DOCUMENT RESUME

ED 145 808 IR 004 962

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TITLE	The Language of Media and the Cultivation of Mental Skills. A Report on Three Years of Research Submitted to the Spencer Foundation.
SPONS AGENCY	Spencer Foundation, Chicago, Ill.
PUB DATE	Jun 77
NOTE	132p.; For related documents, see ED 105 969 and 125 605 ; Parts are marginally legible due to type size
EDRS PRICE	MF-$0.83 HC-$7.35 Plus Postage.
DESCRIPTORS	*Cognitive Processes; *Communication (Thought Transfer); *Cross Cultural Studies; Educational Research; Elementary Education; Individual Differences; *Research Projects; Socioeconomic Status; *Television Research
IDENTIFIERS	*Israel

ABSTRACT

This report presents two research studies. The first, an experiment using 176 fifth graders, tested three hypotheses: (1) When content is held constant across messages, different formats of a medium differentially call for mental skills. (2) Formats which call for the same skills in different ways affect learners differently. (3) The TV formats identified as critical differentially interact with initial skill mastery in the service of knowledge acquisition. The results indicated that different formats differentially affect mental skills, that there is a different pattern of correlation between skills and knowledge acquisition within each format group, and that the kinds of skills a code calls for are partly dependent upon what the learner perceives as the task requirements. The second study was a cross-cultural comparison between Israeli and American samples of fourth and sixth graders. Four hypotheses were tested: (1) Literate exposure to TV correlates positively with mastery of the relevant mental skills. (2) Such correlations are to be found particularly among younger children. (3) A group with heavier exposure to TV also displays better mastery of the relevant skills, but not of the irrelevant ones. (4) Groups with similar amounts of exposure to TV but of different SES backgrounds have more similar levels of relevant skill mastery than other skills. The first three hypotheses were supported, though the fourth was not. The report concludes with the reconsideration of certain assumptions relative to codes. Statistical tables and sample test and questionnaire items are included. (WBC)

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THE LANGUAGE OF MEDIA AND THE CULTIVATION OF MENTAL SKILLS

by

Gavriel Salomon

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A Report on Three Years of Research
Submitted to the Spencer Foundation

June, 1977

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INTRODUCTION

For the last three and a half years our research efforts were devoted to the study of media, particularly television, as they affect the mastery of mental skills. These studies resulted from a previous series of experiments and a field study which dealt with similar questions. The present report summarizes the past three and one half years of research, which were supported by the Spencer Foundation. This report is final, and yet not-so-final, as the results of still another school-based experiment, are not included in it. Consequently, although we end this report offering a revised theory of media and cognition, we delay the drawing of conclusions and educational implication until after the results of the additional experiment will be analyzed.

Many changes have taken place in our thinking about media and cognition, as the project developed over the years since May 1973, when we submitted our proposal to the Spencer Foundation. These changes are reflected in the report. It opens with the original ideas formulated in 1972, and continues to follow, step by step, the developments as they occurred. The final chapter of this report is devoted to a revision of our initial theoretical formulations. The reader neither interested in the developments of our ideas nor in the technical details and specific findings of our studies, could satisfy himself by reading only that chapter.

Because we wanted to show the gradual development of our ideas, we included in this report, mutatis mutandis, parts of the original proposal, annual reports and journal articles which were written during the last three years. Many technical details were omitted from the report as well as a number of secondary statistical analyses, lest the report became too cumbersome.

I wish to thank two collegues of mine without whom the research and consequently also this report would have never seen light. Dr. Akiba A. Cohen of the Communication Institute at the Hebrew University was my close partner in carrying out the research. His devotion, and scientific understanding contirbuted to the research to such an extent that, in effect, he should be recognized as an equal co-researcher. My other collegue, Dr David Feldman of Tufts University, Eliot-Pearson Dept. of Child Study, served as a most valuable consultant to the research, as well as "our man in Boston". It was he who ran the American part of our cross-cultural study. Needless to say that without his help, no cross-cultural study could possibly have been carried out.

Last and not least, I wish to express my gratitude and appreciation to the Spencer Foundation, which not only supported this research by a grant, but also showed much understanding of the difficulties we encountered (the October war). Moreover, its open-minded and generous attitude enabled us to deviate from our original research plan and follow new lines which were not initially planned.

G.S.

1. GENERAL BACKGROUND[1]

Media, sometimes referred to as "instructional technology", are frequently expected to improve teaching and learning to a substantial extent. As the Report of the Commission on Instructional Technology has put it, "technology can make education more productive, individual, and powerful, make learning more immediate, give instruction a more scientific base and make access to education more equal" (1970). However, as Olson (1974a) writes, we know as yet neither how to describe the psychological effects of these technologies, nor how to adapt them to the purposes of education. In fact, if one is to judge by the results of research (e.g. Allen, 1971; Silberman, 1970), media have either negligible impacts or simply unknown ones.

It is quite possible that the impact of media on education is indeed negligible. But this is very likely the result of the ways in which media are currently used. One is reminded in this context of Oettinger and Marks' criticism (1968) of computer based instruction (CBI) which is supposed to cater to individual differences. CBI, they maintained, led to no significant progress not because it was incapable of doing so, but because it was put to unimportant usages.

The fact that media have a rather negligible impact does not imply, however, that we are facing inherent limitations of media. It is more likely an outcome of poor and superficial usages of media (e.g., Mielke, 1970). The same applies to the research accompanying the implementation of media. It failed to deal with the critical issues. As Gordon (1969) put it:

> "What we cannot calculate is the overall effect of this shift [to new media], and whether the right parts of subject matter disciplines have been transferred to these 'new' mediums. Most research in this area has been designed merely to measure the influence of technology (not mediums) upon academic grades, rather than determine the real differences between the mediums themselves" (p. 118).

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[1] The present chapter is taken from the original proposal, May 1973.

Indeed, the negligible impact of media was the result of both their relatively unimaginative use and our poor knowledge of their unique natures.[2]

The unique natures of media are not to be found, however, in their technologies of transmission. Both logic and the ever-present "non-significant differences" found in research on media suggest that the mere shift from one technology of transmission to another cannot account for any meaningful shift in educational outcomes. Consider the case of maps. When black children or children from a Moslem background were found to be poor map readers, they manifested difficulties with the symbolic code of the medium, not with the transmission (Salomon, 1969; Feldman, 1971). Consequently, the question of whether the maps were printed or projected is quite immaterial.

It is the symbolic, communicational attribute of media, rather than technological differences, which is assumed to make a significant difference in learning (Olson, 1974a). In addition we may assume, together with Pryluck and Snow (1967), that whenever unique symbolic attributes of media are used, unique learning outcomes may result.

Technologies of transmission and symbolic codes are, of course, associated with each other. The development of a new technology (e.g. film) opens the way for a new "language" to emerge (Ivins, 1953). This does not yet imply, however, that whenever the technology is in use, its unique "language" components are used. Hence the difference between a televised lesson and a television lesson. The former is a regular lesson transmitted via TV. The latter is a lesson which makes use of whatever uniqueness is offered by the medium.

It is unfortunate that hardly anything resembling the linguistic analyses of spoken languages is to be found in the field of media. There are, however, a few attempts to analyze the language of film (e.g., Pryluck, 1968), pictures (Kolers, 1969; Arnheim, 1974) and maps (Salomon, 1968). Although none of these are complete, they nevertheless make it rather clear that media do in fact have "languages", that these have different "grammars", and that they therefore could call upon different mental skills (e.g. Olson, 1974a; Garnder, Howard & Perkins, 1974). These skills are necessary for the extraction of information and for its processing.

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[2] We are not overlooking the few highly imaginative usages of media as in the case of Sesame Street. This, though, are the exceptions rather than the rule.

It is because of this that one can speak of "intelligence as skill in a medium" (Olson, 1970); that is, one's mastery of the skills required to extract and process information from a specific symbol system or medium. The fact that intelligence, as measured by standard tests, is conceived of as mainly verbal, is a corollary of both the dominance of verbal media in our culture, as well as the paucity of research into the non-verbal media of communication. Nevertheless, there is good reason to believe that media-related mental skills are of vital importance (e.g. Bruner, 1964).

Media-related mental skills are mental operations without which one cannot extract and properly process the information presented through a specific medium. The existence of such mental skills is corroborated by cross-cultural research (e.g., Hudson, 1967) and by theoretical considerations. Bruner (1964) writes:

> "Where representation of the environment is concerned it... depends upon techniques that are learned - and these are precisely the techniques that serve to amplify our motor acts, our perceptions, and our ratiocinative activities" (p. 2).

Moreover, as Bruner, Olver and Greenfield maintain:

> "Any implement system (amplifiers of human capacities) to be effective must produce an appropriate internal counterpart" (1966, p. 56).

It is as if some isomorphism between the external, communicational system and an internal, representational one, is implied. Indeed, Berlyne (1965) goes even further, suggesting a dual function of signs and symbols: they serve for external communication purposes and, at the same time, serve also internal representational ones.

This possible isomorphism has received little attention outside the realm of language. However, for many a researcher in that field, language and thought are closely associated. One of the ways in which the two are linked is the internalization of language to be used as "internal verbaliztion" - a vehicle of thought. This is clearly implied by the research and theoretical formulations of Kendler (1971), Vygotsky (1962) and others. According to Vygotsky language is internalized ("ingrowth") by the child to become "inner speech". Thought then becomes verbal, while speech becomes rational.

Roger Brown (1965), referring to the same phenomenon, states that -

> "Apparently an entity that can be efficiently transmitted from one member to another of the same linguistic community can be efficiently retained from one occasion to another by a single member of the community. When an effective message can be composed for others, an effective message can be composed for oneself. Encoding into the spoken language seems to be useful for information storage and retrieval". (p. 334)

Indeed, when Blank and Solomon (1968) suggested verbal tutoring of culturally disadvantaged children, their purpose was not to improve the children's language. Rather, they expected the verbal concepts to be internalized and used in thought.

There are other approaches to thought and language which oppose the internalization view. Fodor (1975), for instance, provides quite compelling arguments against this view, yet consequently cannot escape making the assumption that one has an internal representational system which is "innate". This view, labelled by Fodor himself as "scandalous" is criticized by Schlesinger (1977a, 1977b) who reformulates an alternative view, based on the assertion that language is, after all, internalized to become a tool of thought.

If language, a communicational symbol system, can be internalized to become a "tool of thought", and if media, other than language, have their own symbol systems, could they not be internalized as well? Moreover, could they not come to serve mediational (i.e., covert representational) functions similar to those accomplished by internalized language?

This question is of more than mere academic interest. If the answer is affirmative, entirely new ways to use media become available. Such new ways would exploit the unique attributes of media to facilitate the development of desirable mental processes.

Granting the presence of non-verbal codes in thought, and their possible generality as schematic figural operations, one is led to ask whether they can be internalized from a cultural source such as films or maps. The analogy with language suggests itself, but it may be misleading. While the young child is both an encoder of ideas into the language code, as well as a decoder of it, he has little opportunity (if any at all) to encode anything into, say, the code of film. With regard to most media he is but a decoder. Could he then internalize a code without any active usage of it? The question, in fact, refers to the process of learning which might account for such possible internalization.[3]

Piaget offers the mechanism of imitation to account for the creation of imagery. He says:

> "It thus becomes possible to view the image, even at the highest levels of representation, as interior imitation resulting from the ever present sensory-motor schemas... The accommodation of the perceptive activity form the image, which is thus interiorized imitation" (1962, p. 77).

This emphasis on imitation, as the main vehicle for the formation of images, is further elaborated on and empirically corroborated by Piaget and Inhelder (1971). Images, according to Piaget, are active copies of perception. However, in contrast to the notion of images as attenuated forms of perception or copies of reality, he considers them to be imitations of perception, meaning: active internalized reconstructions of perception.

It is interesting to note that in spite of the many recent studies on imitation, there is very little direct evidence (aside from the work of Piaget) to show that children, in fact, imitate non-human operations, transformations in space, and the like. However, there is no evidence to rule out such a possibility.

Undoubtedly, such learning could take place only if certain conditions are met. These conditions, such as duration of exposure, relative subjective novelty of the modelled operation, and the like, are discussed elsewhere (Salomon, 1972). More important, though, is the relationship between the medium-modelled code or operation, and the learner's cognitive make-up. Quite clearly, not all the operations which can possibly be shown on, say, film, are internalizable by all learners. Berlyne (1965) points out that just observing an operation does not assure its learning. Piaget (1964) makes this point a bit clearer. An operation, he claims, has to do with a transformation which is a part of a whole system. It has to "agree" in some way with the existing cognitive structures.

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[3] Recent work by H. Gardner sheds light on this issue.

Such "agreements" are difficult to determine because of obvious methodological obstacles.[4] But they can be inferred. Thus, for example, De Soto, London and Handel (1965) studied the relationship between reasoning and spatial ordering of the information. They reached the conclusion that "people have in fact a fateful predilection for linear orderings" of sylogistic problems. Linearly presented, such problems are "easier". The reason: there is some resemblance between the mode of reasoning and the mode of presentation. Travers (1965) makes a similar observation with special reference to line drawings. Their extraordinary value, he maintains, is due to the fact that they transmit information in compressed form which is compatible with the form of compression used by the nervous system. Bruner, in a number of places (e.g., Bruner et al., 1966) maintains that information - to be appropriately processed - needs to be presented in accordance with either the enactive, iconic or symbolic state of the learner's development.

In short, then, for media-codes, or for that matter - any media generated operations, to be internalized, some agreement with already existing structures is needed. Film appears to have precisely this quality. Munsterberg (1970, orig. 1916) describes this quality. Speaking of filmic close-up (a distinctive grammatical feature of the medium) he says:

> "The close-up has objectified in our world of perception, our mental act of attention and by it has furnished art with a means which far transcend the power of any theater stage" (p. 38).

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[4] D. Feldman is presently concerned with this question in his research.

He goes on to explain that while attention (akin to selection of information) is badly required in real life or in a theater play, it is done for us by the film which singles out for us the critical features. Similarly, the filmic techniques of flash-backs, quick cuts, etc., are seen by him as fusing information for us, in a way resembling what we would have done covertly without these techniques. Thus, he maintains: "The photoplay obeys the laws of the mind rather than those of the outer world" (p. 41).

In light of the preceding discussion we could raise a number of researchable questions, for example can a learner internalize an externally presented operation as a result of his exposure to a medium which "models" this operation for him? Given that the operation is part of the medium's code and is thus generalizable, could the learner incorporate it into his cognitive repertoire and use it as a mental skill? Thus, e.g., can the filmic zoom-in technique teach a child who has difficulty in discriminating salient cues to attend more selectively? Can slow motion techniques help an impulsive child to develop a more reflective mental pace (Lesser, 1972)?

To these we might add the following questions. Firstly, does such learning take place "naturally", that is, as a result of natural exposure to the media? Could this then account for differences in media-literacy? Secondly, could such learning be facilitated by deliberate emphasis on specific media attributes? Thirdly, could such learning be enhanced if learners are taught to encode ideas into the medium's code, thus make them communicate through it? Finally, what role do specific aptitudes play in the course of such learning?

The first set of three experiments and one field study, to be briefly reported below, were designed to provide initial answers to some of the above questions.

Related Research

Three experiments (fully described in Salomon, 1974a) were designed to answer the following major questions:

The first question was whether one's ability to visualize a certain operation and apply it to new instances could be improved by exposure to a filmic presentation which models it overtly (we called this function - supplantation). A second question concerned the differential improvement that could be observed, following such exposure, in learners who differ in their ability to perform the modelled operation on their own. A thi[illegible]n concerned the role that verbal ability plays in this kind of learning.

Two kinds of operations were selected for study. One was the operation of singling out details from a rich visual display, an operation which is well supplanted, or medelled, by the filmic technique of zooming-in on details (Munsterberg, 1970). Improvements of this operation were expected to be manifested on tests of cue-attendance. This operation was employed in the first and second experiments (N=80 and N=96 respectively). The other operation, employed in the third experiment (N=42) was that of laying-out solid objects. One's mastery of it is testable by one of Thurstone's tests. This operation differes from the preceding one by virtue of its being unrelated to the filmic code or "language". Zooming-in, unlike laying out objects, is a clear example of a filmic "language" component.

In all the experiments the operations were shown to ths Ss a number of times. In the first experiment, Ss were shown three films in which the camera zoomed-in on 80 details of Breughel paintings. In the second experiment the same procedure was followed, although the number of zoom-ins was reduced to 42 in each film.

In the third experiment, the laying-out of five solid objects was shown. Each object, once completely layed-out, gradually folded up again.

In all three experiments the modelling condition was contrasted with a "short-circuiting" (SC) on[illegible] That is: A condition in which Ss were shown the initial and final states of the operation, but not the operation itself. Thus, in the first and second experiments, Ss in the SC conditions saw slides depicting the whole painting and slides depicting details, but not the operation of zooming-in which connected the painting with any one of the details. In the third experiment Ss saw pairs of slides depicting an object and its layout, but not the operation of laying-out. It was hypothesized that initially able Ss would benefit most from the SC conditions since they could provide the missing operation.

Each experiment was preceded by pretests of the appropriate aptitudes: cue-attendance ability (experiments I and II), visualization ability (experiment III) and verbal ability (experiments II and III).

Results can be briefly summarized as follows:[5] Filmic supplantation had a significant effect on the Ss' ability to covertly execute the operation and apply it to new materials. Thus, in experiment I, those Ss exposed to the zooming-in films became significantly better cue-attenders as well as manifesting significantly more information search than either Ss in the "short-circuiting" conditions or control-group Ss. Similarly, in experiment III, Ss exposed to the lay-out film performed significantly better on Thurstone's test than the other Ss. In experiment II no such effect was observed, apparently due to the reduced amount of modelling.

These findings suggest that:

a) Learners can internalize operations overtly supplanted for them by film, and use them as mental skills in new situations, thus displaying specific cognitive changes;

b) This kind of learning applies to both an operation which is a very part of a medium's "language" (zooming-in experiment I), as well as to an operation which can be supplanted by film without being a necessary part of the medium's "language" (lay-outs in experiment III).

In addition to these average improvements, significant aptitude-treatment-interactions were found in two of the experiments. In general - Ss with poor mastery of the relevant aptitude benefited substantially from filmic supplantation but did not benefit from "short-circuiting" the operation.

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[5] Very similar results were obtained by Rovett (1975) who studied, among other things, the skill-cultivating effects of a film which supplanted spatial abilities à la Shephard.

On the other hand, Ss with relatively good mastery of the skill benefited from the "Short-Circuiting" condition but displayed depressed performance following exposure to the supplanting films. Figures 1 and 2 present the regression lines of post-over pretest scores for each experimental condition.

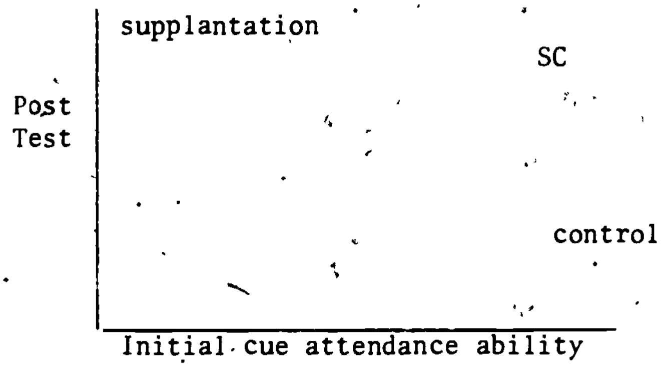

Figure 1: Results from Exp. I

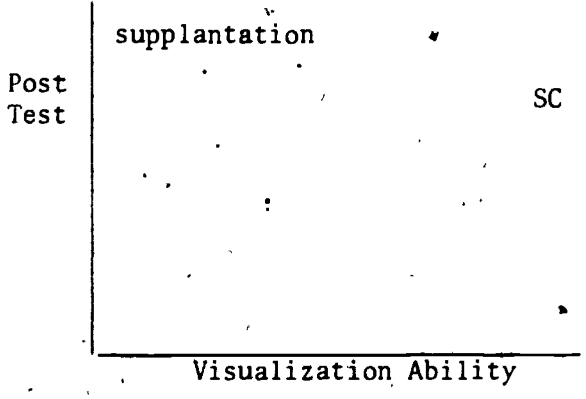

Figure 2: Results from Exp. III

These interactions suggest that:

c) While supplanting an operation very explicitly facilitates the development of the cognitive skill in the learner of poor initial ability, the one with better ability benefits more when allowed to covertly employ a relevant operation which he has mastered already (as is the case in the SC condition).

We witness here a dual instructional function of the medium: It can call upon specific mental operations, as in the SC conditions, and it can overtly supplant them, as in the modelling condition. While calling upon an operation further develops the operation in those Ss who have some initial mastery of it, supplanting the operation is beneficial only to those who have poor mastery of it. Finally, with regard to the role of verbal ability, it was found to either correlate negatively with learning from a modelling film (Exp. III) or not to correlate with learning at all (Exp. II). We are thus led to conclude that --

d) The kind of instruction studied in those experiments is particularly suited for low aptitude scorers, and possibly also for those of poor verbal ability.

The three experiments briefly reported above, were followed by a large field study. Some aspects of the field study bear directly upon issues considered here.

The study was designed to investigate the educational impact of the American TV Program Sesame Street on Israeli children.[6] One of the major aspects of the study was the impact of exposure to the program on children's "media-literacy", i.e., those mental skills which are needed for the extraction of information from the program and which may, at the same time, be developed as a result of exposure to it. Cognitive skills, assumed to be affected by the program were, e.g., the ability to see somebody else's point of view, ability to relate details to a "gestalt", ability to infer a logical sequence from an unorganized one, and the like.

The major hypothesis was that since the program utilizes the "language" of the medium to its utmost, and since Israeli children have had very little exposure to that style of TV by that time, particular mental skills of these children must undergo changes as a result of their exposure to the program.

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[6] For a detailed summary report of the study please see Salomon, 1974c.

A battery of "media-literacy" tests was developed, and children, aged 5, 7 and 8, were pretested on it (N=317). One-half of the sample was lower SES children while the other half was from middle-class homes. Once the program was aired, children's amount of exposure, enjoyment and comprehension was measured on six occasions. The program was shown for five months twice a week. At the end of this period all children were posttested with the same battery.

