTIONNAIRE ON COTTON[d]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
From where does cotton come?	X	0	0	0	X	X	0	X	X	X	X	X	X
	0	0	0	0	0	0	0	X	0	X	0	0	0
How does the cotton grow on the plant?	X	0	0	0	0	0	0	X	X	X	X	X	X
	0	0	0	0	0	0	0	0	X	0	0	X	0
What is done with the cotton after it is picked?	0	0	0	0	0	0	0	0	X	X	X	0	0
	0	0	0	0	0	0	0	0	0	X	0	0	0
How are the seeds removed?	X	0	X	X	X	X	X	X	X	X	X	X	X
	X	0	0	X	X	X	X	X	X	0	X	X	X
What is spinning?	X	X	X	0	0	X	X	X	X	X	X	X	X
	0	X	X	0	0	X	X	X	0	X	X	0	0
What is weaving?	0	X	X	0	0	X	X	X	0	X	X	X	X
	0	0	0	0	0	0	0	0	0	0	X	X	0
What little insect can eat the cotton plant?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	X	X	0	0	0	X	X	X	X	X	X	X
What is cotton used for?	0	0	0	0	0	0	0	X	X	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
Why can't we grow cotton here?	0	0	0	0	X	0	X	0	0	0	0	0	0
	0	0	0	0	X	0	X	X	0	0	0	0	0
Is cotton still picked by hand?	0	X	0	0	0	X	X	X	X	0	0	0	0
	0	0	0	0	0	0	0	X	X	0	0	0	0

[d]The first row beside each question designates lessons taught in November (without audio-visual aids), and the second row designates those lessons taught in March (with audio-visual aids).

APPENDIX E

QUESTIONNAIRE ON INSECTS[e]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What are the three parts of an insect's body?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	X	X	X	X	X	X	X	X	X	X	X	X
What are the two antennae called?	X	X	0	0	X	X	X	X	X	X	X	X	X
	0	0	X	0	0	0	0	X	X	X	0	0	0
How many legs does an insect have?	X	0	0	0	0	X	X	X	X	X	X	X	X
	0	0	0	0	0	0	0	X	0	X	X	X	X
Do all insects crawl?	0	0	0	0	0	0	0	X	X	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
Name some insects that crawl?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
What are the stages in an insect's growth?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	0	0	0	X	X	X	X	X	X	X	X	X
How do insects help us?	0	0	0	0	0	0	X	X	0	X	X	X	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
How do insects harm us?	0	0	0	0	0	0	X	X	X	X	X	X	X
	0	0	0	0	0	0	0	0	0	0	0	0	0
Where do insects live in the Winter?	0	0	0	0	0	X	0	X	X	X	X	X	X
	0	0	0	0	0	X	X	X	X	X	X	X	X
Name some insects that fly?	0	0	0	0	X	0	X	X	0	0	X	X	0
	0	0	0	0	0	0	0	0	X	0	0	0	0

[e]The first row beside each question designates lessons taught in November (without audio-visual aids), and the second row designates those lessons taught in March (with audio-visual aids).

APPENDIX F

QUESTIONNAIRE ON COAL[f]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What is coal?	0	0	0	0	0	0	0	0	0	0	0	0	0
	X	0	0	0	0	0	0	X	0	X	0	0	0
From where do we get coal?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	X	X	X	X	0	X
How is coal made?	0	0	0	0	0	X	0	0	X	X	0	0	X
	0	0	0	0	X	X	X	X	X	X	X	X	X
How do we get coal from the mines?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
What is coal used for?	0	0	0	0	0	0	0	X	0	X	0	0	0
	0	0	0	0	0	0	0	0	X	0	X	0	X
What is left from coal after it is burned?	0	0	0	0	0	X	X	X	X	0	X	0	0
	X	0	0	0	0	X	X	X	X	X	X	X	X
Why don't we use coal more than oil for heat?	0	X	0	0	X	X	0	X	X	0	X	X	0
	0	0	0	0	X	X	0	X	X	X	X	X	0
What other things besides fuel is coal used for?	X	0	0	0	0	0	X	X	X	X	X	0	0
	X	0	0	0	X	0	X	X	X	X	X	X	X
Do we have coal mines here? Where?	X	X	X	X	X	X	X	X	X	X	X	X	X
	X	X	X	X	X	X	X	X	X	X	X	X	X
Is mining dangerous? Why?	0	0	0	0	0	0	0	0	0	X	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0