Data were analyzed by means of Multiple Regression techniques, which allowed us to partial out (or "control for") the effects of SES, age, initial ability and several background factors. This, then, made it possible to evaluate the "net" effect of exposure to the show on children's cognitive skills.

The overall findings were as follows:

a) Exposure to the show accounted for up to 28.4% of the posttest variances after another 16% to 61% of the variances were partialled out due to other factors. Thus, it could be concluded that exposure to a highly demanding program, which utilizes extensively the "language" of the medium, accounts for substantial changes in cognitive skills.

b) The older children underwent larger cognitive changes than younger, pre-school, children.

c) While lower SES children gained more in their analytic and associative abilities (e.g., matching, or field independence), middle class children tended to gain more in abilities of synthesis (e.g., classification or making "gestalts").

In sum, this study suggested that in agreement with out theoretical explication, cognitive skills can be affected by a medium. More specifically, a medium's "language" can be learned to serve in mental capacities. Such cognitive changes have direct effects on additional variables: e.g., exposure to Sesame Street had a strong effect on the children's ability to learn a chapter in biology from a common instructional film.

Rationale for the proposed studies

Having considered the theoretical possibility of inducing cognitive changes through media, and having provided preliminary empirical evidence to support these considerations, we turn to the rationale for the proposed studies.

Our field study of the cognitive effects of Sesame Street suggested that exposure to such a demanding program may have specific cognitive effects which are closely related to the "grammatical" nature of the medium. But the extent of such changes, and the nature of the mental skills which have a better chance of being affected, remained unclear.

Our experiments suggested that one can induce specific changes, employing particular potentialities of film. However, the question of whether supplantation (and hence - imitation) is the most educationally effective and psychologically sound procedure, remains unsolved. As was found, a short-circuiting procedure, which calls upon specific processes rather than models them, is more beneficial for some learners. All that the studies have tentatively shown is that modelling of film-specific and non-specific operations can be internalized by some learners, and that exposure to a demanding program such as Sesame Street may lead to some cognitive changes in second and third graders.

The three major questions which therefore needed to be answered were (a) to what extent does exposure to the mass media modify particular cognitive skills? (b) in whay ways can that potentiality of media (i.e., to induce cognitive changes), be made to serve education most effectively? and (c) in what respects do the cognitive effects of the mass media differ from those produced under more constrained and programmed educational conditions?

A number of questions stemmed from these three major questions. Concerning the effects of the mass media, we wished to know which cognitive skills (or for that matter - cognitive styles) are more affected and which ones less. Are the effects limited to visualization and spatial skills only? Or, as Salomon (1968) and Feldman (1971) have demonstrated with regard to the skills necessary for map-reading, are other and more fundamental cognitive skills involved? This raises another question: namely, what are the critical features of any specific medium which may lead to cognitive changes? Aside from McLuhan's exposition (1965) there is no serious discussion of such features. Related to these are questions concerned with the learners: who are the ones more likely to be affected? What congitive-developmental, social, or emotional characteristics do they possess?

The question about the educationally effective realization of a medium's ability to induce cognitive change, raises other issues. Aside from questions concerned with individual differences, length of treatment, age, and the like, one should question the feasibility of modelling, or supplantation, as an educational procedure. Modelling (and thus - imitation) may account for the changes taking place under natural conditions. But it may not be the most effective way for instruction.

As indicated earlier, most children are only decoders of media-messages. They have little opportunity, if any at all, to encode anything into, say, the filmic code. The importance of being an encoder, in the process of language acquisition, has been demonstrated in studies of mute children. Further evidence, although indirect, comes from research on deaf children. It is a common observation that deaf children perform less well than hearing children on specific types of conceptual tasks (e.g., Furth, 1972). The discrepancy between hearing and deaf varies for instance, as a function of the codability (or verbalizability) of the dimensions of the tasks.

Such a discrepanty can be ascribed to a number of factors, one of which is the deaf children's lack of opportunity to serve as verbal encoders. De Lee Lantz and Lenneberg (1966) refer to this, stating that

> "Apparently the hearing children used their verbal descriptions in some kind of intrapersonal communication system...and the deaf children did not make this kind of use of their verbal description" (p. 74).

However, to be able to carry out elaborate "intrapersonal communication" one is vastly aided by using the code as an encoder for social communication.

This, then, leads to the hypothesis that allowing children not only to decode a medium's messages, but also to encode their ideas into that medium's code, should enhance their internalization of that code. In other words, imitating a filmic model should be less effective than encoding ideas into the filmic "language".

Our third major question, concerned with the differences between natural and instructional media effects, is in fact a question about transfer of learning. Wohlwill (1970) makes a very illuminating distinction between unstructured and structured ("instructional") experiences, and their transfer values. Cognitive development, he maintains, is to be conceived of as a combination of horizontal and vertical transfer. The former means generality of a skill and its applicability to different instances, while the latter represents the number of steps of distance separating his initial and desired levels of mastery.

Wohlwill postulates, on the basis of a number of studies, that the more directed and programmed instructional treatments lead to mainly vertical transfer. On the other hand, unstructured "natural" experience leads mainly to horizontal transfer.

From this distinction we can deduce the hypothesis that cognitive effects of mass media differ from those induced in a well-structured instructional setting along the lines of horizontal and vertical transfer. Voluntary natural exposure to a medium, such as TV, can be considered to be a part of one's unstructured experience. It should lead to small changes which, however, have wide transferability.

On the other hand, instructional inducement of skills, whether through modelling or through the child's encoding behavior, may result in larger changes, but the skills so developed are highly task or instance specific.

In sum, we wished to further explore the ability of media to produce cognitive changes in both "natural" as well as planned instructional settings. The general premise underlying the proposed studies was, as originally postulated by Salomon (1970), and later elaborated by Olson (1972), that different media call upon different skills, and hence facilitate their differential development. However, there was reason to ask about the nature and extent of the cognitive effects of mass media, the differences between their "natural" effects and those made possible under instructional applications of media in terms of their cognitive effects.

This, then, called for (a) a study which examines the natural effects of a mass medium on cognition, (b) an experimental study in which the effects of decoding are compared with those of encoding, and (c) a comparison between the transfer value of the "natural" effects and the instructionally induced ones.

Prior to the actual conducting of the two proposed studies, it became necessary to first choose an appropriate medium of communication to study, then to identify at least part of its "language" elements which could possibly affect the mastery of mental skills, and finally to identify and operationally define those skills.

The decision to choose one medium of communication for study, rather than a wide sample of different media was made for two reasons. First, if different media indeed affect different skills, then one would be hard put to make comparisons between the codes and the skills of each. Second, studying one (preferably a salient) medium would allow us comparisons across a series of studies, something we would not be able to do if a number of media were involved. However, in spite of our focusing on a single medium, it was hoped that conclusions could be generalized to a theory of media and cognition. For rather obvious reasons, outlined in our research proposal, the medium of television was chosen for study.

It was precisely the identification of television's language elements (and hence, the skills expected to be related to them), where difficulties were encountered. Our initial conception of the sought elements was that they are grammatical, rather than semantic entities, applicable to different contents, and essential to the medium. In doing so, we followed other general formulations such as Chomsky (1966) and Goodman (1968), as well as more specific ones by media and art researchers, such as Spottiswoode (1965), Kracaure (1965), Panofsky (1966), Garner (1961), Pryluch (1967), Gardner, Howard and Perkins (1974), and others.

It will be noted that our initial conception of the lnaguage elements of TV was of a "linguistic" type, pertaining only to their structural functions. Nothing in these elements connects them with any psychological processes, nor are any psychological functions implied by them. Thus, the well known criticizm of linguistics, expressed by psycholinguists applies here as well. A similar criticizm of non-psychological descriptions of film attributes was made by Salomon (1968) and could not be ignored. This, then, called for a new examination of what it is in media that could affect cognition, and why. The academic year of 1974&75 was devoted to coping with this issue.

2. MEDIA AND COGNITION - A SECOND LOOK[7]

If television's language elements are expected to have cognitive effects then they ought to "make a difference" in a psychological sense, i.e., differentially call for different clusters of mental skills. This, indeed, is a widely shared assumption. It underlies, directly or by implication, claims made by Bruner (1964), Olson (1970, 1974a, 1974b), Travers (1970), Salomon (1968, 1970, 1972, 1974a, 1974b), and numerous others. There is evidence from other areas to support this notion (e.g., in research on instructional methods; see, for instance, Egan and Greeno, 1973). An analogous claim was made by Chomsky, concerning the different mental processes being activated by different surface structures of sentences.

Yet, while one can perhaps accept the claim as a general principle (even this is recently being questioned, see e.g., Olson and Filby, 1972), there is no evidence to substantiate it in the realm of media "languages". Thus, we do not really know whether indeed different ways of encoding the same content activate different mental skills. Even if this is shown, we would still need to see which TV codes and "language" formats are sufficiently critical to relate to specific mental skills.

The nature of this relationship needs exact explication as it would be impossible otherwise to generate hypotheses as to the way specific media attributes affect specific cognitive skills. It is in this respect a problem related to the more general issue of culture and cognition. Whereas it is agreed that culture cultivates thought processes, the researcher is challenged to identify specific links between cultural experiences and cognitive outcomes (e.g., Goodnow, 1969).

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[7] Parts of this chapter are taken from our First Year Annual Report (September, 1974).

This issue entails also a methodological aspect. Assume that a cross-cultural study has been done and no residual correlation between exposure to television and mastery of mental skills has been found. Before accepting the null hypothesis of no cognitive effects of exposure to television, one should consider rival hypotheses. Thus, e.g., may not the absence of results be caused by the measurement of the wrong mental skills? Or may it not be due to the identification of the least significant "language" components of the medium? Not knowing in advance that the identified "language" formats are indeed the crucial ones, and that the measured mental skills are the relevant ones, could prevent us from ruling out such rival hypotheses.

To avoid this in advance, three questions need to be answered. The first pertains to the conception of media "language" formats as they theoretically relate to mental skills. The second question pertains to the identification of critical "language" formats. The third question pertains to the identification and measurement of the relevant mental skills, and their relation to the identified formats.

First, the question of media formats as they relate to mastery of mental skills. The "language" formats of media are to be conceived of as codes (Worth, 1969; Gardner, Howard & Perkins, 1964). As such, they impose particular modifications on the "raw" (i.e. still uncoded) idea. Once the idea is coded, hence - undergone modification, it becomes a message whose content needs to be extracted and processed. In fact, there are no uncoded, or "raw" messages in existence. Every communication act, where an idea is mediated, entails coding. Only the natural surrounding is uncoded. But then, once responded to, stroed, processed, etc. a mediating code is imposed on it by the person interacting with it.

Where media are involved, thus where socially agreed upon codes are used such that "raw" ideas are modified by them, at least two levels of cognitive comptency appear to be involved. The first level entails the acknowledgment that modifications are involved. That is the level at which sign is distinguished from signified and representation from presentation. This has been described by Gross (1974) as the "awareness of the operations and transformations involved in coding...messages and activities" (p. 63). At this level one expects a child to be able to distinguish between a drawing of an object and the object itself, or between the nature of time in films and real time.

The next level concerns the ability to decode, that is - to reverse, correct or transform the modifications caused by a code. Thus, for example, one is called upon to close logical gaps caused by the editing of film, to perceive elevation in a flat map, to create a cognitive map of a chain of events presented as fragments in a television program, or to transform a verbal statement into a figurative image. Whereas the first level of competency described above is universal, the second level is more medium-specific. While being able to encode the codes of one medium, one may be unable to do the same with another with which he is unfamiliar.

Mastery of the skills which are called upon by a code for decoding purposes enables one to better extract knowledge and meaning from a message (see, for instance, the findings in Salomon, 1974a). This level of skill mastery may thus be labelled "media literacy". It pertains to the mastery of highly specific skills which facilitate and serve the extraction of knowledge.

Note, that we assume the receiver to process not the coded message as presented. Rather he processes the information, or knowledge which is extracted from the decoded message, that is - the "message" which is obtained after the modifications caused by the code are "corrected" for. This, of course, bears much resemblence to the assumption underlying the concept of transformational grammar.

It follows then that -

a) Specific mental skills are needed to overcome the modifications caused by codes in the service of extracting information from coded messages; thus -

b) The extraction of information should correlate with mastery of the needed mental skills.

Such skills when called for, could possibly become generalized as a result of frequent and reinforcing usage. The frequency is determined by the amount of exposure to a medium which calls for the particular skill; the reinforcement is determined by the subjective success of knowledge extraction.

When "media literacy" skills are generalized, schematized and applicable to new materials, ~~one~~ can speak of the cultivation of skills by the medium. Such, for instance, is the case with regard to the development of generalized patterns of perceptual exploration which appear to result from the skills called upon by reading (Kugelmass, Lieblich & Ehrlich, 1972). It is this level of developed competency which is the focus of our cross-cultural study.

However, we have reasoned, skill development may be a result of still another mechanism. Some media codes which function as explicit models to supplant internal processes may be imitated, internalized, schematized and used as "mental tools" which are applicable to new instances (Salomon, 1972, 1974b; Rovet, 1974). It is still unclear, though, how this mechanism relates to the above mentioned one.

With these considerations in mind, it becomes apparent that for a code, format, or "language" element of a medium to call upon (or supplant) a mental skill and perhaps also cultivate it, it has to fulfill the following conditions:

1) It changes the appearance of a message.

2a) It affects the meaning extracted from the message, thus, two different meanings would be extracted from one and the same message if coded in two different ways,

and/or:

2b) Whereas the meanings extracted from a message differently coded may be the same on some occasions, the mental processes involved must be different. Thus, whereas the number 22 may be of the same meaning as "XXII" or "twenty-two", the mental processes which lead to that meaning are different.

A format is critical if at least conditions (1) and (2b) are met.

Examinations of television programs as well as a survey of the relevant literature have yielded a list of television formats which we had reason to believe are critical according to the above conditions. Particualr mental skills, which we hypothesize to be either called upon or supplanted by the formats, were then identified in relation to each format. The temporary results of these deliberations are given below.[8]

a) Critical formats related to the notationality of the television message

In spite of the observed fact that television carries more verbal messages per unit time than, say, film, its unique and critical attribute is the non-notationality (pictorial) appearance. The television messages are also very concrete, in terms of their appearances, a limitation frequently noted with regard to film and television in general.

Research on imagery (e.g., Paivio, 1971) and recent research on the way children interpret television shows (Gross, 1974) suggest two skills which might be affected by the pictorial and the concrete nature of the medium's messages. It could be hypothesized that both imagery ability and inference making ability may be related to these formats. Imagery ability may be affected either because a ready model is provided by television or because of the concreteness of the messages, which has been found to arouse imagery. Inference making ability, on the other hand, is clearly a skill which is called upon, and hardly ever modelled by television.

b) Critical formats related to the shot

The shot (or in Worth's words, the "edeme") is perhaps best characterized by the way the camera is employed. One highly typical format is the zoom of the camera lens, another is the close-up, and a third is the changing point of view.

The zoom and the close-up are complementary formats. Both deal with the relationships between selected parts of a visual field and between parts and wholes. The latter could be visual wholes (a whole field of vision), or conceptual-inferential. However, whereas the zoom overtly supplants those relations, thus models a process, the close-up calls upon it. Inability to bring the skill of interrelating parts and wholes to bear upon close-ups, would hinder the proper extraction of meaning.

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[8] Dr. David Feldman of Tufts University, was of much help in defining the skills mentioned below.

Two skills were identified as possibly being related to the above formats: Ability to relate parts to perceptual wholes (studies in Salomon, 1974a), and the ability to relate parts to inferred wholes.

The changing point of view of the camera can be conceived of as supplanting the process needed when seeing somebody else's point of view (salomon, 1974a). Development of that ability has been studied by Piaget (Piaget & Inhelder, 1956) and recently by Hoy (1974). The question of its being affected by television supplantation has been studied, however, on pilot grounds only.

c) Critical formats on the level of sequences

When shots are combined into strings, or sequences, other formats can be identified. Among them we find mainly two: The fragmentation of space and the creation of plot, or logical gaps. As these formats have been described in detail in the literature (e.g., Spottiswoode, 1965; Worth, 1969), we will not dwell on them here. In both cases specific skills may be called upon. In the case of the fragmented space one needs to coordinate the spatial fragments such that a unit common space, in which the events take place, is constructed by him. In the case of the logical gaps, one has to go beyond the information given and close the gaps by supplying his own information such that missing details, cause and effect relations, etc. are available. However, unlike the above mentioned inference making which calls for vertical inferences, closing logical gaps requires lateral inferences (de Bono, 1971).

d) Critical formats on the level of programing

A child does not view a sequence or even a single program. He watches a succession of programs which is perhaps best described by the format of quick changes of plot, place, type of message, intend, figures, etc. In other words, it is characterized by high variability. As a matter of fact, high variability is not typical only of programing, in which commercial interruptions add much to the amount of variability, but it appears also within programs. Programs such as Sesame Street or the Electric Company utilize this format to its extreme.

High variability was conceived by us as a format in which interrelating parts is not called for. On the other hand, one has to process much information in a relatively short time within each part or unit. Two skills were thus identified as being possibly related to this format: Speedy processing of condensed information presented in a unit of time and space (Archer, 1954), and one's avoidance of interrelating discontinuous parts. The latter is clearly in conflict with the need to close logical gaps described above. Moreover, it may run counter to the natural development of the child. Thus, it is not clear to us as yet whether the format of variability hinders the development of processing messages by interrelating them or whether it develops (by calling upon) a different skill better suited to handle such messages.

Variability may, in addition, have an affect on what might be seen as a style, rather than skill. As has been found in a study accompanying the Israeli investigation of Sesame Street, this format may model an impulsive style. The rapid shifts may be imitated by some children and contribute to their (already existing) tendency not to stick to an issue, not to preservere. This format may also facilitate the preference for the complex and varied as studies, for instance, by Barron (1966). The target of such an effect would also be considered as a cognitive style rather than skill.

The formats, skills and styles mentioned above are, of course, only hypothetical. Thus, we felt the need to examine their validity under favorable experimental conditions as a preliminary step.

3. STUDY I: AN EXPERIMENT[9]

The above considerations and analysis led us to design an experiment to test the following hypotheses:

a) When content is held constant across messages, different formats of a medium (television - as an examplary case) differentially call for mental skills, i.e. knowledge acquisition depends on the interaction between the nature of the dominant codes and the initial mastery by the learners of specific skills.

This, if supported, would provide empirical evidence for the claim that media's language-codes are of psychological significance.

b) Formats which call for the same skills in different ways affect learners differently, e.g., a format which calls upon a skill affects learners in other ways than a format which supplants it.

c) The TV formats which we identified are critical, that is - if experimentally manipualted they differentially interact with initial skill mastery in the service of knowledge acquisition.

According to our rationale, empirical support of these hypotheses would allow us to conclude that the "format is the cognitive skill".

The following TV formats, and their hypothesized corresponding skills were sampled for experimentation.

The Format	The Skill
On the level of notationality:	
- concreteness of perceived message	- inference making
On the level of the shot:	
- the zoom - the close-up	- relating parts to perceptual and/or perceptual wholes
On the level of the sequence:	
- logical gaps in plot	- bridging logical gaps
- fragmentation of spaces	- coordination of spaces
- high information load in time/space unit	- visual memory
On the level of programing:	
- variability of unrelated messages	- preference for the complex

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[9] Parts of this chapter were taken from our Second Year Annual Report (October, 1975), and from an article by G. Salomon and A.A. Cohen in the Journal of Educational Psychology, 1977 (in press).

METHOD

Materials

Four versions of the same eight-minute television film were produced.[10] The plot (i.e. content) of all the versions was identical in all respects except for the major code, or format, emphasized in each. One version was based on the fragmentation of space, in which shots were taken from various angles, thus conveying a fragmented space which the viewer was expected to try and overcome by interrelating the spaces in the service of acquiring the presented plot (the FS version). The second version was based on logical gaps in which specific segments of four scenes were edited out leaving brief gaps in the continuity of the plot (the LG version). The third version was based on numerous close-ups interchanged with long shots (the CU version). The fourth version was based on many zoomings in and out (the Z version). The latter two versions were produced so as to make the CU and Z versions completely identical except for the fact that the shifts from long shots to close-ups were accomplished by zoomings in and out in the Z version but left out in the CU one. Thus, the Z version supplanted the mental skills of connecting parts and wholes which the CU version was expected to call upon.

Subjects and Procedures

One hundred and seventy-six fifth graders, equally divided by sex, were randomly assigned to view one of the four television versions. Each group was pretested one day before viewing its film. Prior to the viewing the subjects were told to pay close attention to the TV monitors since they would be asked questions about the film later on. Posttesting took place immediately following the film presentation.

Pretest Measures

The pretest measures consisted of tests of specific mental skills. The tests were designed and selected to measure mastery of those skills which were expected to be either called upon or supplanted by the different formats used in the films. The test battery was printed in a booklet and was group administered.

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[10] In fact there were two additional conditions. However, data analyses revealed that they entailed a number of flaws. As a consequence we omitted them from the study.

The tests were as follows:

1) Detail and Concept: The test was designed to measure the subject's ability to identify a missing element in a pictorial display, conceptualize it, and identify the relevant missing part in an adjacent drawing. Thus, for example, there was a drawing of children on a hike, arguing, and observing a missing object. This object, a map, appeared among many other objects in the other drawing. The test consisted of five items. The Alpha Cronbach Reliability coefficient was .57.

This test was expected to measure a skill which is called upon by the CU version and thus to correlate with the respective facet of knowledge acquired from this version. Since the Z version was designed to supplant that skill, no such correlation was expected there. This test was also expected to correlate with one's ability to reconstruct the logic of the plot in the LG version

2) Closing Gaps - Visual Test: The test measured the subject's ability to correctly choose and insert in a series of drawings, making up a story, other drawings which closed gaps left in the former series. Thus, each item consisted of two series: one "told a story", but elements were missing from it, and the other from which specific drawings were to be selected and correctly placed among the drawings of the first series. There were five such items. The reliability was .69. This test was expected to measure a skill which is called upon by both the LG and the FS versions, and thus to correlate with the respective facet of acquired knowledge from these two versions.

3) Closing Gaps - Verbal Test: The test was identical to the visual test, except that the items were created by using verbal sentences. There were 5 items and the reliability was .76. This test was expected to correlate with knowledge acquisition in the same way as the preceding test.

4) Detail and Whole: While test No. 1 measured the subjects' ability to relate details to conceptual wholes, this test measured their ability to relate details

to perceptual wholes. A similar test was used by Bogatz and Ball (1970) in their evaluation of Sesame Street, and later by Salomon (1974c) in his study of that program. The subject was shown an enlarged detail of a drawing and had to relate it to one of several correct whole drawings to which it belonged. There were ten items, and the reliability was .77. This test was expected to predict knowledge acquisition in a similar way to the Detail and Concept Test.

5) Visual Memory: The child was shown a drawing for 20 seconds which was very rich in details, and was asked to recall as many details as possible within a three-minute period. There were two such drawings, and the reliability was .74. This test was expected to predict knowledge acquisition in the CU and LG versions.

6) Space Construction: The test was designed to measure the subject's ability to interrelate four separate unordered components of a completely drawn space (e.g. a room). He did so by rearranging the positions of the four components into a complete whole. There were four items, and the reliability was .75. The test was expected to predict acquisition of spatial knowledge in the FS version.

The intercorrelations between the six tests are shown in Table 1. As can be seen, the two tests which measure closing gaps (Tests 2 and 3) intercorrelate quite well (.50), but not enough to make any one of them redundant. It is interesting to note that the verbal test of closing gaps (Test 3) correlates modestly with some of the other tests, suggesting the possibility that the process of verbally closing logical gaps is achieved by means of internal verbalization.

Table 1: Intercorrelations Among the Skill Mastery Pretests

(N = 176)

	1 Detail and Concept	2 Closing Gaps - Visual	3 Closing Gaps - Verbal	4 Detail and Whole	5 Memory	6 Space Construction
1	-	.09	.06	.02	.02	.09
2		-	.50**	.36*	.10	.35*
3			-	.32*	.06	.31*
4				-	.13	.28
5					-	.16

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*) p < .05

**) p < .01

This is particularly the case with the Space Construction Test, indicating that the spatial ability measured is not unrelated to verbal ability, a point often mentioned in the literature.

All the test items were factor analyzed together using a varimax rotation procedure with minimum eigenvalues of 1.00. This analysis yielded six factors for the six tests. The items of each test loaded separately on one factor. Since there were no loadings of one test item on a factor heavily loaded by another test, it thus appeared that the six tests were different from each other to a satisfactory degree, and had reasonable validity inasmuch as all the items in each test measured the same skill.

Posttests

There were two posttests administered immediately following each group's viewing of its film.

1) Specific-knowledge: The test consisted of 24 multiple choice items pertaining to the detailed content of the film. Reliability of the test was .69.

2) Overall-knowledge: The test consisted of three 7-picture series each printed in a row. These still pictures were selected and enlarged from the films and represented major events of the plot. Their printing order was randomly determined and the subject had to rearrange the order of the pictures in each series so as to correspond to the film's plot. Reliability was .77.

RESULTS

According to the hypothesis of the study, knowledge acquisition from the film, as measured by the posttests, should depend on the interaction between the mental requirements of any given format and the subjects' mastery of the relevant mental skills. Thus, assuming that mastery of relevant mental skills was indeed measured, different correlational patterns between pretested skill mastery and posttested knowledge acquisition should emerge as a function of the format that each group was exposed to. Table 2 summarizes the correlations between the six pretests and the two posttests separately for each group.

Table 2: Correlations Between Pretests and Knowledge Acquisitions for All Film Versions

	Film Version Groups[a]							
	Fragmented Space		Logical Gaps		Close-Up		Zooming	
Pretests	Specific Knowledge	General Knowledge	Specific Knowledge	General Knowledge	Specific Knowledge	General Knowledge	Specific Knowledge	General Knowledge
Detail and Concept	.31*	.07	.39**	.47**	.67**	.22*	.27	.33*
Gaps - Visual	.42**	.33*	.35*	.31*	.18*	.35*	.04	.16
Gaps - Verbal	.23	.12	.18	.39**	.16	.38*	.07	.21
Detail and Whole	.10	.19	.17	.23	.32*	.07	-.03	.34*
Memory	-.15	.16	.32*	.41**	.33**	-.11	.03	-.02
Space Construction	.14	.42**	.26	.34*	.33*	.40**	.07	.37*

a) N = 44 in each group

*) p < .05

**) p < .01

As can be seen, the pattern differs from group to group ($p \leq .05$ or $p < .10$, in all comparisons). It is important, however, to note at this point that the distributions of pretest scores did not differ significantly among the four experimental groups (no F_{max} ratio reached the critical level for $p < .05$ with $df = 4$ and 43). Thus, the different patterns of correlations should not be seen as reflecting differences between the distributions of scores.

Acquisition of specific-knowledge in the FS version called upon one's skill in relating details to conceptual wholes and one's skill in closing logical gaps, a pattern which partly resembled the one obtained in the LG version. The similar mental requirements of spatial and logical construction has already been pointed out by Olson (1973). Still, the acquisition of specific-knowledge in the LG group also called into play the subjects' visual memory Indeed, only in the two versions in which the format failed to provide logical or visual continuity (LG and CU), was memory called upon

The CU version was the one which relied most heavily on the subjects' skill in relating details to conceptual ($r = .67$) or perceptual wholes ($r = .32$). In addition, it also called for memory and skill in space construction. This pattern is strikingly different from the one obtained in the Z version, in spite of their apparent similarity.

This difference between the CU and Z correlational patterns strongly supports the expectation that while the CU format calls upon specific skills, the Z version supplants them, thus rendering one's initial mastery of the supplanted skills unnecessary for the acquisition of the specific-knowledge.

In all groups, except for the LG one, the correlations between the specific-knowledge and the general-knowledge posttests ranged from .04 to .12, indicating that two quite independent aspects of knowledge acquisitions were measured. However, in the LG group the two posttests correlated .48 ($p < .01$) suggesting that in the LG group the distortion of the total logic of the plot, caused by the format, affected both aspects of knowledge acquisition. Thus, acquiring knowledge of specific details was linked to the acquisition of general knowledge and both depended on mastery of the same mental skills.

The low correlations between the two knowledge posttests in the other three groups are also reflected in the different patterns of correlations between skill-mastery and knowledge within each group. Thus, for instance, whereas skill in relating detail and concept in the FS group correlated .31 with specific-knowledge, it correlated only .07 with general knowledge. Similarly, space construction correlated only .14 with specific-knowledge but .42 with general-knowledge in that group. Similar differences can be observed in the other groups, clearly indicating that it is not only the nature of the format that determines the kinds of skills called into play, but also the kind of knowledge acquisition which is measured. As already pointed out (Salomon, 1974b), a three-way interaction exists when different symbolic systems are involved: the formats, the skills affected by them, and the psychological demands of the learning task.

How do these different patterns of correlations between skill mastery and knowledge acquisition relate to the amount of knowledge acquired? Table 3 provides the means and standard deviations for each group on the two posttests.

Table 3: Means and Standard Deviations of the Two Knowledge Acquisition Posttests for Each Group[a]

	Film Version Groups				
	FS	LG	CU	Z	Overall F
Detail-knowledge[b] Posttest					
Mean	11.22	11.88	9.84	12.60	7.28*
SD	5.70	5.10	5.58	6.06	
Overall-Knowledge[c] Posttest					
Mean	13.60	10.37	10.61	13.61	5.04*
SD	5.89	5.52	4.81	4.85	

a) N = 44 in each group

b) Maximum Score = 24

c) Maximum Score = 21

*) $p < .01$

The amount of specific-knowledge acquired differed significantly from group to group ($F = 7.28$, $df = 3,175$, $p < .01$), as did the amount of general-knowledge ($F = 5.04$, $df = 3,175$, $p < .01$). Newman-Keuls tests showed the following pattern of differences with respect to the means of the specific-knowledge test:

$$\begin{array}{cccc} Z & LG & FS & CU \\ \cline{1-3} & & & \\ \cline{2-4} \end{array}$$

and with respect to the general-knowledge test:

$$\underline{Z \qquad FS} \qquad \underline{CU \qquad LG}$$

On both posttests the Z group had among the highest means whereas the CU group had among the lowest.

The high mean of the Z group on the specific-knowledge test totally supports the expected effect of supplantation. Indeed, if most of the relevant measured skills become unnecessary because they are overtly supplanted, achievement can be highest as it is not debilitated by subjects with initially poor skill mastery. The lower mean achievement of the CU group can be well understood along the same lines. If achievement correlates relatively high ($r = .67$) with skill mastery, subjects with poor initial mastery necessarily depress the group mean.

The differences between the groups are somewhat less obvious with respect to the general-knowledge test. It stands to reason that the FS format calls upon task relevant mental skills (Space Construction and Closing Gaps), but the same could be stated about the LG group. Similarly, the Z format, given this task, also calls upon one of the task-relevant skills (Space Construction), which is also the case with the CU format.

There is, however, a major common denominator between the CU and LG groups which differentiates between them and the other two groups. Whereas all the necessary information is given in the Z and the FS versions to allow skillful subjects to succeed on the general-knowledge test, much information is missing (due to the very nature of the formats) in the LG and CU versions. Thus, even those who mastered the format and the task-relevant skills well could not possibly be very successful on the test. This finding is supported by the fact thet in only these two groups, memory and the skill of closing verbal gaps (a skill which was found to correlate .44 with verbal intelligence) correlated with general-knowledge acquisition. This indicates that subjects in these two groups had to compensate for the information deleted by the formats by drawing on their verbal skills. In other words, they tried to determine the logic of the plot by relying on their own resources.

Discussion

The purpose of this study was to examine whether or not differences of codes or formats were related to differences among mental skills called into play in the service of knowledge acquisition from coded messages, with content held constant. The rationale guiding the study was twofold. First, empirically showing that codes, or formats, differentially affect mental skills would possibly substantiate the claim that "in mediated experience, or instruction, the content of the medium relates to the knowledge acquired while...the code in which the message is represented is related to the skills...that are called upon" (Olson, 1974b). Second, empirically examining the extent to which the selected sample of TV formats is indeed critical, in a psychological sense.

The results of the study showed that different formats, typical of the television medium, differentially affect the mental skills which are called into play. Thus, in spite of a common content, knowledge acquisition was mediated by different kinds of skills, depending on the nature of the dominant format in which the content was represented. This tends to support the major hypothesis of the study, and thus support the conceptual approach suggested here, namely - that the codes and formats of media merit to be used as defining attributes. It was found that when skills were supplanted by a format, rather than called upon, their importance or relevance diminished, thus giving learners of different levels of skill-mastery a more even start.

Another important finding of the study was the different pattern of correlations between skills and knowledge acquisition within each format group. This finding, although not unexpected, focuses attention on the three-way interaction between the mental requirements of the codes or formats, the subjects' mental repertoire, and the mental requirements of the knowledge acquisition task. This offers some modification of Olson's contention quoted above. The content of a message does indeed relate to knowledge acquisition, but not independently of the skills which are called into play by the code. The acquisition of different knids of knowledge (in the present case - specific reconstruction of details and overall comprehension of logic), are served by different mental skills. This is in much agreement with Fodor's contention (1975) that "the subject affects a rational correspondence between his performance and (what he takes to be) the demand characteristics of the experimental task" (p. 165).

This carries us back to a distinction suggested by Salomon (1974b) between the psychological effect of a code, and its instructional effectiveness. Whereas the former results from the interaction between code and aptitude, the latter results from the interaction between aptitude and task requirements. There was therefore one correction which was called for in light of our findings: the kind of skills a code calls for are partly dependent (rather than independent) upon what the learner perceives as the task requirements. Similarly, different skills (rather than the same) are activated by a code depending on the perceived task. It may even be the case that a code can potentially call for a number of different skills. Which ones are then actually employed by the learner depends on what he intends to do, and what he is capable of doing, with the message.

At the time these data were analyzed, we were not fully aware of all the ramifications suggested by the findings. We might have suspected already then that children of different ages, SES and countries may watch television in different ways, thus addressing themselves to different task requirements, and hence employing different mental skills. It was not until the data from the cross cultural study were examined, that this point was better understood.

4. STUDY II: A CROSS-CULTURAL COMPARISON[11]

The state of our thinking thus far about media and cognition can be briefly summarized as follows:

1. The unique elements of media are their codes
2. The codes, unlike the content of messages address themselves to mental skills.
3. The latter need to be employed in the service of knowledge acquisition from the coded messages by "correcting for" the transformations imposed on the "raw messages" by the codes.
4. Thus, different codes call for different mental skills, depending also on the perceived demand characteristics of the task
5. By having such effects, codes can (and have been shown to) cultivate the mastery of the skills either by calling upon them or by supplanting them. In the latter case codes come to serve both a communicational as well as a representational function.
6. This then shows what media codes can be made ~~to~~ do under experimental conditions (Salomon, 1974a; Rovett, 1975; Carrier, 1976), or under partucular "natural" conditions (Salomon, 1974c)

Knowing what effects codes can be made to have is an educationally important question, yet it leaves unanswered the psychological question, namely - do the codes of media serve a significant cultural role in a child's course of mental development? In other words, do the codes of media cultivate mental skills under normal, "natural", conditions? Since we regarded the mental skills under investigation of a child's intelligence, we wished to test the proposition, originally stated by Greenfield and Bruner (1966) that "intelligence is to a great extent the internalization of tools provided by a given culture". We were interested in particular in the possible cultivation of mental skills by the cultural medium of television. Studying the cognitive effects of TV outside the laboratory was expected to tell us what effects this cultural medium has on cognitive growth, aside of the effects it *can* have, when educationally utilized for such purposes, under controlled conditions.

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[11] Parts of this Chapter are either taken from or based on our Third Year Annual Report (December, 1976).

Specifically, we hypothesized the following:

a) Literate exposure to TV correlates positively with mastery of the relevant mental skills;[12]

b) Such correlations are to be found particularly among younger children;

c) A group with heavier exposure to TV also displays better mastery of the relevant skills, but not of the irrelevant ones;

d) Groups of similar amounts of exposure to TV, but of different SES backgrounds have more similar levels of relevant skill mastery than on other skills.

General Considerations

Studying the effects of TV on the cultivation of mental skills clearly calls for a wide variation of exposure to the medium. Such a variation can be found within any given culture, but a cross-cultural comparison allows for even larger variation. Such variation would be highly desireable in our study as it would allow the comparison of heavy versus light TV-viewers.

Samples taken from different cultures may be said to represent individuals who have been assigned to different "treatment" groups by natural circumstances rather than by random assignment of by self-selection (Lloyd, 1972). However, a comparison of two culturally-different samples could be valid only if they are shown to be identical in all relevant aspects, except for on the independent variable of the study, i.e. the amount of exposure to TV. This approach differs significantly from the typical cross-cultural study in which samples are taken from extremely different cultures, thus entailing numerous known and unknown differences. A comparison of the latter kind often fails to identify the specific cultural factors which may account for the observed differences (Goodnow, 1969). Indeed, only very carefully executed cross-cultural studies, which combine comparisons within and between cultures are conductive to fuller understanding of psychological process (e.g. Cole, Gay, Gluck and Sharp, 1971). The purpose of our study was to examine the extent to which mastery of specific mental skills could be ascribed to differences of exposure to a specific cultural medium, namely television, other factors being equal as much as possible.

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[12] By "relevant" we meant those skills which, as our first study has shown, are called for when critical codes and formats of TV are dealt with.

The key factor of such a study is, of course, the independent variable - exposure to TV. The purpose is to examine its effects on cognition, rather than the effects of any other cultural factor. In fact, to warrant comparability the effects of other factors, if found relevant, would need to be partialled out. But what does "exposure" mean in this context? Many of the cross-cultural studies fall back on using terms such as "experience" or "familiarity" (e.g. Hudson, 1967; Harari & McDavid, 1966) with cultural tools or media to explain cross-cultural differences. Very often such terms remain quite ambiguous and thus misleading. Deregowski (1968) has found that Zambian domestic servants did not produce more 3D responses to pictures than equally educated mine workers in spite of the former people's greater "experience" with the visual world of Europeans. He concluded that passive exposure to a pictorial environment had little impact on pictorial understanding. A similar conclusion was reached by Berlyne (1965), referring to the internal representation of transformational images. Evidence was brought to show that such representations do not occur simply as a result of passively witnessing the overtly executed transformations.

For Piaget "experience" means active manipulation. For Olson (1970) it means the information obtained from the choices encountered while manipulating objects or performing a task. What, then, do "exposure" and "experience" mean in our present context?

According to our theoretical conceptions the messages one encounters are coded and these codes are to be "broken" by means of overcoming or correcting the changes and transformations they impose on the messages (Chapter 2). Doing so, in the service of knowledge extraction, requires some degree of previous media literacy, which is "experienced" and thus gradually develops. At the same time, specific codes are internalized and become mental tools. The key factor in this formulation is the extraction of knowledge in which service one deals with the codes. Hence, "exposure" entails more than just watching TV. It entails the active extraction of knowledge. Exposure of this kind is, in fact, literate (though not necessarily "intelligent"), as indeed it is assumed to be based on previous media-literacy. More passive kinds of televiewing, which do not entail any knowledge extraction cannot be considered as "exposure to" or "experience with" the medium in terms of active handling of codes and formats. Such a conception of these terms is very much in accord with Deregowski's (1968) findings.

Another general consideration concerns the nature of mental skills which are expected to be affected by exposure to TV. This question has been dealt with in preceding chapters. We have defined as relevant skills (i.e., skills which could be affected by the codes and formats of TV) only those which are called for when information is to be extracted from a specifically coded message. Other skills which are either very general and may serve information extraction from numerous codes, regardless of medium, or skills which do not correlate with information extraction from any coded message, were not defined as relevant to our study. It should be emphasized that the focus of the study was not on the skills themselves but rather on the cultivating effects of TV. This study differs, therefore, from many cross-cultural or developmental studies whose major concern is with one or another skill or ability. Focusing on what exposure to TV does to the cultivation of mental skills enabled us to choose a variety of different skills deemed to be relevant regardless of their generality. We expected, however, to be able to draw inferences from the study concerning the nature of those skills which are more influenced by a cultural factor such as TV and distinguish them from categories of skills which are less influenced.

Skills which we have found to be relevant to the extraction of information from specific coded messages can also be expected to be cultivated by exposure to TV messages. If, however, they do not serve any culturally reinforced function aside from the extraction of knowledge from television (a highly unlikely possibility), then they could not be measured through any means other than televiewing, nor would they be regarded as general mental skills. On the other hand, if a mental skill is culturally relevant outside the realm of televiewing, then different cultural factors would partake in its cultivation, aside from the role played by TV. Thus, in the absence of televiewing, or in the face of little exposure to TV, other cultural factors would be responsible for the cultivation of the skill. This leads us to a dilemma: If, indeed, we measure the mastery of skills which are culturally relevant beyond televiewing, then children heavily exposed to TV would not necessarily have better mastery of the skills than children with little exposure. Mastery by the former could result from televiewing, and that of the latter from other cultural sources, but how would we be able to separate the different effects? Specific methodological and statistical methods were needed to cope with this issue.

Methodology

To test our hypotheses, while taking into consideration the points raised above, we developed the "Tilted H Design" (Figure 3). According to this design two cultures are compared. In each, two clusters of variables are measured:

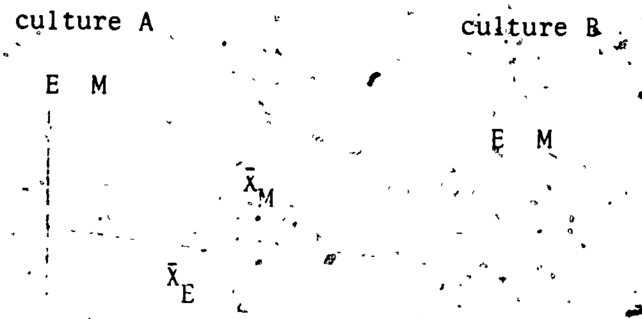

Figure 3

The Tilted H Design

Exposure to TV (E), and Mastery of mental skills (M). These two are expected to correlate within both culture A, which is characterized by heavy exposure to TV, and within culture B, which is characterized by little exposure. Since mastery of skills is expected to depend, to a significant extent on exposure, culture A would also show on the average better mastery for the skills than culture B (the oblique lines in Figure 3). Correlations between exposure and mastery within each culture would indicate that the two are related to each other. Comparison between means across cultures would point to the direction of the effect (i.e., exposure → skill mastery), since the cultural group with more televiewing would be expected to develop better mastery of the relevant skills.

Two assumptions underly this design: (a) that culture A is more heavily exposed to TV than culture B, and (b) that the samples taken from the two cultures are similar in most relevant respects except for the difference of exposure to TV.

For those reasons two samples were drawn: An Israeli sample of middle class, fourth and sixth grade children (N=113 and 105 respectively), and an American sample of identical composition (N=87 and 73 respectively). A third sample of Israeli lower class children of the same ages (N=160 and 111) was added to allow us to compare children from the same culture but with different home backgrounds, thus gaining a better understanding of the role played by factors other than televiewing on one's mastery of the skills.

The Israeli samples were from the Jerusalem area. One school was randomly selected from schools in the highest 20% bracket based on SES ranking, while another school was randomly selected from the lowest 20% SES bracket. From each school four classes of each of the two grade levels were selected. The American sample was similarly drawn from the Boston area. Care was taken to select middle class schools to allow comparison with the Israeli middle class sample. Sample sizes are presented in Table 4.

Table 4: The Samples

		Israeli		
	American	Middle Class	Lower Class	TOTAL
Fourth Grade	n = 87	n = 105	n = 160	n = 352
Sixth Grade	n = 73	n = 113	n = 111	n = 297
TOTAL	n = 160	n = 218	n = 271	N = 649

It was very clear from the available literature (e.g. Greenberg & Dervin, 1970; McIntyre & Teevan, 1971) that the average American child must be a far heavier TV viewer than the average Israeli child if for no other reasons but the number of broadcast hours, number of broadcast channels (Israel has but one), and the number of TV receivers owned by households. On the other hand, there was no reason to believe that the Israeli and American middle class samples differ in any significant respect other than with regard to televiewing. To secure evidence concerning the similarity of the two samples, measures were taken of the occupational and educational levels of the children's parents. Using the Treiman Occupational Scale (1975), it became possible to compare the two samples on this dimension.