[f]The first row beside each question designates lessons taught in November (with audio-visual aids), and the second row designates those lessons taught in March (without audio-visual aids).

APPENDIX G

QUESTIONNAIRE ON PLANTS[g]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
Are plants alive?	0	0	0	0	0	0	0	X	0	0	0	0	0
	0	0	0	0	0	0	0	X	0	0	X	X	X
How do we know	0	0	0	0	0	0	0	X	0	0	X	0	0
plants are alive?	0	0	0	0	0	0	0	X	0	0	X	X	X
What do plants	0	0	0	0	0	0	0	0	0	0	0	0	0
grow from?	0	0	0	0	0	0	0	X	0	X	0	0	0
What do they	0	0	0	0	0	0	0	X	0	X	0	X	X
need in order to	0	0	0	0	0	0	0	X	0	0	0	0	0
grow?													
What kinds of	0	X	0	0	0	0	X	X	X	X	X	X	X
plants are there?	0	0	0	0	0	X	X	X	X	X	X	X	X
Are all plants'	0	0	0	0	0	0	0	X	X	X	X	0	0
flowers?	0	0	0	0	0	X	X	X	X	X	0	X	0
Name some foods	0	0	0	0	0	0	0	0	X	0	0	0	0
that we get	0	0	0	0	0	0	0	0	0	0	0	0	0
from plants?													
What happens to	0	0	0	0	X	X	X	X	0	X	X	X	X
plants in the	X	0	0	0	X	X	X	X	X	X	X	X	X
Winter?													
What happens to	0	0	0	0	0	0	0	0	X	0	X	0	0
plants in the	0	0	0	0	0	0	0	X	X	X	X	X	X
Spring?													
What veggtable	X	0	0	0	0	0	0	0	0	X	0	0	0
plants do we	X	0	X	0	X	0	X	0	X	X	X	0	0
grow here?													

[g]The first row beside each question designates lessons taught in November (with audio-visual aids), and the second row designates those lessons taught in March (without audio-visual aids).

APPENDIX H

QUESTIONNAIRE ON FIRE[h]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
What does fire need in order to burn?	0	0	0	0	0	0	0	X	X	X	X	0	0
	0	0	0	0	0	X	X	X	X	X	X	X	X
Why do we fan a fire to get it started?	0	0	0	0	0	X	X	X	X	X	X	0	X
	0	0	0	0	0	X	X	X	X	X	X	X	X
How does sand put a fire out?	0	0	0	0	0	0	0	X	X	X	X	X	X
	0	0	0	0	0	0	0	0	X	X	X	X	X
Why did the fire last longer on the candle that had the larger covering over it?	0	0	0	0	0	0	0	0	X	0	0	0	0
	0	0	0	0	0	X	X	X	X	X	X	0	0
How should a fire be put out?	0	0	0	0	X	0	0	0	0	0	0	X	0
	0	0	0	0	0	0	0	X	X	0	0	X	0
What does a fire extinguisher do?	X	X	X	X	X	X	X	X	X	X	X	X	X
	0	0	0	0	0	X	X	X	X	X	X	X	X
What would you do if your clothing caught on fire?	0	0	0	0	X	0	0	X	0	0	0	0	0
	0	0	X	0	0	X	0	0	0	0	X	0	X
Is fire a good friend? Why?	0	0	0	0	0	0	0	X	0	0	0	0	0
	0	0	0	0	0	0	0	X	X	X	X	0	0
Is fire a bad enemy? Why?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
How should we be careful with fire?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	X	0	0	0	0	0	0

[h]The first row beside each question designates lessons taught in November (with audio-visual aids), and the second row designates those lessons taught in March (without audio-visual aids).