Method

The entire battery of measures used in the study consisted of three clusters (see details in next section): (a) background data secured from (i) the children, (ii) their parents, and (iii) school files and records, (b) exposure to television, including televiewing habits, preferences over other media, amount of viewing done "yesterday" and, most importantly, amout of literate exposure done "yesterday"; (c) mastery of selected mental skills.

For the Israeli samples the battery was divided into five parts of equal length and administered on five occasions to the two Israeli samples. In the U S., however, due to practucal and administrative reasons, the battery was divided into three parts and administered on three occasions The Israeli battery included three additional reference tests, whose purpose was to aid in validating the skill measures. Since these tests were not included in the American battery, the testing load on each of the three occasions in the U S. was identical to that in Israel.

Testing was carried out in the classrooms during regular school days All tests were group administered. Two to four trained students administered the battery in each classroom. Administration of the tests and other measures were done once a week, on randomly selected days. It took five weeks to complete the administration in Israel and three weeks in the U.S.

All the work in Israel was done by Drs. Gavriel Salomon and Akiba A. Cohen with their assistants. All the work in the U.S. was done by Dr. David Feldman and his assistants at Tufts University.

Measures

All data, except for the information gathered from school files, were obtained by means of tests and questionnaires. The latter served to obtain data pertaining to background and exposure variables.

a) Background data: Background data obtained from each child dealt with after-school activities, movie-going, book-reading, helping at home, playing with games and toys, reading newspapers and magazines, and the like.

Data obtained directly from [illegible] parents pertained to mother's and father's education and occupation, size of household, ownership of appliances, age at which child began formal education, etc.

b) Exposure: As discussed earlier, the exposure measure served as the major independent variable of the study. A number of different measures of exposure were obtained, including televiewing habits, preferences over other media, amount viewed "yesterday" and the like. Each of these measures were obtained on at least two occasions for reliability and validity purposes. However, the major measure of exposure was the Literate-Exposure measure (LE). It was obtained three times in the U.S. and five times in Israel.

The LE measure consisted of a series of content questions, each pertaining to every 15-minute period of broadcasting. The questions were of an *extremely simple nature* and called for the recognition of a highly salient feature that appeared in the corresponding 15 minutes of the broadcast. Each questions was followed by four alternative answers, only one of which was correct. There was also a possible response of "I didn't watch the program". (A sample question: "On 'Hawai Five-O' yesterday we saw:"
1. A submarine
2. A horse race
3. A plane crash
4. A car accident).

Correct responses to the LE questionnaires correlated .00 to .35 with verbal intelligence, depending on the age and SES of the children, thus indicating that this measure did not tap "intelligent viewing". It was reasoned that a child who could not answer the simple recognition questions included in the LE measure may have turned the TV set on but did not extract any information from it. On the other hand, a child who answered the LE questions correctly was assumed to have attempted to extract information from it, and thus coped with the codes of the messages. Interestingly enough, LE correlated only about .50 with the self-reported number of hours of viewing "yesterday", indicating that self-reports (particularly of the younger children) can be quite misleading.

The LE questionnaire tapped viewing of programs broadcasted on the preceding afternoon and evening. A team of investigators watched all aired broadcasting between 4:00 and 10:00 p.m. and composed the 24 questions, one for each 15 minutes of broadcasting. The whole questionnaire was typed and mimeographed the same night and administered on the following morning.

Each LE questionnaire covered all the televised programs from 4:00 to 10:00 p.m. on all channels. Since there is only one channel in Israel each LE questionnaire contained 24 questions. In the U.S., where eight channels were available, each LE questionnaire contained 192 questions. Yet, to avoid overload, each cluster of questions was identified by the time period it covered, which appeared on a separate page, and had a question for each channel, which appeared on the same location on each page. Thus a child who did not watch during that time period simply moved on without attempting to answer the questions on that page.

The reliability of the measure was .76 in the Israeli sample, and .82 in the American sample.

c) Tests of mental skills: Many of the tests were taken from our experiment (Chapter 3) with only few changes introduced. There were also several new additions to the battery. Samples of the battery appear in the Appendix.

1) Detail and Concept: See Chapter 3. The test contained five items. Alpha Cronbach Reliability was found to be .82.

2) Detail and Whole: See Chapter 3. There were ten items, and the reliability was .88.

3) Closing Gaps - Visual Test: See Chapter 3. There were five items and the reliability was .80.

4) Closing Gaps - Verbal Test: See Chapter 3. There were five items and the reliability was .80.

5) Visual Memory: See Chapter 3. There were two such drawings, and the reliability was .74.

6) Space Construction. See Chapter 3. There were four items, and the reliability was .75.

7) Points of View. The child was shown a standard view and was to select from among four alternatives the one which correctly showed the same view from another, specified, point of view. There were five items, and the reliability of the test was .49.

8) Picture Stories: There were three drawings depicting a sequence of events. The child had to provide a title, as concise as possible, to the whole sequence. Two scores were given: conciseness and accuracy of the title ("titles"), and degree of integration of the description ("content"); the more the description dealt with each drawing separately, the lower the scores. There were seven items, and the reliability for "Titles" was .96 and for "Content" .95.

9) Series Completion. The original test was used. It had 14 items and was used for comparison (in terms of correlational patterns rather than average scores) with the test of Interrupted Series. The reliability was .88.

10) Interrupted Series: This test was based on a known test of series completion (see test No. 9). However, since it was used to test a child's ability to overcome the disruption of commercials on TV, each series was interrupted by an irrelevant activity of 20 seconds, inserted between the presentation of a problem and the solution. The test had five items and reliability was .79.

11) Mixed Stories: It was reasoned that literate exposure to TV may strengthen the child's ability to treat a mosaic of contents presented in rapid succession, as separate unconfused entities. To test this four half-page stories were read aloud (as well as presented in print), followed by five multiple choice questions. The wrong alternative responses entailed mixed story-lines. The reliability was .92.

12) Pairs: It was reasoned that literate exposure to TV may affect one's imagery by either calling upon it and cultivating it, or by supplanting and thus debilitating it. Twelve pairs of words, half of them concrete and half abstract, also divided into frequently and infrequently used ones, were read

and presented in print. The children were urged to use imagery while attempting to memorize the pairs (Paivio, 1971). Then they were given the response list, randomly ordered. In some pairs, the response member of the pair was missing, in others - the stimulus member. This test was based on experimental treatments used in Paivio's experiments (1971). It was never used before as a test. The reliability was .93.

The following tests were used as reference tests and were administered in Israel only.

13) MILTA: A standardized Israeli test of intelligence. Only the verbal part was administered and is known to correlate .93 with the total score. Scores were not converted into standard scores or IQ points as within each grade level age is quite homogeneous. Reliability of the test was 93.

(In the U.S., standard language and math tests were administered for the same purpose.)

14) Witkin's Test of Field Dependency (1971): This test has 16 items and its reliability was .87.

15) Spatial Rotations: The test was taken from the kit of reference tests (French, et al., 1963) It was designed by Thurstone to measure one's ability to visualize spatial rotations. The reliability was 92

The Validity of the Tests

Attempts were made to gain better knowledge about the validity of the tests Towards this end three reference tests were added to the Israeli battery: MILTA (verbal intelligence), Field-Dependence (EFT), and Spatial Rotations. The whole battery of 16 tests was submitted to a factor analysis and the resultant Varimax rotated factor solution yielded four factors with eigenvalues of more than 1.00 (Table 5).

A number of tests loaded heavily on the first factor Most salient among them were the tests of Closing-Gaps (Visual), Detail and Whole, Space-Construction and Series Completion. Tests with weaker loadings on this factor were Spatial Rotations, Pairs, Closing-Gaps (Verbal), Points of View, and Titles. It appears

Table 5: Factor Analysis Varimax Solution of the 16 Tests (N = 216)

	Factor I	Factor II	Factor III	Factor IV
Points of View	.34	.14	.10	.09
Titles	.31	.04	-.00	-.00
Content	-.12	.60	.12	.22
Detail & Concept	.06	.03	.46	-.01
Closing Gaps (Verbal)	.43	.39	.15	.12
Memory	.00	.09	.67	.28
Interrupted Series	.03	.66	.03	.11
Stories	.30	.12	.12	.34
Closing Gaps (Visual)	.79	.07	-.05	.06
Detail & Whole	.62	.27	.24	.14
Pairs	.41	.39	.44	.00
Space Construction	.48	.32	.15	.12
Series	.50	.47	.13	.29
MILTA	.29	.56	.11	-.04
EFT	.31	.11	-.00	.59
Rotations	.40	.39	-.06	.31

that this factor is a visual-spatial one. The fact that other tests, known to be mainly verbal (MILTA and Content), do not load on this factor strengthens this point.

The tests which were found to load heavily on the second factor were Content, Interrupted-Series, MILTA, Series, Pairs, Closing-Gaps (Verbal), and Rotations. It appears that this is a verbal factor. The fact that some of the spatial tests also load on this factor proves again the point often mentioned elsewhere that spatial problems are solved, partly, by verbal logic and internal speech. This does not apply to all spatial and visual tests, and it suggests that some of the tests (e.g. Closing-Gaps - Visual, and Detail & Whole) are more "purely" visual, whereas the others also entail a verbal component (mainly Pairs, which is a test of verbal memorization aided by imagery, and Space-Construction).

The third factor is quite clearly a factor of memory. The following tests load heavily on it: Visual Memory, Detail and Concept, and Pairs. Two of these three tests were designed to measure memory whereas the third, Detail and Concept, was not. It appears that the latter test, designed to measure one's ability to relate visual details to conceptual wholes, and should therefore load on both the visual and the verbal factors, entails mainly visual memorization.

The fourth factor includes Witkin's test of Field-Dependence and (to a lesser extent) also Stories and Rotations. The fact that the Stories test loads on this factor and not on the verbal one suggests that it taps one's analytic ability (indeed, a higher score was given to the child who succeeded to avoid confusing the four short stories presented to him), and thus measures the intended skill.

Generally then, we found that the tests of Points of View, Closing-Gaps (Visual), and Detail & Whole are visual-spatial tests. The tests of Closing-Gaps (Verbal), and Space-Construction measure both spatial and verbal skills, whereas the test of Pairs also measures memory. The fact that it loads on the visual-spatial test is evidence that it apparently measures imagery, as intended. The test of Stories, as we have found, measures field independence, as originally intended, and only the test of Detail and Concept fails to measure the intended skill.

The Samples

It was our intention to find Israeli and American samples of similar backgrounds, SES and home environment, in addition to a lower SES Israeli sample. While the two former samples were expected to be similar on most relevant accounts, but to differ with respect to their amount of exposure to TV, the two Israeli samples were expected to differ on most relevant accounts but to have similar amounts of exposure to TV. Table 6 below presents the means and standard deviations of some major background variables of the American and Israeli middle class samples.

Table 6: The Israeli and American Samples - Selected Background Data

	ISRAEL (N=216)		U.S. (N=160)		
	X̄	SD	X̄	SD	t
Mother's Education (in scale units)[1]	6.13	1.45	3.39	0.89	5.45**
Father's Education (in scale units)[1]	6.30	1.57	3.94	1.22	2.23**
Mother's Occupation (in scale units)[2]	45.44	16.48	42.24	6.06	2.31**
Father's Occupation (in scale units)[2]	53.74	14.70	47.40	11.56	4.33**
Size of household	4.79	0.88	5.56	1.72	-5.38**
Amount of help child gives mother	0.27	0.41	0.28	0.45	-0.31
Watching TV jointly (in scale units)[3]	3.30	0.77	3.13	0.76	2.00*
Dinning jointly (in scale units)[3]	3.90	1.07	4.60	0.67	-7.14**
Age started KG	2.64	0.78	4.44	0.83	-19.13**
No. of books read last month	4.30	1.37	2.78	1.14	11.29**

* p < .05; ** p < .01

[1] Scale units are: 1=eight years, 2=partial high school, 3=completed high school, 4=partial college, 5=B.A., 6=M.A. or Ph.D.

[2] Scale units according to Treiman's occupational scale (1975).

[3] Scale units - on ordinal scale from "little" to "much".

As can be seen from Table 6, the two samples differ from each other in numerous respects, although their sex composition and ages do not. Israeli children in the sample were of families with somewhat higher levels of education and occupational status, read more books, watched more TV jointly with their parents, began pre-school education at a younger age and came from smaller families. Thus it would appear that the Israeli sample represents a somewhat higher SES than the American sample.

Table 7 presents the means and standard deviations of the two Israeli samples on the same variables.

Table 7: Middle and Lower Class Israeli Samples - Selected Background Data[a]

	Middle Class (N=216)		Lower Class (N=271)		
	X̄	S	X̄	S	t
Mother's education	6.13	1.45	3.29	1.36	20.09**
Father's education	6.30	1.57	3.58	1.48	18.08**
Mother's occupation	45.44	16.48	30.09	6.95	13.59**
Father's occupation	53.74	14.70	35.50	9.80	16.03**
Size of household	4.79	0.88	5.90	1.41	-9.32**
Watching TV jointly	3.30	0.77	3.50	0.97	-2.31**
Dinning jointly	3.90	1 07	4.20	1.03	-2.99**
Age started KG	2.64	0.78	2.81	0.90	2.06*
No. of books read last month	4.30	1.37	3.90	1.44	3.04**

* p < .05

** p < .01

a) For the nature of scale units, please consult Table 6.

As expected, the middle class Israeli group differs from the lower class Israeli one on all accounts known to differentiate between the two SES levels.

The two comparisons have shown, thus far, that whereas the two Israeli samples represented the desired populations, the American sample deviated somewhat from our expectations, thus introducing undesirable differences from their Israeli "counterparts".

RESULTS

Surprise

As it will be recalled, the American sample was chosen on the basis of the widely shared knowledge that American children, by and large, are among the heaviest known TV consumers. Numerous surveys and field studies using mainly self-reports, viewing "diaries" or mothers' reports, have alleged time and again that the American child is an extremely dedicated TV viewer.

However, when examining our data a dramatically surprising finding emerged, namely - that the American children's literate TV-viewing was slightly below that of their Israeli counterparts. The data are presented in Table 8.

Table 8: Measures of TV Exposure Averaged Across Sessions for Israeli and American Middle Class Samples (hours per day)

	ISRAEL		U.S.		
	$\bar{X}$	SD	$\bar{X}$	SD	t
Fourth Grade	(N=105)		(N=87)		
Self-reported general amount of TV-viewing	3.35	1.28	4.17	1.84	-3.61**
Self-report on "Yesterday's" amount of TV-viewing	2.08	1.38	2.73	1.85	-2.77**
Amount of Literate Exposure	1.06	0.57	0.86	0.7	2.28*
Sixth Grade	(N=110)		(N=73)		
Self-reported general amount of TV-viewing	3.55	1.44	4.22	1.56	-2.9 **
Self-report on "Yesterday's" amount of TV-viewing	2.34	1.25	2.90	1.96	-2.3 **
Amount of Literate Exposure	1.29	0.59	1.23	0.79	0.58

* $p < .05$; ** $p < .01$

Since the American sample was interviewed on three occasions compared to the five sessions with the Israeli children, the Israeli TV viewing data were all multiplied by a constant factor of 0.6 so as to make them comparable to the U.S. data. Whereas American children claim to be watching TV about four hours daily at age 9 and 11, Israeli children claim to be watching about 3.5 hours. These figures decrease when the question is more specific: only about 2.7-2.9 hours are watched "yesterday" by the American children, while the Israelis claim to watch between 2.1 and 2.3 hours. However, when the amount watched on the preceding day is examined in light of the most superficially extracted knowledge from the screen (Literate Exposure) the difference either disappeared (sixth grade) or was in favor of the Israeli children (fourth grade). When translated into minutes, it turned out that the Israeli fourth grader watched about 64 minutes a day while his American counterpart watched about 51 minutes only. At age 11, the figures are 77.5 and 74 (N.S.) respectively.

This finding is surprising indeed and raises questions as to the validity of the data. Could it be that the questions pertaining to literate exposure were more difficult for the American sample? If indeed they were, then the children's attempts to answer the questions, whether correctly answered or not, should be considered. Accordingly, a separate calculation was made in which all responses, either correct or incorrect, were scored as "watching", whereas only the response "[illegible] didn't watch the program" was scored as "not watching". The mean number of attempted answers for the Israeli fourth graders, when translated into minutes of watching was 67 minutes, and that of the American fourth graders - 61 minutes ($p < .05$). The mean for the Israeli sixth grader was 78.5 minutes and that of the American sixth grader was 84 minutes (N.S.). Thus, ~~even~~ if all responses, correct or incorrect, are considered, still the expected difference in favor of the American child does not appear.[13]

Could it be that "Literate Exposure" actually measured intelligent-viewing, and that since the Israeli sample was of a slightly higher SES than the American, that the latter factor compensated for actual less TV viewing? The findings did not support such a possibility either. Literate Exposure, correlated negatively with mothers' education and occupation (-.22 to -.25) in the fourth grade groups and with no socio-economic variable at all in the sixth grade groups.

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[13] The correlations between LE (correct responses) and the number of attempted answers were .72 for Israel, and .92 for the U.S.

The same occurred when Literate Exposure was correlated with verbal intelligence (the MILTA Test) in the Israeli sample, and with language scores in the American sample. In the Israeli sample only in the fourth grade - lower class sample, did we find a correlation between LE and verbal intelligence (.33). In the other groups no correlation was found. Correlations of LE with language and math scores were similarly low, ranging from -.07 to .15.

Thus, the LE measure cannot be considered to measure intelligent viewing (with the exception of the Israeli fourth grade lower class group), and hence cannot be considered as biased in favor of any sample.

In sum, we could not find any reason to invalidate the finding that the Israeli children in our sample had as much, or even more, literate exposure to TV than American children, in spite of the higher saliency of TV in the U.S.

Tests of the hypotheses

Two sets of data analyses served as the major bases for the testing of our hypotheses:[14] Correlational analyses within and across groups, and comparisons of means across groups. Whereas the former were expected to show the extent to which exposure to the medium is related to one's mastery of specific mental skills, the latter was supposed to show the direction of that relationship (see the section on methodology).

Correlational data were handled in two ways. First, zero-order correlations between background variables, Literate Exposure and skill mastery were computed and examined. These led to the utilization of multiple regression (MR) analyses, with a forced order of LE entered as the last predictor. Doing so, we were able to isolate, or partial-out the contribution of relevant background variables to the variance of each of the mental skill tests. Once done, it became possible to examine the additional, or "net" contribution of Literate Exposure to the variance of any chosen skill test. This was done as we were interested only in those parts of skill mastery variance which could be attributed statistically to our main independent variable - Literate Exposure. This then entailed the partialling out of background variables such as verbal intelligence,[15] SES (when the same age groups were lumped together), or age (when different social classes were collapsed). One has to be cautious in interpreting the findings based on stepwise regression analyses. The "net" amount of variance in any given dependent variable which is exclusively accounted for by amount of exposure, depends to an extent on the amount of variance which is partialled out due to background variables. Therefore, there is much more meaning to the relative contributions to the variance when groups are compared, and less so to the absolute contributions. If, for example, we find that exposure to the medium contributes in group 'a' to 8% of the variance of a given test, while in group 'b' the comparable contribution reaches only 2%, then we can see who was more and was less "affected" by exposure to TV.

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[14] Due to the large amounts of data, only major findings are reported here in summary form.

The absolute percent of accounted for variance in each one of the groups is contigent upon the amount of variance isolated previously. This amount is influenced by the number of background variables analyzed by the various steps of the multiple regression. If some variables were excluded the overall variance accounted for would be smaller, whereas if some variables were added the overall variance accounted for could be greater.

Table 9 presents in summary form the MR analyses pertaining to the combined American and Israeli sample (N=376), of middle class (fourth and sixth grade) children and to each of its different age and national sub-groups. The first thing to note is the relatively small amounts of skill variances accounted for by the different background variables included in the analyses as predictors. Clearly, the more homogeneous the sub-group of subjects, the smaller the contribution of background variables. Still, even when the whole sample is considered, the amounts of skill variance accounted for by background do not exceed 34.8%.

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[15] The question as to whether a skill such as, say, imagery, correlates with verbal intelligence, interesting as it may be, is not directly related to our hypotheses.

Table 9: Amounts of skill-mastery variance accounted for by LE after partialling out variance due to background variables (ΣR^2) in the American and Israeli middle class samples (in percents)

Groups	Tests	Points of View	Titles	Content	Detail and Concept	Stories	Pairs	Space
Total sample	ΣR^2	12.44%	14.90%	5.31%	12.38%	16.66%	34.78%	20.47%
(N = 376)	+LE	0.08	0.05	0.11	0.62	0.00	0.36	0.03
Fourth grade	ΣR^2	17.50	23.34	21.35	19.37	23.31	28.37	10.80
(N = 192)	+LE	0.27	-0.58	0.45	3.91*	-0.04	0.01	2.92
Sixth grade	ΣR^2	14.30	12.33	7,25	22.82	14.18	17.60	18,48
(N = 183)	+LE	-0.05	1.03	-0.21	0.44	1.88	0.23	-2.31
Americans	ΣR^2	16.78	10.69	10.74	6.39	7.53	30.22	26.13
(N = 160)	+LE	0.52	0.00	-3.10	-0.04	0.40	0.78	0.29
Israelis	ΣR^2	13.37	12.94	4.16	4.33	12.80	41.53	17.89
(N = 216)	+LE	1.25	0.04	2.19	2.80*	0.58	0.59	0.01
American 4th grade	ΣR^2	14.63	21.59	7.81	13.39	9.54	26.78	12.58
(N = 87)	+LE	0.72	-1.12	1.57	1.63	-1.46	-3.80	1.37
American 6th grade	ΣR^2	16.97	19.95	5.89	19.78	14.88	32.18	42.51
(N = 73)	+LE	0.82	3.45	-0.74	-0.51	0.86	2.27	-0.87
Israeli 4th grade	ΣR^2	18.57	27.27	9.99	14.07	34.09	26.68	10.35
(N = 105)	+LE	4.39	0.04	5.12*	1.97	0.22	1.35	1.43
Israeli 6th grade	ΣR^2	8.88	7.74	3.48	11,00	7.45	6.47	14.47
(N = 110)	+LE	0.32	1.63	1.35	3.18	2.68	0.88	-1.53

* $p < .05$

Table 9 (continued)

Groups	Tests	Interr. Series	Verbal	Visual	Detail and Whole*	Series	Memory
Total sample	ΣR^2	16.69%	23.23%	20.61%	19.32%	26.09%	21.44%
(N = 376)	+LE	-0.37	0.00	0.07	0.07	0.33	0.66
Fourth grade	ΣR^2	23 00	22.28	31.46	24.63	28 69	23.81
(N = 192)	+LE	-1.40	-0.02	-0.69	-1 03	1 39	0 41
Sixth grade	ΣR^2	23.22	21.80	16.15	9 58	19.75	20 08
(N = 183)	+LE	0 67	0.90	-1.32	2.65*	-2.16	5 95*
Americans	ΣR^2	9.31	29.31	11 77	8.59	15.80	19.19
(N = 160)	+LE	0.27	0.01	0.11	0.00	0.00	0 56
Israelis	ΣR^2	20 50	35.60	19.98	27 44	35 65	14 59
(N = 216)	+LE	0 03	0.00	0.05	0.29	0 98	4 85
American 4th grade	ΣR^2	7.78	26.40	29 48	11 33	23 60	27.74
(N = 37)	+LE	2 99	-1.14	0 7[illegible]	0.43	-0.28	-1.25
[illegible] 6th grade	ΣR^2	35 [illegible]	[illegible]	[illegible]	15.85	[illegible]	[illegible]
(N [illegible]3)	+LE	1 78	1 7[illegible]	2 19	-0.[illegible]	-[illegible] 51	[illegible]
Israeli 4th grade	ΣR^2	28.80	4.44	14.01	[illegible]	[illegible]	[illegible] 04
(N = 105)	+LE	0 06	4.17	2.18	0.79	[illegible]	[illegible]00
Israeli 6th grade	ΣR^2	18.41	2[illegible].62	13.06	9.24	23.67	13.09
(N = 110)	+LE	-1.14	-0.98	-0.55	-1.53	-0.56	9 87*

* $p < .05$

A similar finding was reported in our study on the cognitive effects of Sesame Street on Israeli children (Salomon, 1974c). This repeated finding suggests that what concerns the media-related mental skills under investigation, other than SES or verbal intelligence factors seem to affect their mastery. Television could possibly be one of those "other" factors.

However, as it can be seen in the table, LE does not account for any significant portion of skill-mastery variance in the combined American-Israeli middle class sample. Breaking the sample down into age sub-groups shows that within fourth grade, LE accounts only for 3.91% of the variance on Detail & Concept ($p < .05$). In the sixth grade group LE accounts only for 3.95% of the Memory variance ($p < .05$).

The breakdown according to country shows that LE accounts for no variance on any one of the skill-mastery tests in the total American sample. It accounts for 3.4% of the Titles variance (N.S.) in the American sixth-grade group, and negatively for 3.8% ($.10 < p < .05$) of the imagery (Pairs) variance in the American fourth-grade group.

In the Israeli middle class sample, LE accounts for 2.86% ($p < .05$) of the variance of Detail & Concept, and 4.85% ($p < .01$) of the Memory variance. More specifically, in the sixth-grade LE accounts for 9.87% ($p < .001$) of the variance of Memory, while in fourth-grade it accounts for 5.1% ($p < .01$) of the variance of Content, and 6.3% ($p < .01$) of the variance of Series. In all the latter mentioned cases, when the amount of variance accounted for by LE in one of the Israeli sub-groups is compared with that in the parallel American sub-group, the differences of the b weights are statistically significant at $p < .05$ or smaller.

It thus appears that overall LE contributes to the variances of only a few tests, and that these contributions are only within the Israeli sample, a bit larger in fourth- than in sixth-grade.

Analysis of the Israeli sample and its sub-groups reveals a somewhat different picture (Table 10).[16]

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[16] The parts in Table 10 which pertain to the Israeli middle class were reproduced, for purposes of convenient reading, from Table 9.

Table 10. Amounts of skill-mastery variance accounted for by LE after partialling out variance due to background variables (ΣR^2) in all Israeli groups (in percents)

The Group	The Tests	Points of View	Titles	Content	Detail & Concept	Stories	Pairs	Space	Interr Series	Verbal	Visual	Detail and Whole	Series	Memory
Total sample	ΣR^2	22.67%	8.01%	9.49%	17.48%	29.89%	31.44%	33.30%	36.13%	37.24%	31.33%	30.05%	43.33%	21.83%
(N = 486)	LE	0.16	0.66	0.13	1.57*	3.12*	0.08	0.65	0.13	0.06	0.89	1.51*	1.66*	1.95*
Sixth grade	ΣR^2	21.74	6.94	8.55	13.44	19.30	41.71	35.17	32.99	40.69	26.10	28.82	42.37	18.68
(N = 223)	+LE	0.21	0.20	0.01	1.18	3.61	1.76	0.00	0.44	0.05	0.09	0.74	0.08	6.68*
Fourth grade	ΣR^2	21.19	10.04	10.20	21.38	33.12	16.26	24.42	36.51	24.16	25.27	21.17	32.17	17.30
(N = 271)	+LE	0.36	0.55	0.34	3.80*	3.42*	0.02	2.87*	0.01	0.68	2.37*	2.44*	3.65*	0.77
Low SES	ΣR^2	4.54	4.44	3.28	10.10	29.85	12.96	15.32	17.80	24.85	18.61	16.90	20.80	16.37
(N = 270)	+LE	0.17	0.50	0.28	1.38	3.00*	0.00	2.36*	0.08	0.34	3.82*	2.40*	3.10*	0.80
Middle class	ΣR^2	13.37	12.94	4.16	4.33	12.80	41.53	17.89	20.50	35.60	19.98	27.44	35.65	14.59
(N = 216)	+LE	1.25	0.04	2.19	2.86*	0.58	0.59	0.01	0.03	0.00	0.05	0.29	0.98	4.85*

* $p < .05$

Table 10 (continued)

The Group	The Tests	Points of View	Titles	Content	Detail & Concept	Stories	Pairs	Space	Inter. Series	Verbal	Visual	Detail and Whole	Series	Memory
4th grade Low SES	ΣR^2	9.52%	6.17%	4.51%	14.91%	27.04%	9.82%	19.86%	16.13%	24.73%	17.85%	13.46%	14.85%	11.43%
(N = 160)	+LE	0.53	0.45	0.55	4.15*	4.18*	0.23	0.91	0.00	0.32	6.40**	3.90*	3.54*	1.20
4th grade Middle class	ΣR^2	18.57	27.27	9.99	14.07	34.09	26.68	10.35	28.80	14.44	14.01	18.60	28.89	8.04
(N = 105)	+LE	-4.39	0.04	5.12*	1.97	0.22	1.35	1.43	0.06	4.17	0.18	0.79	6.34**	0.00
6th grade Low SES	ΣR^2	6.70	10.27	3.71	13.25	22.00	18.68	18.27	19.17	24.52	19.15	21.21	25.50	10.69
(N = 103)	+LE	0.02	0.24	-0.03	0.47	4.11*	6.93**	2.18	0.20	0.27	0.93	0.27	1.90	0.87
6th grade Middle class	ΣR^2	8.88	7.74	3.48	11.00	7.45	6.47	14.47	18.41	29.62	13.06	9.24	23.67	13.09
(N = 110)	+LE	0.32	1.63	1.35	3.18	2.68	0.88	-1.53	-1.14	-0.98	-0.55	-1.53	-0.56	9.87**

* $p < .05$

** $p < .01$

Within the total Israeli sample LE significantly accounts for no more than 3.1% of the variance of the Stories-test, and less than 2% on Detail and Concept, Detail and Whole, Series and on Memory. Although statistically significant, these contributions are rather small.

The breakdown into sub-groups is a bit more revealing. LE significantly accounts for between 2.3% and 3.8% of the variances of six tests in the fourth-grade group, and 6.7% on only one test (Memory) in the sixth-grade group. Similarly, LE accounts for 2.3% to 3.8% ($p < .05$) on five tests in the low SES group, but on two tests only in the middle class group.

A further breakdown into social class and age groups shows that whereas LW accounts significantly for between 3.5% to 6.4% of the variance on five tests in the low SES fourth-grade, it accounts for 5.1% to 6 3% on two tests in the middle class fourth-grade group. In the sixth-grade, LE significantly accounts for 6.9% and 4 1% of the variance on two tests in the low SES group, and 9.8% of the variance on one test (Memory) in the middle class group.

Comparison of the b weights associated with LE between the two social classes of fourth-grade age and of sixth-grade age are presented in Tables 11 and 12 respectively.

The Tables clearly show that there are statistically significant differences of b weights between the social class sub-groups in all the cases in which LE accounts for significant portions of skill-mastery variances.

Two things seem to emerge from these analyses. First, it appears that LE accounts for variances on more tests in some groups than in others. The group in which LE significantly accounts for the variance on the largest number of tests is the Israeli lower-class fourth-grade group. Next come the Israeli middle-class, fourth-grade and the lower-class sixth-grade groups. This point seems to be rather important as it tends to suggest that LE is related to a larger number of mental skills among younger and less advantaged (also verbally less intelligent) children.

Second, it appears that LE accounts for different skills in the different groups. In the lower class, LE accounts for variances on tests which seem to measure mainly analytic and visual abilities (see the description of the tests' factor analysis). Thus, for example, the test of Stories (to whose variance

Table 11: Comparison between b coefficients associated with LE in the MR analyses between low and middle class fourth graders

	Lower Class			Middle Class			
	b_1	$S_{y \cdot x}$	SE^2	b_2	$S_{y \cdot x}$	SE^2	t
Points of View	.050	1.048	.0046	.031	1.31	.0006	.26
Titles	.264	5.98	.150	.024	6.69	.017	-.58
Content	-.312	6.30	.167	.554	6.05	.014	-2.03*
Detail and Concept	.192	1.38	.008	-.036	1.39	.0007	2.44*
Stories	.175	1.24	.006	.008	0.99	.0004	2.08*
Pairs	-.103	3.20	.043	.071	3.39	.004	-.80
Space	.066	1.02	.004	.028	1.32	.0006	.56
Interrupted-Series	-.008	1.38	.008	-.005	1.10	.0004	.14
Verbal	.071	1.89	.015	.015	2.06	.0016	.43
Visual	.352	2.06	.017	-.017	2.25	.002	2.68**
Detail and Whole	.282	2.09	.018	-.034	2.10	.0017	2.25*
Series	.352	2.71	.030	.760	3.40	.004	-2.21*
Memory	.47	6.20	.162	.009	7.25	.020	1.07

Note: The formula used to test the significance of the difference between b coefficients was:

$$t = \frac{b_1 - b_2}{\sqrt{SE^2 + SE^2}}, \quad \text{where } SE^2 = \left(\frac{S_{y \cdot x}}{S_x \sqrt{N-2}}\right)^2$$

*) $p < .05$

**) $p < .01$

Table 12: Comparison between b coefficiencts associated with LE in the MR analyses between low and middle class sixth graders

	Lower Class			Middle Class			
	b_1	$S_{y \cdot x}$	SE^2	b_2	$S_{y \cdot x}$	SE^2	t
Points of View	.009	1.04	.06	.011	1.17	.0005	-.008
Titles	.192	6.81	.152	.092	6.60	.017	.24
Content	-.089	8.72	.250	.130	8.25	.026	-.42
Detail and Concept	.051	1.29	.005	.042	1.30	.0006	.012
Stories	-.095	1.05	.003	.012	0.70	.0002	-1.89
Pairs	.166	2.22	.0167	-.095	2.70	.0003	2.04*
Space	.11	1.34	.0067	-.020	1.30	.0006	1.52
Interrupted-Series	.037	2.93	.028	-.005	.82	.0002	.25
Verbal	.070	2.35	.0185	-.018	2.41	.002	.61
Visual	.13	2.31	.017	-.028	2.40	.0009	1.18
Detail and Whole	.060	2.02	.013	-.025	1.54	.002	.69
Series	.25	3.12	.032	.003	2.63	.0049	.13
Memory	-.24	8.13	.218	.82	11.22	.049	-2.05*

See note in Table 11.

*) $p < .05$

LE accounts 3.0% in fourth-grade and 4.18% in sixth-grade, both $p < .05$) loaded heavily on one factor together with Witkin's Figure-Embedded Test, clearly appearing as an analytic ability. Similarly, the tests of Detail and Concept, Closing-Gaps (Visual) and Detail and Whole are more analytically oriented. The only exception is the test of imagery (pairs) which is more a test of synthesis than a test of analysis.

On all these tests LE accounts for significantly more variance in the lower than in the middle class group.

On the other hand, LE accounts in the middle class group mainly for skills which entail *synthesis*: Content, in which the child had to synthesize different drawings to make one story out of them, and Memory in which one's performance is facilitated by chunking the items through categorizing them

LE accounts for variance on the Detail & Concept test in both groups, but *more so* ($p < .05$) in the low SES group. Also the test of Series, in which superordinate concepts are to be inferred and integrated, is accounted for by LE in both groups. However, LE accounts for *more* of its variance ($p < .05$) in the middle class group.

It is important to note, in this connection, that about half the tests measured in one way or another, abilities of synthesis. Thus, the fact that LE related to fewer skills in the older middle class group is not an artifact of the battery.

In general then, Literate Exposure did not appear to be related to the mastery of mental skills in the American sample. It was related to a number of skills, in the Israeli sample, to a larger extent in the younger and disadvantaged group and to a lesser extent in the older and more adavantaged group. Related to this is the finding that whereas LE is related to skills of *analysis* in the younger and less advantaged group, it is related to skills of *synthesis* in the *older and more advantaged* group.

Next we turn to a comparison between the mean test scores of the groups. It was our hypothesis that those who are more heavily exposed to TV will also have better mastery of the relevant mental skills. We expected the American sample, due to (alledged) heavier exposure to TV to show better skill mastery than the Israeli sample. However, as we have discovered, to our surprise, it was the Israeli fourth-grade sample which was significantly more exposed to TV than its parallel. In the sixth-grade we found the American and Israeli samples to be equally exposed to TV. Thus, our hypothesis had to be changed: Israelis should have better mastery of the skills related t[illegible]E than the American parallel groups.

Table 13 presents the means and standard deviations of all the tests in the two American and the two (middle class) Israeli age groups.

Table 13: Test Means and Standard Deviations of the American and Israeli Middle-Class Age-Groups

Groups	Fourth Grade					Sixth Grade				
	Israeli (N=97)		American (N=87)			Israeli (N=101)		American (N=70)		
Tests	X̄	S	X̄	S	t	X̄	S	X̄	S	t
Points of View	2.08	1.32	1.80	1.22	1.48	2.62	1.19	2.76	1.55	-.69
Titles	8.00	6.70	7.27	4.95	.82	11.25	6.65	9.55	5.88	1.72
Content	14.69	6.17	11.26	3.88	4.41**	12.51	8.30	14.05	4.56	-1.41
Detail & Concept	3.60	1.44	2.91	1.[illegible]1	3.29**	4.00	1.33	2.83	1.36	5.44**
Closing-Gaps (Verbal)	4.08	2.07	4.20	2.71	-.33	6.43	2.42	6.34	2.94	.22
Memory	27.23	7.31	22.94	8.21	3.59**	32.61	11.86	25.92	6.83	4.16**
Interrupted Series	3.82	1.12	3.02	1.45	4.01**	4.14	.83	3.48	1.37	3[illegible]*
Stories	4.47	1.00	3.87	1.15	3.60**	4.73	.71	4.18	.97	4.23**
Closing-Gaps (Visual)	4.67	2.29	5.48	2.53	-2.15**	6.27	2.45	6.41	2.06	-.37
Detail & Whole	6.70	2.15	7.75	1.89	-3.33**	8.41	1.55	8.65	1.31	-1.08
Pairs	6.04	3.40	6.83	2.95	-1.58	10.05	2.71	9.81	2.63	.60
Space	1.68	1.33	1.62	1.37	.25	2.53	1.32	2.79	1.13	-1.31
Series	7.08	3.46	8.12	3.[illegible]9	-1.98*	9.62	2.65	9.85	2.28	-.57

*) $p < .05$

**) $p < .01$

As it can be seen in Table 13, there were a number of significant differences between the mean scores of the different groups. The Israeli fourth-grade group achieved higher scores than the American group on Content, Detail & Concept, Memory, Interrupted-Series and Stories, while the American fourth-grade group performed better than the Israeli on Detail & Whole and Series. Similar, though fewer, differences can be found when the two sixth grade groups are compared.

These comparisons would be valid if the two national samples were identical on all other (background) variables as we have expected them to be. However, they were not (see Table 7). The Israeli sample appeared to come from a somewhat more favorable background, which could account for most of the differences between test scores. This, then, called for the partialling out of those initial background differences which were related to skill-mastery differences We used MR methods, through which relevant variables were "neutralized"; The variable of "country" was entered as the last predictor.

As it can be seen in Table 14, most of the differences between the American and Israeli fourth-grade groups observed earlier, disappeared as a result of the covariance method used Still, the variable "country" accounted for significant differences in favor of the Israeli fourth-grade group on three tests - Content, Interrupted-Series and Series In other words, once "equallized" on all relevant background variables, the samples still differred on these three tests. It will be noted, that Literate Exposure accounted for significant portions of variance of two out of these three tests (Content - 5.12%, $p < .05$; Series - 6.34%, $p < .01$). It thus appears that on the tests for whose variance LE accounted significantly, the group with higher LE scores also achieved higher skill-mastery scores This seems to be the rule, with one exception - Interrupted-Series. The higher mean score achieved on it by the Israeli fourth-grade sample was not associated with differences of LE and must therefore be due to other, unknown, factors.

In the sixth-grade sample one can observe a very similar pattern. Once differences due to background variables were partialled out, only three significant difference due to nationality remained: on the tests of Detail & Concept, Closing-Gaps (Verbal) and Memory. All significant differences were in favor of the Israeli sample

Table 14: Amounts of skill variance accounted for by the difference of country in both age groups

Groups / Tests	Fourth Grade Background ΣR^2	Fourth Grade Country $+R^2$	Fourth Grade F^1	Sixth Grade Background ΣR^2	Sixth Grade Country $+R^2$	Sixth Grade F
Points of View	12.78%	0.57%	0.81	13.30%	0.36%	0.44
Titles	19.52	0.14	0.22	9.35	0.41	0.47
Content	13.55	3.38	6.38*	1.21	2.69	2.91
Detail and Concept	16.11	0.19	0.28	14.70	4.95	6.41*
Stories	31.25	0.01	0.01	12.44	1.35	1.63
Pairs	26.15	0.00	0.00	13.71	0.51	0.62
Space	8.82	0.16	0.22	17.96	0.87	1.12
Interrupted Series	16.99	3.80	5.91*	18.41	0.92	1.19
Closing-Gaps (Verbal)	14.01	1.42	2.06	14.53	4.34	5.56*
Closing-Gaps (Visual)	24.54	1.61	2.21	14.54	0.13	0.16
Detail and Whole	22.51	0.01	0.02	4.48	1.15	1.27
Series	24.69	3.28	5.59*	16.74	1.81	2.31
Memory	17.82	0.19	0.28	18.43	4.11	6.21*

[1] F ratios associated with the removal of variance due to the variable "country".

* $p < .05$

It will be recalled that although the American and Israeli sixth-grade samples were not found to differ in amount of Literate Exposure, LE significantly accounted for 9.87% ($p < .01$) of the variance of Memory, and 3.18% ($.10 > p < .05$) on Detail and Concept in the Israeli sixth-grade group. These are also two of the three tests on which the Israeli sample received significantly higher scores. The only exception was the test of Closing-Gaps (Verbal) to which LE was not related and yet the two samples differred on it.

The comparisons between countries, separately for each age group, tend to support our hypothesis: when other things are made equal by statistical means, more LE is associated with better skill mastery, or - as is the case in the sixth-grade sample, the group in which LE is related to skill-mastery also achieves higher scores on the same mastery tests.

Last, we turn to a comparison between the two Israeli samples - the middle and lower class groups. We did not expect them to differ on LE (indeed, they did not), but did expect them to differ less than usually observed, on those skills which were related to LE only in the low SES group. Similarly, differences between the groups were expected to be larger where LE accounts for skill-mastery variance only in the middle class group.

Table 15 presents the means and standard deviations of the Israeli groups. As it can be seen, both middle class groups consistently achieve significantly higher scores; only the test of Titles is an exception. The differences between the groups are rather large across the board. Neither are the differences visibly smaller on tests the variance of which LE was found to account in the lower SES group (e.g. Visual). Nor are the differences systematically larger on tests the variance of which LE was found to account for in only the middle class (e.g. Memory).

Two additional analyses were performed. First, we examined the proportion of differences between the means on each test to the respective standard deviations.[17] The proportions differred from test to test, but in no way could we find systematic pattern of the expected kind. Second, we examined the amount

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[17] For each test first a pooled variance was computed and then - its pooled standard deviation.