APPENDIX I

QUESTIONNAIRE ON THE MOON[1]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
Is the moon bigger or smaller than the earth?	0	0	0	0	0	0	X	X	X	X	X	X	X
	0	0	0	0	X	X	X	X	X	X	X	X	X
What is the moon made of?	0	0	0	0	0	0	X	X	0	X	X	0	0
	0	0	0	0	0	0	0	X	X	X	X	0	X
Where does the moon travel?	0	0	0	0	0	X	0	X	0	0	X	0	0
	X	0	0	X	X	X	X	X	X	X	X	X	X
Could we live on the moon?	0	0	0	0	0	0	0	0	0	X	0	0	0
	0	0	0	0	0	0	X	X	0	0	0	0	0
What does the moon give us?	0	0	0	0	0	0	0	0	X	0	0	0	X
	0	0	0	0	0	X	X	X	X	X	X	X	X
Do we see all of the moon?	0	X	0	X	X	X	X	X	X	0	X	0	0
	0	X	0	X	X	X	X	X	0	X	0	X	X
Is the moon always the same?	0	0	X	0	X	0	0	X	0	0	X	0	0
	0	X	X	0	X	X	0	X	X	X	0	0	0
Is there more than one moon?	X	0	X	X	X	X	X	X	X	X	X	X	X
	0	X	X	X	X	X	X	X	X	X	X	X	X
Has anyone ever landed on the moon?	0	0	0	0	0	0	0	0	X	X	0	X	X
	0	0	0	0	X	0	0	0	X	X	X	X	X
Could we walk around on the moon like we do on earth?	0	0	0	0	0	0	0	0	X	0	0	0	0
	0	0	0	0	0	0	X	X	X	0	X	0	X

[1]The first row beside each question designates lessons taught in November (with audio-visual aids), and the second row designates those lessons taught in March (without audio-visual aids).

APPENDIX J

QUESTIONNAIRE ON WOOL[j]

CHILD NO.	3	4	7	8	1	10	13	6	2	11	12	9	5
Where does wool come from?	0	0	0	0	0	0	0	X	X	0	0	0	0
	0	0	0	0	0	0	0	X	X	X	X	0	0
How does the farmer get the wool from the sheep?	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	X	0	0	0	X	0
What happens to the wool after it is sheared?	0	0	0	0	0	0	0	0	X	0	0	0	0
	0	0	X	X	X	X	X	X	X	X	X	X	X
What is "carding"?	X	0	0	0	0	X	0	X	X	X	X	0	X
	0	0	0	X	X	X	X	X	X	X	X	X	X
What is spinning?	0	0	0	0	0	0	0	0	0	X	X	X	X
	0	0	0	0	0	X	X	X	X	X	X	X	X
What is weaving?	0	0	0	0	X	X	0	0	X	0	X	0	X
	0	0	0	0	0	0	X	X	0	X	X	0	X
What is wool used for?	0	0	0	0	0	0	0	X	0	0	0	0	0
	0	0	0	0	0	0	0	0	X	X	X	0	0
How long does it take the wool to grow back on the sheep?	X	0	0	X	X	X	X	0	X	0	X	0	X
	X	X	X	X	X	X	X	X	X	X	X	X	X
Why aren't our woolen clothes gray or white like the sheep?	0	0	0	0	0	0	0	X	X	X	0	X	0
	0	0	0	0	0	0	0	X	0	X	X	X	X
From what place does most of our wool come?	X	X	X	0	X	0	X	X	X	X	X	X	X
	X	X	X	X	X	X	X	X	X	X	X	X	X

[j]The first row beside each question designates lessons taught in November (with audio-visual aids), and the second row designates those lessons taught in March (without audio-visual aids).

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