Table 15: Test Means and Standard Deviations of the Two Israeli SES Groups, by Age

Groups Tests	Fourth Grade Low SES (N=153) $\bar{X}$	 S	 Middle Class (N=97) $\bar{X}$	 S	 t	Sixth Grade Low SES (N=111) $\bar{X}$	 S	 Middle Class (N=110) $\bar{X}$	 S	 t
Points of View	1.21	1.05	2.08	1.32	-5.73^{**}	1.57	1.05	2.62	1.19	-6.91^{**}
Titles	8.26	6.00	8.00	[illegible].70	0.32	10.72	6.82	11.25	6.65	-0.58
Content	11.23	6.39	14.69	6.17	-4.23^{**}	8.74	8.75	12.51	8.30	-3.24^{**}
Detail & Concept	2.42	1.43	3.60	1.44	-6.00^{**}	3.06	1.30	4.00	1.33	-5.06^{**}
Closing-Gaps (Verbal)	2.69	1.92	4.08	2.07	-5.25^{**}	4.05	2.40	6.43	2.42	-7.21^{**}
Memory	22.01	6.55	27.23	7.31	-5.70^{**}	26.75	8.30	32.61	11.85	-4.22^{**}
Interrupted Series	2.22	1.40	3.82	1.12	-9.16^{**}	2.96	1.46	4.14	0.83	-7.16^{**}
Stories	3.28	1.30	4.47	1.00	-7.36^{**}	4.19	1.11	4.73	0.71	-4.20^{**}
Closing-Gaps (Visual)	3.06	2.11	4.67	2.28	-5.45^{**}	4.37	2.38	6.27	2.44	-5.85^{**}
Detail & Whole	5.62	2.17	6.70	2.15	-3.66^{**}	6.78	2.05	8.40	1.55	-6.54^{**}
Pairs	4.98	3.23	6.04	3.40	-2.35^{*}	6.34	3.30	10.05	2.71	-9.02^{**}
Space	0.83	1.04	1.68	1.33	-5.39^{**}	1.38	1.31	2.53	1.32	-6.44^{**}
Series	4.38	2.84	7.08	3.46	-6.44^{**}	6.19	3.25	9.62	2.65	-8.48^{**}

$p < .05$

** $p < .01$

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of each test's variance accounted for by SES differences. Again, no systematic differences between the tests, of the kind we have expected, were found.

It thus appears that our hypothesis pertaining to changes in the gaps between the skill-mastery levels of the two social classes, due to the contribution of exposure to TV, is not supported by the data.

Discussion

The purpose of the cross-cultural study was to test the hypothesis that the codes of a medium, in our case - TV, cultivate the mastery of mental skills when exposed to under normal, "natural" conditions. Support of this hypothesis would allow us to conclude that the codes of a medium cannot only be made to affect cognition, but also to affect cognitive skills under normal conditions of televiewing.

To test this hypothesis we selected two middle class samples - one of supposedly high TV viewers (U.S.A.) and one of supposedly low viewers (Israel). These two samples were expected to resemble each other except for the average amount of exposure to TV. To these, a third sample, of low SES Israeli Children was added. This sample was expected to be indetical to the Israeli middle class sample in amount of exposure to TV but to differ in skill mastery.

It was hypothesized that -

a) Exposure to TV (defined as Literate Exposure), with other things being equal, would correlate with mastery of the relevant mental skills.

b) Such correlations would be higher among younger children.

c) A group with heavier exposure to TV, other things being equal, would also show better mastery of the relevant mental skills than the group with less exposure.

d) Groups with the same amount of exposure to TV, but of different SES (the Israeli middle and lower class groups), would be less different on the TV-relevant skills than ~~on~~ other skills.

Our findings tended to support our first and second hypotheses. LE was found to account for significant (though never very large) portions of skill variance in the Israeli, but not in the American sample. Within the Israeli sample, LE accounted for the variance of more tests in the younger, low SES group, than in the older middle class one.

LE accounted also for skill-mastery variances in the middle class group. However, there was a rather clear distinction between the skills for the variance of which LE accounted for in the low class (analytic skills) and in the middle class (skills of synthesis). This finding is strikingly similar to the one reported in Salomon's (1974c) Sesame Street study. Using the crossed-lagged correlation technique with panel data it was possible to show in that study that improvement in analytic skills due to TV exposure preceded in time improvements taking place in skills of synthesis

There were, however, also skills which were not found to be related to LE. These were the tests of Points-of-View, Titles, Interrupted-Series and Closing-Gaps (Verbal). The first three of these four tests were not used in our Study I, and hence we do not really know how relevant the skills measured by these tests are to the handling of television codes and formats. Only the test of Closing-Gaps (Verbal) was used in Study I, where it was found to correlate with the extraction of general knowledge when the codes of logical gaps and close-ups were encountered. It may be quite possible that the tests of Points-of-View, Titles and Interrupted-Series do not correlate with LE at all, simply because they measure skills which are not called for when TV codes and formats are encountered. However, this does not account for the Closing-Gaps (Verbal) test which was found to measure a relevant skill.

The most reasonable explanation seems to be that this test measures an entirely verbal skill, unlike its parallel test of Closing-Gaps (Visual) (the two tests intercorrelate .40 to .50). This is quite clearly shown in the factor analysis of the test items (see Table 5). It is apparently the case that verbal rearrangement of a visual sequence is not often called for, under "natural" conditions of televiewing, unless one is required to perform such a task. Indeed, this test correlated in Study I only with general knowledge acquisition which was measured by a sequence rearrangement test.

Our third hypothesis was generally supported. When background variables were partialled out, the fourth-grade group with more LE (Israel, as we have found to our surprise) also achieved higher scores on precisely the same tests whose variances were accounted for by LE. In sixth-grade, a very similar pattern emerged. Thus, it can be concluded that more LE is associated with better skill-mastery scores.

Our last hypothesis pertaining to a smaller or larger-than-usual difference between the low and middle class groups on skill-tests the variances of which LE significantly accounted for, was not supported. Thus, even if more LE is associated with better skill mastery, it has no measurable effect on the usually-found differences between the two SES samples.

Our findings raise a number of questions the answers to which bear directly upon the interpretation of the data. Let us start with the unexpected finding that LE was not associated with any test of skill-mastery in the American sample It could be argued that the different contributions of LE to skills in the two national groups were due to dissimilarities between the Israeli and American versions of the tests and questionnaires. However, this explanation seems to be implausible as no evidence was found to show that any one of the (generally identical) tests or questionnaires had psychometric properties which differred from country to country. Nor were the testing conditions any different

There were, of course, other differences between the American and Israeli samples indicating that the latter came from a somewhat more advantaged background. Knowing, however, the general background of the American sample to be that of middle class, we could statistically equate the two samples. Indeed, nearly all of the unexpected differences between them disappeared as a result of using MR methods. Thus, the background differences between the two samples also do not explain the finding that LE was totally unrelated to skill-mastery in the American sample.

It will be noted that our major independent variable was amount of LE. May it not be that regardless of different or similar amounts of LE in the two countries, that the qualitative nature of exposure to TV differs from one cultural surrounding to another? Consider for instance the fact that the American child selects a TV program from amongst several alternatives, whereas the Israeli child has but one channel to view. Ernst Rothkopf (private communication) has observed American children to be frequently busy changing channels, while far less frequently sitting through a whole program. In the face of a great choice frequent selection and shifting may clearly interfere with literate exposure, producing not only relative low LE scores but also a different kind of televiewing.

Our data bear on this point. As it will be recalled, one of the Exposure measures employed was the children's self reported amount of televiewing on the preceding day. This measure accounted negatively for up to 8.5% of skill-mastery variances in the American sample, and for no variance at all in the Israeli sample. Although it is difficult to interpret this finding, it becomes quite evident that the qualitative nature of televiewing in a television-experienced country such as the U.S., differs from that of a television-newcomer such as Israel. We will return to this issue in our concluding chapter.

Another, even more important issue, concerns the directional interpretation of our findings. We have reasoned that the examination of the "net" amount of skill-mastery variance accounted for by LE would tell us how strongly exposure and mastery are related, and that mean differences would tell us the direction of that relationship. Indeed, it was found that where LE accounted for more mastery variance, mean mastery scores were also higher. Still, such findings could be interpreted in two ways. As deduced from our theory, LE cultivates the mastery of specific mental skills, thus - more LE leads to better skill-mastery. Alternatively, mastery of specific mental skills could be a necessary condition for literate consumption of television, and hence better mastery would lead to more LE. Formulating this dilemma in terms analogous to a similar question in psycholinguistics, we would label the first interpretation as the hypothesis about the symbolic code input, and the second as the cognitive determinism hypothesis (Schlesinger, 1977a). The former hypothesis would assert that the child's mastery of the mental skills under investigation is determined, at least in part, by his experience with the codes of TV. The latter (cognitive determinism hypothesis) would assert that the child's mastery of the skills is determined by his cognitive development.

There is no firm and unequivocal answer to this dilemma in the psycholinguistic literature. But there is good reason to believe that the two hypotheses pertain to different linguistic abilities and to different levels of development (see the experiments on the effects of linguistic inputs on conservation and seriation, by Sinclair-de Swart, 1967, and a more recent theoretical account by Schlesinger, 1977a,b).

Our findings tend to support the hypothesis about the symbolic code input (i.e. that LE leads to better mastery), although not unequivocally. As it was shown in Table 14, mean differences on the mastery tests between American and Israeli same-age children, were limited, in four out of six cases, to those tests to whose variances LE accounted for significantly. The mastery scores of the groups did not differ on any of the other ten tests. According to the cognitive determinism hypothesis a group with a better mastery on all tests would also be found to have higher LE scores. However, since the groups differred nearly exclusively on only those tests which were related to LE, one may wonder why the Israeli groups excelled precisely on those tests, and not on the others. It is therefore warranted to conclude that LE, other things being equal, led to better mastery of specific mental-skills, rather than vice versa.

Still, the extent of the cultivating effect of LE on the mastery of those skills is relatively small (far smaller than what was found in our controlled experiments), suggesting that exposure to TV is far from being the sole or even major cultivator of the skills. Moreover, as we will show in our concluding chapter, there may be a two-way, rather than one-way relationship between LE and the skills. Younger and less cognitively developed children are more strongly affected by TV codes which apparently supplant mental skills of analysis. These codes which are relatively new to them, are being imitated and internalized as well as decoded in the service of knowledge axtraction. Hence the cultivating effects of the codes. Older and cognitively better developed children are still affected by codes which call upon skills of synthesis, but by and large, they are capable of utilizing the better mastery of skills which they already possess, to handle the coded messages. In other words, LE affects the mastery of mental skills, in concert with numerous other agents, only up to a limit, whereupon these already mastered skills begin to facilitate LE.

Last, it is interesting to examine the nature of those skills which are affected by literate exposure to TV. As we have noticed already, younger and low SES children appear to be more stongly affected in the area of analytic skills, whereas older, middle class ones are more affected in the area of skills of synthesis. The skills most strongly affected among the former, were imagery (the test of Pairs) and visual rearrangement (Closing-Gaps-Visual).

We entertained two alternative hypotheses concerning the possible effects on imagery. If TV supplants images it could increase one's dependency on the external supply of ready-made images. Alternatively, if imitation and internalization are involved, one could learn how to better produce images for himself. Since LE was found by us to facilitate, rather than debilitate children's imagery, it becomes justified to accept the latter hypothesis, namely - that the overt supplantation of images by TV further develops one's skill of imagery.

LE apparently has a similar effect on one's ability to logically rearrange visual sequences. TV programs do not usually call upon one's skill of rearrangement. They usually provide a ready-made sequence which one can, and possibly does, reconstruct in his memory later on. TV supplants that process by sequencing the events for the viewer. Imitating the ready-made model, the child can then perform similar activities of sequencing on his own. Again, supplanting such a process appears to somewhat improve skill mastery. As in earlier studies, the present one also shows that improvements due to supplantation take place mainly among younger and less advantaged children.

Amongst the skills of synthesis, Series-Completion and Visual Memory were the ones most affected by LE. Only middle class children showed such effects. It may be argued that at least the skill of memory is called upon by TV rather than supplanted. TV does not provide ready-made "memories"; one has to call upon his memory to better comprehend a sequence. The fact that a skill which is called upon is being cultivated only in older and generally more intelligent children is in full agreement with previous findings.

We may then briefly summarize the major findings of Study II as follows:

a) Literate exposure has small, yet measureable effects on the mastery of specific mental skills.

b) Such effects are found only among Israeli but not among American children. The reason may be due to differences in the qualitative nature of televiewing between children of TV-saturated and children of TV-poor environments.

c) Younger and lower SES children are more affected by literate exposure than older, middle class ones.

d) Younger and lower SES children are more affected in the area of analytic skills which are overtly supplanted by TV; Older, middle class children are more affected in skills of synthesis which are called upon.

5. MEDIA AND COGNITION - REVISITED

Now that three years of study on the cognitive effects of media are about to be concluded,[18] we wonder what do all our findings add up to? starting with our early experiments on flimic supplantation, through our Sesame Street study, and presently ending with the two recent studies, we can see numerous commonalities as well as inconsistent findings. Could the propositions and theoretical formulations with which we have started (see Chapter 1) account for them? As it must have become evident to the reader of this report, the inevitable answer is - no. Several of our findings were unexpected, some of our hypotheses were rejected, while others were systematically supported. A fresh look at our assumptions and theoretical formulations is thus clearly called for. The present chapter is devoted to such an attempt, bearing in mind that our revisted formulations are partly still untested hypotheses at best.

Revision of Assumptions

Underlying our initial formulation were, among a few others, three assumptions which we presently feel ought to be revised. The first assumption was that a code, symbol or format has specific mental counterparts which it affects. A stimulus which entails, for instance, collative properties arouses uncertainty (Berlyne, 1965); a passive negative sentence activates specific processes of transformation (Chomsky, 1965); and - by way of an analogy - the filmic format of, say, fragmental space - calls upon the skill of space reconstruction.

We have followed this assumption further to a distinction between a code, or format's effect and its effectiveness (Salomon, 1974b). The "effect", we argued, is what happens in one's mind upon encountering a particular code or format. The kind of mental process activated at that point is a function of the codes' properties as they interact with the person's mental repertoire, implying that in a honogeneous population a given code aught to call for a particular, more or less unitary mental process. On the other hand, "effectiveness" (in terms of instruction) depends on the match between the activated mental process and the specific psychological requirement of the learning task. Fragmented space film, expected to arouse processes of spatial reconstruction (the effect), will lead to more effective learning only where such processes are conductive to the attainment of the learning task.

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[18] The series of studies is not yet really concluded as the results of our school-based experiment on active encoding of messages into the filmic codes are still to be analyzed.

This assumption can be supported by many previous empirical findings, but now it appears to be inaccurate. Mental processes are not (or at least, infrequently) activated "automatically". Mental processes which are activated upon encountering a particle code or format, which serves as a message vehicle, come to serve a purpose. The purpose is more often then not the extraction of knowledge from the coded message. However, there is never one and only one kind of knowledge to be extracted from a coded message, particularly when the message has non-notational codes (Gardner, Howard & Perkins, 1974). Nor are there predetermined levels or amounts of knowledge which could potentially be extracted. It follows, then, that the code cannot be the only factor which determines (given a person with a specific mental make up) what mental process, i.e. effects, will take place.

Wanner (1968) has shown in his study on the relationships between complexity of verbal statements and levels of recall, that the kind of transformational processes activated in learners depended not only on sentence complexity but also on the instructions which the learners were given. In more general terms, the kind of mental process activated depends on three, rather than two factors: the nature of the code, the learner's mental make up, and the demand characteristics of the task. The latter may be subjectively perceived, as when no clear task is prescribed, or imposed as under regular instructional or experimental conditions.

This inadequacy of the original assumption can be observed in the different patterns of correlations between skill-mastery and knowledge acquisition in our Study I. Not only did the patterns differ as a function of the dominant code used in each film-version, but also within each condition - as a function of the required knowledge-task. A similar interaction between codes and (perceived) demand characteristics of televiewing may well account for the fact that Israeli children were affected by televiewing while their American parallels were not, as we have found in Study II. But more of this later on.

The second assumption which we have made and needs to be revised concerns the relationship between code and mental process. Originally we have assumed that codes call for some kind of mental activity with which they are handled. In effect, it is a "Chomskian" assumption according to which codes are analogous to surface structures of sentences. Codes, we have claimed, impose particular modifications on the "raw-message", and therefore - in the service of extracting knowledge - need to be "retransformed" in a way analogous to the transformation of surface structures into base structures.

Although this may be, and probably is, the case when *new* or *difficult* codes are encountered, it need not *always* take place. Fodor (1975) argues that "What apparently happens is that grammatical relations are computed only when all else fails. There exist heuristic procedures for sentence recognition which, in effect, ignore grammatical relations and infer messages directly from lexical content..." (p. 167-168). Olson and Filby (1972) provide evidence to support the claim that "the comprehension of a passive sentence does not necessarily involve the recovery of the base structure equivalent to the active sentence or the base S-V-O structure usually assumed to underlie...sentence meaning..." (p. 379). There are additional studies to strengthen this argument.

What this means is that some complex structures, codes and symbols are not always translated into simpler ones. How, then, does one handle them? Simply stated, by either ignoring them or by dealing with them *as they are*. Whereas the former way is possible whenever the code is not salient and plays no critical role in the message, the latter is possible *when the person is already capable of thinking in terms of the code or complex structure*. When one thinks symbolically there is no inevitable need to "translate" each code, symbol or structure into their simpler bases or concrete references, should such exist at all. He thinks already in terms of such codes.

It follows that media codes cannot cultivate mental skills (hypothesized to serve "retransformation", or decoding of codes) endlessly. At some age one has already learned to think in terms of the codes, and unless encountering new ones, no skill cultivation takes place any more. We may argue therefore that the Israeli middle class sixth-graders in our Study II, were not affected by TV codes and formats which apparently affected analytic skill-mastery of low SES fourth-graders, precisely for this reason. They have mastered the codes, i.e., already use them in their thinking. They do not employ any skills to "transform" the codes and hence no such skills could be cultivated by the same codes any more.

The third assumption we wish to revise concerns the dual function of symbolic codes. Following Vygotsky (1965), Berlyne (1965), Bruner (1964) and others, we assumed that codes can serve in a dual function. They are used as message vehicles in communication as well as representational vehicles in thinking. On the basis of the assumption that language is internalized to serve in a representational capacity, we derived the hypothesis that media codes could be internalized likewise and serve as "mental tools" in a similar fashion.

This, of course, is a disputed assumption in psycholinguistics. Olson (1970) maintained that not the language is internalized but rather the new information which encountering it provides. Fodor (1975) is very critical of the assumption about the internalization of language, claiming that the language of thought ("mentalese") is innate. Neither words nor images are the components of the language of thinking, which goes on at deeper levels.

We do not wish to enter this dispute, particularly as it bears upon our research only partly. When we have hypothesized that a code can be internalized to serve as a mental skill, we did not pose to examine what mental tools the child is equipped with to enable that internalization. But then we have found in our earlier experiments (Salomon, 1974a) that the children with even the lowest levels of skill-mastery, had some initial mastery. It may have come from prior encounters with film and TV but it may have been developed through other means as well. One is reminded in this context of the study by Elkind (1969) in which it was found that even children with no experience with figural representations showed at a later age normal levels of spatial skill mastery.

If a skill is demanded by one's culture its development is bound to be reinforced whether encountering the code-to-be-internalized takes place or not.

No wonder therefore that exposure to TV, had only small effects on skill-mastery (Study ~~II).~~ Internalization of a code *facilitates* the development of a skill but does not determine it in an all-or-none fashion. The question is thus not whether codes are the sole base for mental skills, but rather whether they can be internalized and thus facilitate the development of a skill which is already mastered to some extent. Even Fodor (1975) qualifies his general argument by stating that :

> "...Though it might be admitted that the *initial* computations involved in first language learning cannot themselves be run in the language being learned, it could nevertheless still be claimed that, a foothold in the language having once been gained, the child then proceeds by extrapolating his boot straps: The fragment of the language first internalized is itself somehow essentially employed to learn the part that's left. This process eventually leads to the construction of a representational system more elaborate than the one the child started with, and this richer system mediates the having of thoughts the child could not otherwise have entertained" (p. 83).

Schlesinger (1977b) suggests a distinction between linguistic thinking (mediated by semantic structures and subject to the categorization imposed by language) and non-linguistic thinking (associated with immediate, uncategorized experience). The preverbal child has only non-linguistic thinking available but out of his interaction with the world of language, forms the linguistic thinking. *Ultimately*, but not initially, "we 'compute' our thoughts in those structures which serve us in the production and comprehension of speech". And back we are at the dual function of codes.

The codes and formats of the media can certainly not be regarded as "raw" experience to be handled with non-linguistic thinking. Cross-cultural comparisons of media-literacy clearly attest to that. The interpretation of media codes needs to be mapped upon already existing concepts, mostly language-based. How could a child handle a code such as fragmented spaces in film, or isomorphism in maps without being able to bring to bear on them already existing concepts of space, time, causality, and the like?

The codes we have been dealing with are more analogous to language structures than to uncategorized experience. Their internalization depends, therefore, on the existence of prior structures, whether innate, as Fodor would have it, or experience-based, as Schlesinger would maintain.

We thus end up maintaining that media codes do serve a dual function, and that they can be internalized to serve as mental skills, but qualify this assertion by arguing that this follows prior acquisition of mental structures,[19] rather than precedes them. In a sense, the internalization of codes is superimposed on such existing structures.

Revision of the Theory: A Developmental View

Let us now turn to a general overview of the effects of media-languages on the mastery of mental skills.

The whole series of studies this far has covered the age range from six to eleven years. A striking developmental pattern emerges: Preschoolers are not affected by the codes of TV, but at the age of seven-eight years children are quite strongly affected, lower class children mainly in the area of visual analysis and middle class children mainly in the area of synthesis. Overall, however, the latter are much more strongly affected than the former (Salomon, 1974c).

Then, at age nine, lower class children are more affected, again - mainly in areas of analysis, while middle class ones, who are now generally less affected, show effects in the area of synthesis. At age eleven, middle class children are hardly affected at all whereas lower class ones are still affected, but now in the area of synthesis. In addition, we have systematically found that whereas smaller and less advantaged children are affected mainly by codes which supplant mental skills, more advantaged ones are more affected by codes which call-upon their skills. Finally, when raw mastery scores are compared, a familiar pattern emerges, namely that lower class children perform at a level which is about two years behind that of middle class ones (Study II).

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[19] These structures need not be only language-based. Imagery, of the kind studied by Piaget (1962) may serve as well. See also Schlesinger (1977b).

The developmental pattern just described is very much in line with that observed by Gardner and his associates (Gardner and Gardner, 1971; Gardner, 1972; 1973) in their studies of style sensitivity. They have found preschoolers to have a very strong "subject matter" orientation towards works of art, with no sensitivity to style (or what may be called the symbolic elements of the works). Seven to ten year olders on the other hand, showed much sensitivity to style and could therefore be trained to group works of art along stylistic lines. Finally, adolescents imposed their already existing mastery of abstract categorization on the works, thus exhibiting "impoverished access to the richness and repleteness of artistic works".

The age differences in what concerns susceptibility to the impacts of TV codes found by us, as well as those found by Gardner in relation to style sensitivity, can serve as a basis for the understanding of how media codes affect cognition. The young preschooler is very much oriented toward the salient visible figural content of a message (notational and non-notational alike). James Thurber, the late American humorist describes in one of his writings (Thurber and Sauers, 1970) how, as a young child, he interpreted idioms in a purely literal way, failing to deal with their symbolic nature. One may argue that the child at that age extracts knowledge from messages without bothering to "break" codes. Not yet being sufficient sensitive to codes and symbols he does not feel the mismatch between his skills and the demands of the codes.

It is only later on, at the age of seven that the more advanced children (usually of middle class) sense this mismatch, and bring their already available skills to bear upon the encountered codes. Becoming increasingly more "operational" in the Piagetian sense, encountering a code which is now rather demanding (inasmuch as it is a carrier of critical information), the child may be said to experience a crystallizing event (Feldman, 1976) which leads to rapid and dramatic shifts in his mastery of mental skills.

This is also the age at which reading is mastered. Thus, the child begins to move from a non-literate stage, in which meaning is ascribed to statements on the basis of what he expects, to a literate stage in which he regards the statements as a reality on their own rights (Olson, 1975). Meaning for him, as Olson describes it, becomes conventionalized as he begins to treat statements as logical propositions, rather than as ~~descriptions which~~ map upon his own expectations. He thus has to handle the codes of the messages.

But how does he do it? We do not know whether he masters mentally supplanting codes earlier than codes which call upon available skills, although this would be expected. We do know, however (see Study II) that at that age, codes which overtly supplant mental skills have a stronger effect on skill mastery than codes which call upon skills. Among low SI children this is the case also at age nine. In other words, codes which supplant a skill have a better chance to being effective in the cultivation of skills, by virtue of being assimilated, through imitation and internalization into the child's repertoire.

It could be argued that the better cognitively developed child is more affected by supplanting codes. Indeed, at about age seven this is the case, as we have found in our Sesame Street study. For one thing, the child experiences a stronger mismatch between his available repertoire and the demands of the codes he encounters. For another, he is already better cognitively equipped to imitate a code, internalize it and apply it in his thinking to new instances (Piaget, 1962).[20]

Once internalized, the code can be used in an imitative way. But it is not yet really mastered nor fully comprehended, but for the child's ability to assign the code an internal counterpart which is perhaps no more than an internal mirror-image of the code. Thus, the child can, for instance, perform mental "play-backs" of zoom-ins or slow-motions, and even apply them to new instances, but not yet reverse them. Why should that be needed? As described in Chapter 2, the code imposes restrictions on the "raw" message, transforming it into a coded message. To extract knowledge from it the child has to "correct" for that transformation, i.e, to decode the message, in a fashion possibly analogous to transforming a sentence from surface to deep structure.

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[20] This statement would seem to contradict earlier findings which show that it is the child with poorer skill-mastery who is more likely to imitate a supplanting code. However, it appears now in hindsight that the children with pre-experimental better mastery of the skills, although of the same age as the others, were simply beyond the stage of imitation and internalization, as it will become clearer in the following sections.

Imitating and internalizing a code is not sufficient for this process to take place. Olson (1970) maintains that upon performing an act (manually or mentally) one encounters choice-points from which he has to choose. This provides the occasion for gaining new information from the perceptual world, which guides us in making the necessary choices. The activity (in our case - the mental "play-back" of a supplanting code) is the means for encountering new alternatives for which new information is needed. But repeating mentally the "play-back" of the code would fail to provide the required information, which we can postulate to lie in the deep structure semantic representation of the coded message (e.g., E. Clark, 1975). As Olson (1974b) observes, "the skillful use of a symbolic system involves the mastery of both its structure and its rules of transformation". Internalization of a supplanting code provides only the former.

Hence, upon encountering a code, particularly the one which did not supplant a skill and could not even be imitated and internalized, the child has to "correct" for the transformations imposed by the code on the "raw" message. He brings specific skills to bear upon the coded message. These skills are called upon by a code which is to be corrected for. This, of course, is done in the service of extracting knowledge from the coded message. The more salient the code and the more critical the knowledge it entails, the more are processes of "correction" needed. Indeed, this was observed in our Study I where a deliberate effort was made to manipulate codes in a way which rendered them critical.

"Correcting" for the code's transformations, that is - encoding it, provides an opportunity for the employment of specific skills which are immediately reinforced by the successful extraction of knowledge. The skills are thus further cultivated. But note that this is possible only at a somewhat later stage of development (age nine) and with better cognitively developed children (in our Study II - middle class ones). Less developed ones (low SES children) of the same age are still more affected by codes which supplant, rather than call upon, a skill.

However, the cultivation of mental skills by codes which call upon them for "correction" in the service of knowledge extraction, does not go on endlessly.

Two factors converge to bring it to a near end. First, as we have noted in the beginning of this chapter, the children mature and become capable of thinking in terms of codes and symbols. They need no longer transform familiar codes. Codes are now comprehended in terms of their surface structures, a development which comes about age eleven, on the verge of formal operations. This is also the age at which style sensitivity begins to give way to a more rigid application of already existing abstract categories (Gardner and Gardner, 1971).

Numerous televiewing studies repeatedly show that at that age amount of viewing reaches its peak (see summary by Liebert, Neale and Davidson, 1973). At that age TV reaches also the peak of its influence in a number of areas (e.g. Comstock, 1976). All this is very much in keeping with the fact that at that age children are capable of handling TV's coded messages in terms of their surface structures, without the need to decode them any more.

This does not mean that no skills are being cultivated by codes any more. First, a youngster may still encounter new codes in media such as computers (Tikhomirov, 1974), elaborate maps or avant-garde films. This is not very likely to happen with regard to TV as it is presently used, since its codes do not develop in concert with the development of a youngster's capabilities. Second, as the youngster's abilities develop, so do his knowledge extraction expectations. Thus, codes which earlier entailed no critical information for him now become a cognitive challenge.

It is important to note here that the only skill in which middle class eleven-year olders have improved as a result of literate exposure to TV (Study II) is visual memory. This finding should not astonish us. As TV messages do not become increasing complex, and as the youngster is now capable of dealing with them in terms of their surface structures, he may turn to acquire more of the information which the medium offers. One of the characteristics of the non-notational TV message is its tremendous syntactical denseness (Goodman, 1968), which calls for the discrimination of relevant from irrelevant information.[21] Since, however, most other codes have been mastered, the eleven year older can now turn to handle that denseness by improving his skill of "chunking" increasingly large quantities of information to be kept in memory.

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[21] This skill, measured by our test of Content, was indeed affected by exposure in the fourth-grade middle class group of Israeli children.

All this is also quite in keeping with our findings that as the children grow [illegible] they are more affected by codes which apparently call upon skills of synthesis rather than skill of analysis. As it has been shown in another study (Salomon, 1974c), skills of analysis precede those of synthesis.

In sum, we postulate that the cognitive effects of media codes follow a developmental trend. At preschool age, when the child is "subject-matter" oriented, he feels no need to handle codes. By the age of seven he begins to be both sensitive to codes as well as capable of imitating and internalizing those codes which overtly supplant mental skills. This already leads to some improved mastery of the skills, but is not a final step. Having incorporated the code into his repertoire of skills, he still has to "correct" for the modifications imposed by the code on the message. "Correcting" these modifications in the service of extracting knowledge particular skills are employed and reinforced, and are thereupon cultivated. This may go on until the age of ten or eleven when the child becomes capable of thinking in terms of familiar codes, without the need to decode them into simpler entities any more. No further cultivation of mental skills by codes takes place at least under "natural" conditions of exposure to the media, except in cases where novel or extremely demanding codes are encountered.

Revision of the Theory: A Cross-Cultural View

Keeping our revised theoretical formulations in mind, one may wonder why nothing of the developmental trend described above was observed in the American sample of Study II.

To answer this question we will have to go back to the beginning of this chapter where the interaction between code, skill-mastery and demand characteristics of the viewing task were discussed. It was our claim that whereas codes call for mental skills, not only as a function of the code's nature and the person's cognitive make-up, but also as a function of what he perceives the task to be (e.g. Fodor, 1975).

Close examination of our cross-cultural data reveals that the qualitative nature (not necessarity quantity) of exposure to TV may have differred in the two sampled countries. We have observed, for instance, that the American children have many more alternative programs to choose from compared with the Israeli chidren, and that 39% of the Americans have at least three TV receivers at home, whereas the Israeli's have, accross the board, but one.

More importantly, though, the mothers of our American sample liked TV, on the average, significantly less than their Israeli counterparts. We have also found that the American children in the sample watch TV jointly with parents or siblings significantly less than their Israeli counterparts. The latter observation is of particular interest in light of some previous findings of ours (Salomon, 1977) which show that the co-observation of TV by mother and child has a rather strong effect on both cognitive change as well as knowledge acquisition.

All this seems to suggest that the American children in our sample viewed TV in a qualitatively different form than the Israeli children. Or to put it in other terms, the demand characteristics of televiewing by the American children differred from those of the Israeli ones.

There are no direct data to point to the direction or nature of this cross-cultural difference. However, we may entertain the possibility that Israeli children, due to the novelty of the medium, the absence of alternatives and the mothers' general support, take TV more seriously than their American counterparts. There is at least one shred of evidence in our data to support this contention: Although American fourth graders watch more TV than Israeli fourth graders, the amount of literate exposure of the former is significantly smaller. There is nothing in the data to suggest why this should be the case. Even if we entertain the possibility of limited channel capacity in the literate consumption of TV, there is no reason to expect the channel of American children to be more limited than that of the Israelis.

The only plausible hypothesis we have to account for this finding, and which is in keeping with the other differences in viewing patterns, is that the American children define for themselves the task of televiewing to be less demanding. Hence, in spite of more time spent at the TV set, their literate consumption is smaller. To the best of our knowledge there is no additional evidence to bring to bear upon this hypothesis, as this question has not been raised by TV researchers.

This hypothesis implies, in effect, that the demand characteristics of televiewing, as perceived by our American fourth graders, called for far less elaborate handling of the critical TV codes. (As the mean mastery scores were similar in the two groups, except for where exposure was directly related to skill-mastery, it would be unreasonable to argue that the American fourth graders have mastered the codes already.) Indeed, in those skill areas where literate exposure had a measurable effect, the Israeli children had a significant margin over the Americans.

But there is a more general implication to be considered. As noted by Lloyd (1972), samples taken from different cultures may represent individuals who have been assigned to different "treatments" by natural, rather than arbitrary, circumstances. These different "treatments" may, however, entail more than meets the eye. We have expected the qualitative nature of TV to be similar in both countries and only quantities of exposure to differ. What we may end up finding is that we are dealing also with two culturally different media, although both are called "television". It is not just the nature of the stimulus or even the technology which carries it that counts. Apparently also much depends on the way the medium, its messages and its codes are perceived. What Cole, Gay, Cluck and Sharp (1971) have shown, also applies to the roles assigned to language in different cultures (see also Olson, 1975).

This then, may have rather interesting ramifications for the uses of educational TV. If, as Hornik et al. (1973) show in their evaluation of ETV in El-Salvador, older high school students regard ETV as being of marginal importance, then whatever may have been found to apply to ETV's effects in younger ages, may not apply to them.

What concerns our theory, seems to be that a far more important role aught to be assigned to one's perception of the task of encountering coded messages, then originally envisioned. Media codes can affect the mastery of mental skills, along developmental lines described above, but whether they

~~affect the skills~~ in fact, depends on how the child perceives the situation.

Experiments and Field Studies

Last but not least, these considerations may shed some light on the differences of media's cognitive effects between our controlled experiments and our field study. In the controlled experiments we have asked whether TV and filmic codes can be made to affect the mastery of mental skills. In the field study (Study II) we have asked whether TV affects in/fact the mastery of skills, when exposed to under normal, "natural" conditions. As one would expect, the effects of even short, though intensive, experimental treatments were far larger than those resulting from prolonged exposure to TV.

At least three reasons, which follow from our theoretical considerations, may account for these differences. First, as already mentioned, literate consumption of TV may be limited by one's cognitive channel capacity. But while all of one's channel capacity is solely devoted to the experimental treatment, making a strong treatment effect possible, many inputs compete for space in the limited channel under "natural" conditions, thus badly restricting the potential effects of TV messages.

Second, the codes utilized in our experiments were designed to be salient and critical carriers of information, forcing the subject to cope with them. Under natural conditions of exposure, on the other hand, not all codes are constantly salient or critical, nor is the viewer forced to cope with them. He has got enough freedom of choice to select those messages from which information can be extracted without dealing with demanding codes.

Finally, in the experiments specific demand characteristics are imposed on the subject, forcing him to seriously extract information from the coded messages. Under natural conditions of exposure one is free, as we have suggested, to approach the task of viewing more seriously or more lightly as one desires.

It seems that these factors causing the differences between our experiments and field study may well account also for similar differences observed in the studies of TV and aggression and TV and pro-social behavior.

We may conclude that whereas media *can* be made, and perhaps *should* be made, to cultivate specific desirable mental skills under controlled experimental and instructional conditions, their "natural" effects are small. Yet, what our series of investigations, experimental together with field studies, suggest is that there are developmental trends and situational factors which need to be considered when media are to be used to aid the cultivation of mental skills.

A Final Note.

This is our final report to the Spencer Foundation summarizing three years of research. However, we prefer to delay the drawing of final conclusions and specific educational implication until after the results of our school-based experiment, concerned with the cognitive effects of *encoding* messages into filmic codes, are analyzed. Thus, our final conclusions and educational implications will be published separately.

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APPENDIX

Sample Test and LE Questionnaire Items
(American Version)

Name ____________________

Class ____________________

School ____________________

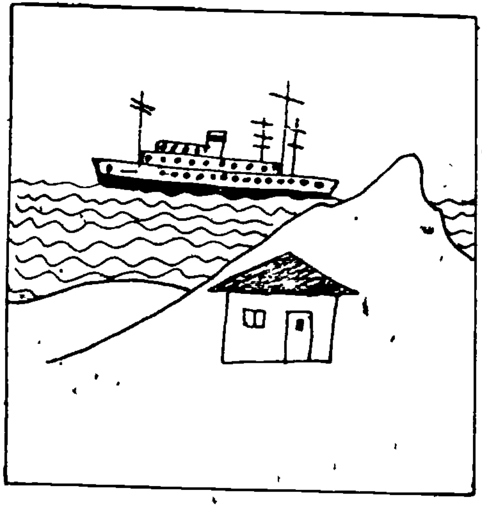
POINTS OF VIEW

On the following pages you will see a picture at the top of the page and other pictures below it, as you can see in this example. In the top picture there is a scene of a beach and a boat. Let's imagine that you are a sailor on the boat and are looking towards the beach. What would you see? Would you see the view marked "A" or the one marked "B"? The correct answer is "B".

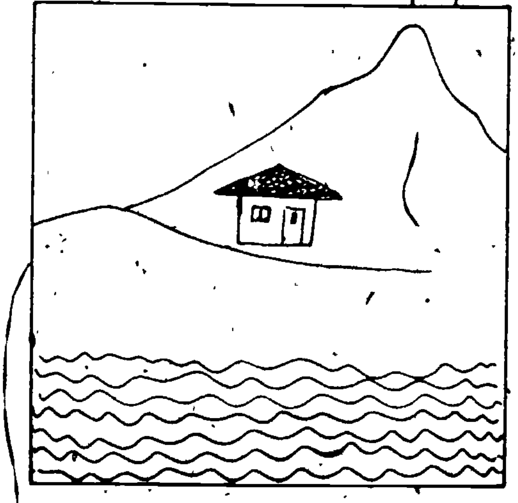
The sailor on the boat cannot see the house because the hill blocks his view of it. Also, since the top of the hill in the upper picture points to the right, the sailor on the boat sees it pointing to the left, as in picture "B".

Please mark an X in the box next to the letter "B", as you see in the example.

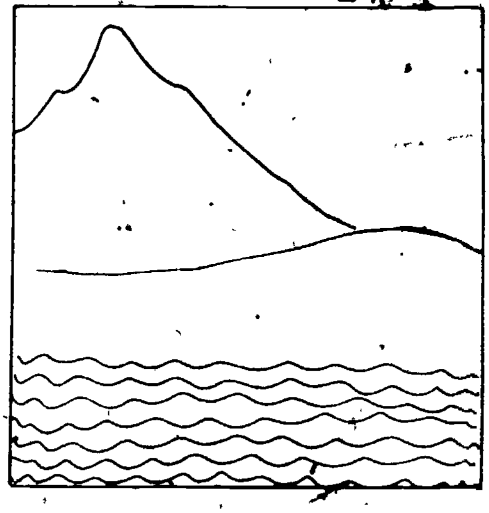
You may now continue. On each of the following pages you will see a picture at the top. Next to the picture there is a question. There are four pictures at the bottom to choose from, not just two as in the example. Answer the question by marking an X in the box above the correct picture.



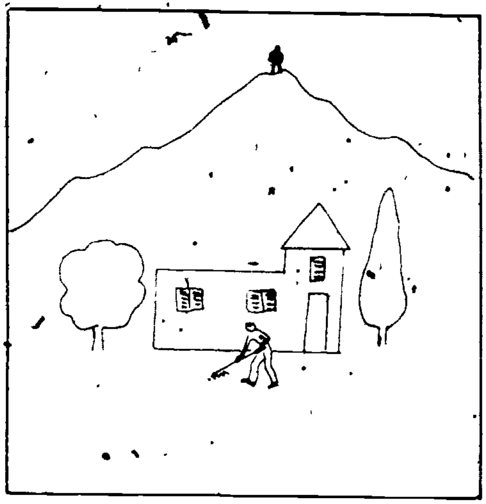
A ☐



B ☒

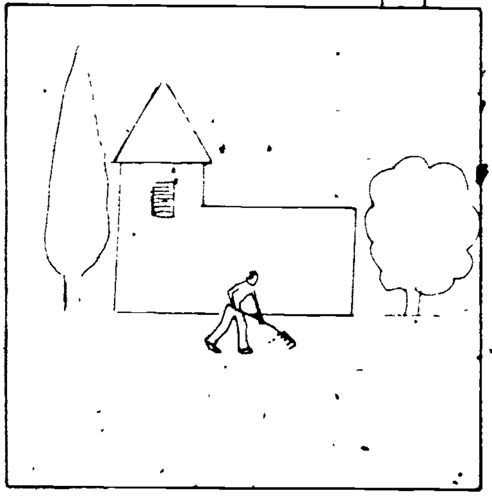


1

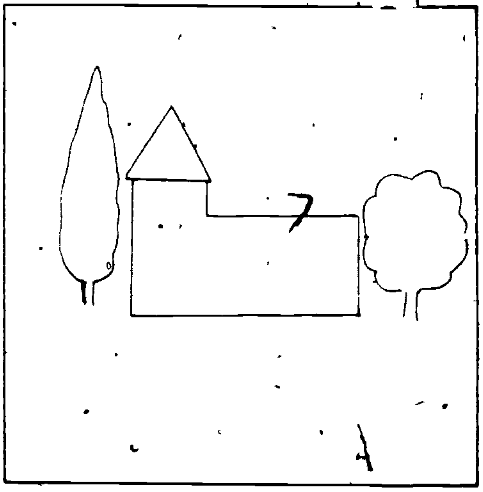


Imagine that you are the person standing on the top of the hill. Which of the pictures below is the view you would see?

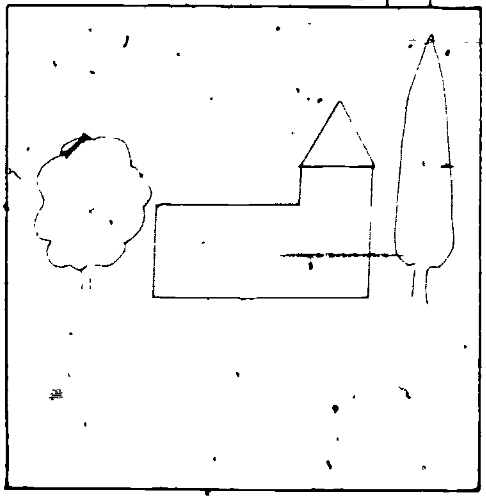
A ☐



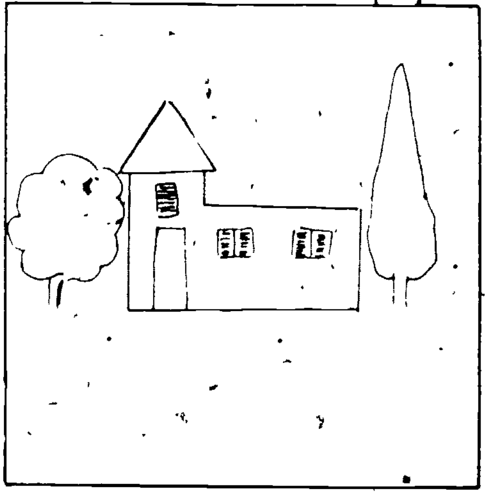
B ☐



C ☐



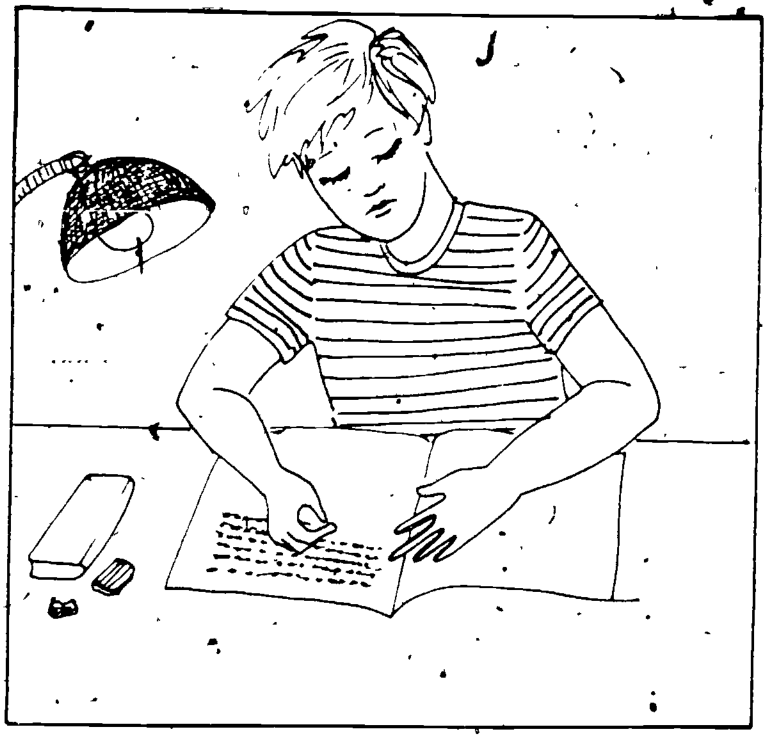
D ☐



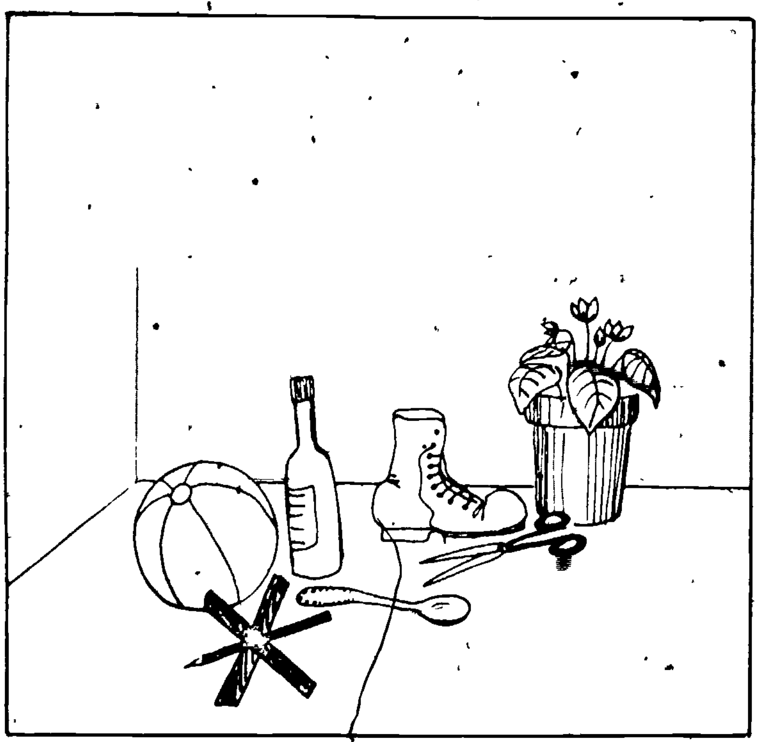
DETAIL AND CONCEPT

On each of the following pages there are two pictures, just like in the example below. In the top picture, which is marked by the number 1, something is missing. For instance, in the example below, the pencil is missing from the boy's hand in picture 1. In the bottom picture, marked by the number 2, there are several things, including the missing object from picture 1. As you can see, the pencil missing from picture 1 can be found in picture 2. Look for it and you will find it. Now, please mark an X over the pencil, just like you see in the example.

Find the missing object on each of the following pages.



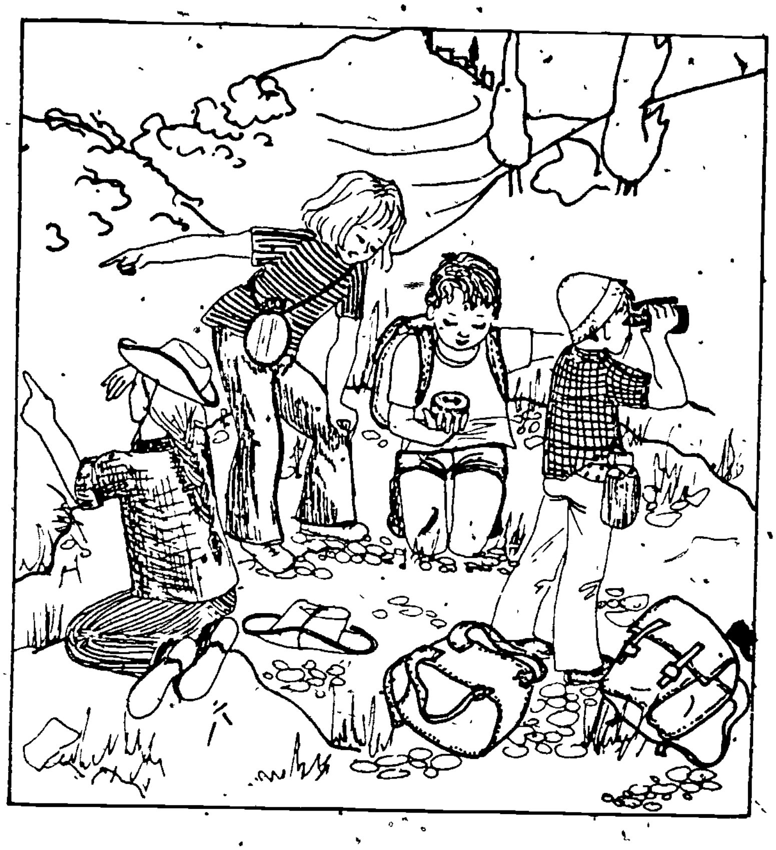
1



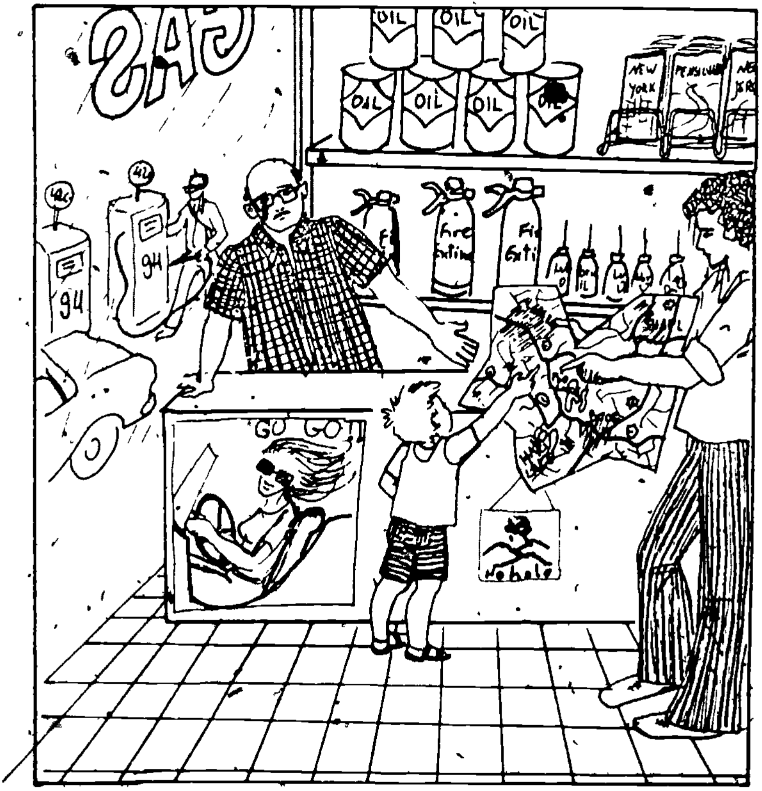
2

3

1



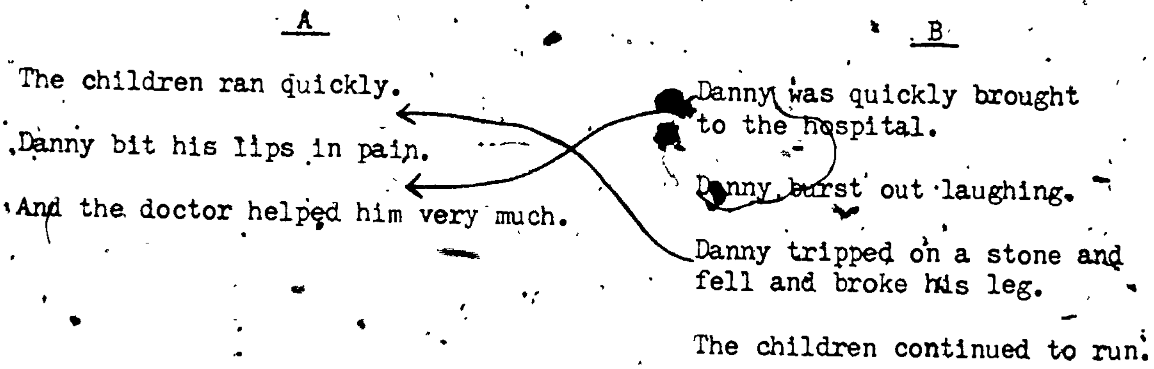
2


GAS
OIL
OIL
OIL
OIL
OIL
OIL
OIL
OIL
NEW YORK
PENNSYLVANIA
NEW JERSEY
42
42
94
94
Fire Extin
Fire Extin
Fi Exti
GO GO

STORY COMPLETION (Verbal)

On each of the following pages there is a story in the left-hand (A) column. The story is incomplete - some of the sentences are missing from it. The missing sentences appear in the right-hand (B) column. Please show, by drawing arrows from the sentences in column (B) to the story in column (A), which sentences are missing and where in the story they belong.

For Example:



A

The children ran quickly.

Danny bit his lips in pain.

And the doctor helped him very much.

B

Danny was quickly brought to the hospital.

Danny burst out laughing.

Danny tripped on a stone and fell and broke his leg.

The children continued to run.

- 1 -

A

When Jim came home from school he saw smoke coming from the window of a tall building. He ran for the nearest phone.

It was difficult to put out the fire because there was a lot of smoke.

But the people were saved and only some furniture was damaged.

"You are very brave. You deserve a medal", said the Fire Chief to Jim.

B

"Fire Department! There is a fire on Market Street", he said.

"Today we learned in school how firemen put out fires."

The ambulance arrived [illegible] hospital full of w[illegible]n.

Only a few moments passed and the firemen arrived.

- 2 -

A

The ship sank and only a few were saved.

First, they rested on the sand, and realized they had no food or tent.

One older boy said they should first look for some wood for a fire.

"But how will we light the fire?", cried one child.

That same night they all sat around the fire and kept warm.

B

The cave was deep and dark.

"We'll learn from the Indians," said the older boy.

"Let's put on our bathing suits."

They swam to the island with all their might.

PAIRED WORDS

On the next page you will see several pairs of words. Your task is to remember each word and its partner. In order to help you learn them, we suggest that you find some relationship between them and that you make a picture in your mind which describes this relationship.

For example: Lamb - Pants

If you can think of a picture in which the lamb is wearing a pair of pants, it will be easier for you to remember the pair of words, Lamb - Pants.

Let's take another example: Pencil - Cloud

Picture in your mind a cloud that puts forth a hand and draws in the skies with the pencil.

When you are asked to turn the page, read the list of the word pairs and for every pair think of a picture in which both words appear.

Here are the word pairs for you to remember:

1. arm - boy
2. rice - daisy
3. nothing - life
4. mood - humor
5. house - water
6. boot - owl
7. pencil - elephant
8. dignity - sympathy
9. time - matter
10. hand - town
11. energy - kindness
12. mind - way

See if you can complete each pair with the right word.

1. boot - ______________

2. pencil - ______________

3. ______________ - sympathy

4. time - ______________

5. ______________ - boy

6. ______________ - daisy

7. nothing - ______________

8. mood - ______________

9. ______________ - water

10. hand - ______________

11. ______________ - kindness

12. ______________ - way

Name ______________________

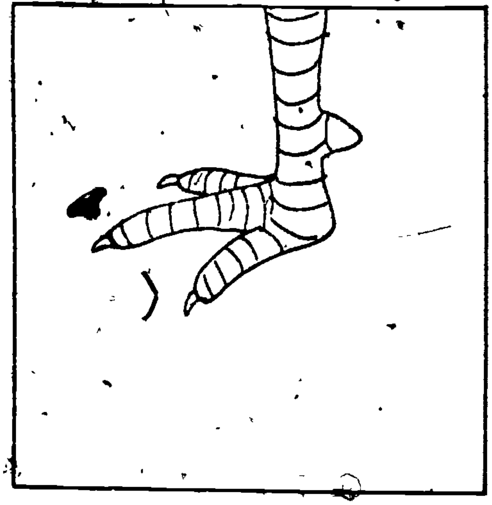
Class ______________________

School ______________________

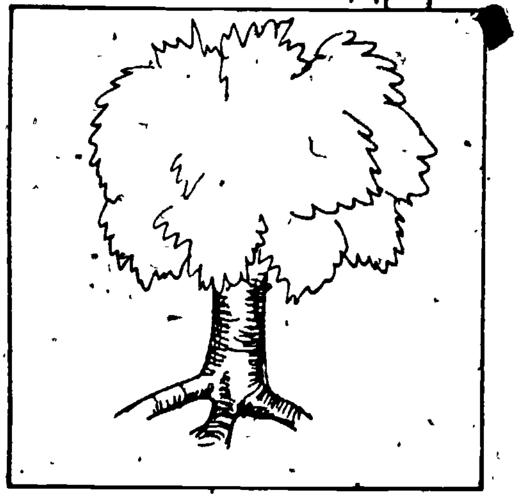
☐ ☐ ☐

DETAIL AND WHOLE

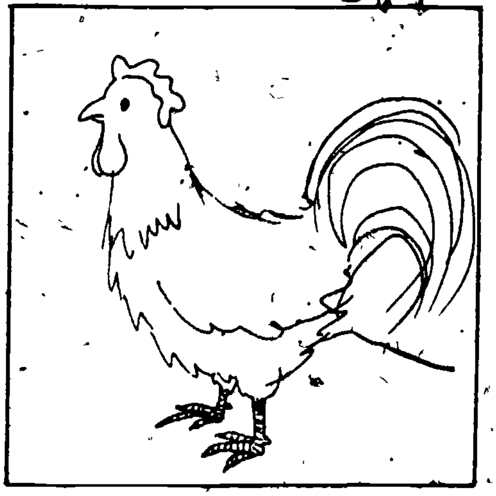
On the following pages you will see one picture at the top of the page which _is_ different from the four others at the bottom of the page. The top picture is an enlarged part of _one_ of the bottom pictures. For example, here you see the foot of a rooster in the top picture. If you look carefully at the lower pictures you will see the foot in picture "B", but this time you see it as part of a whole picture. Please mark an X in the box above the correct picture "B". Please continue in this way on the following pages.



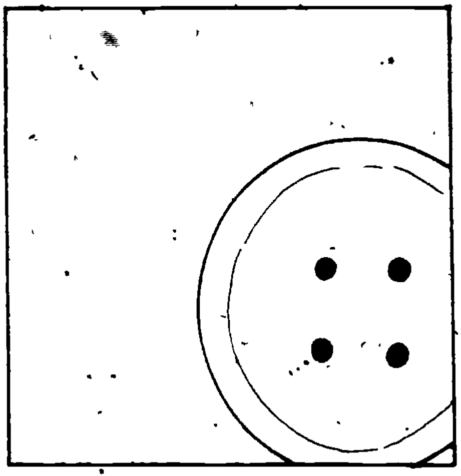
A ☐



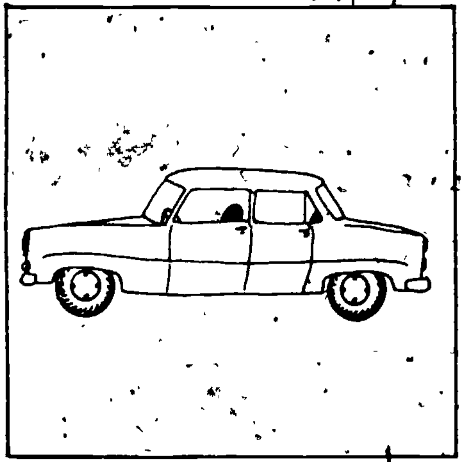
B ☒



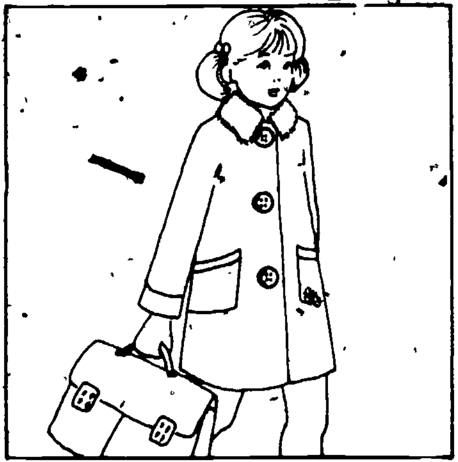
2



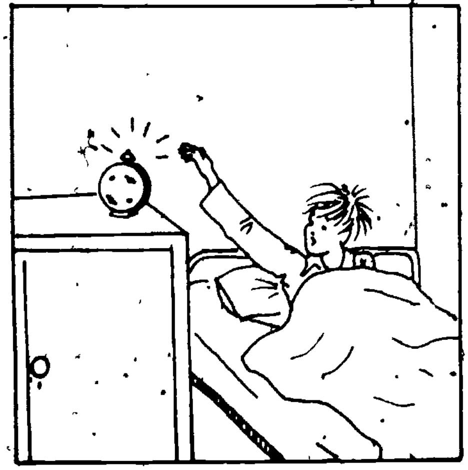
A ☐



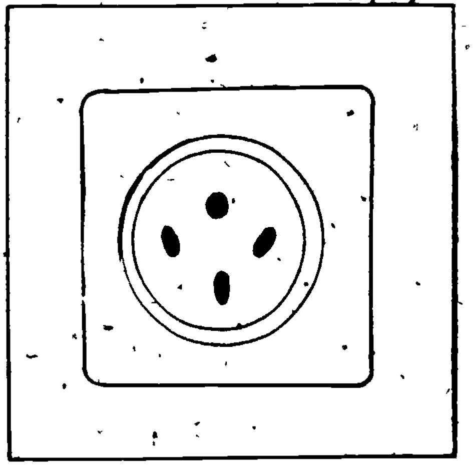
B ☐



C ☐



D ☐



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PICTURE ORDER

(Space Construction)

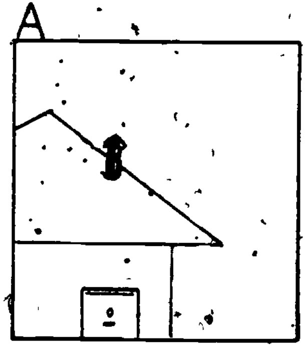
What you see on the top is a picture which has been cut into four pieces, but the pieces are not in their correct positions. Try to imagine how the four pieces must be placed in the four squares at the bottom so that they will form one correct picture.

Here is an example:

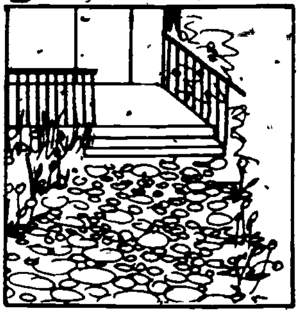
This picture of a house has been cut up so that you see one part of the roof, the front door and porch, a bottom corner of the house, and another part of the roof. If you imagine that picture "A" fits into the upper-righthand square and that picture "D" fits into the upper-lefthand square, then you will have a complete roof. Now, if you can imagine picture "B" as fitting into the lower-righthand square, and picture "C" into the lower-lefthand square, then you will have a complete picture of the house.

Please complete the following four pages in the same manner. Each piece of the picture has a letter. Write that letter in the empty square to show how you would arrange the pieces to make a complete picture.

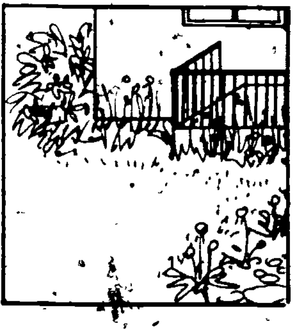
A



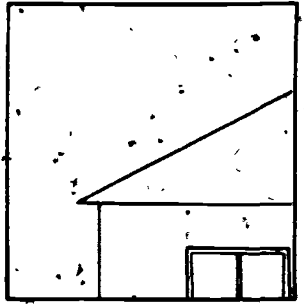
B



C



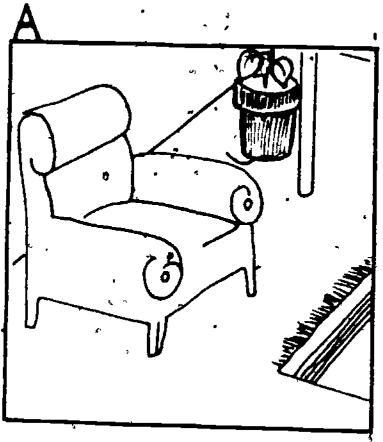
D



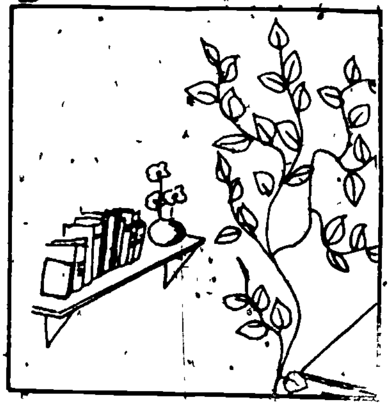
d	a
c	b

3

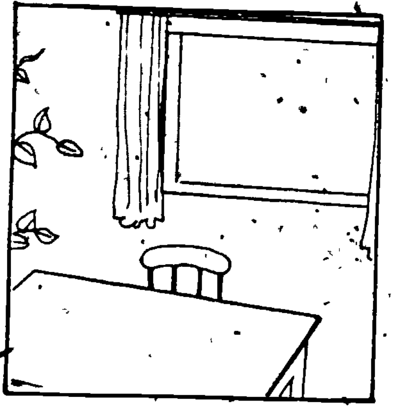
A



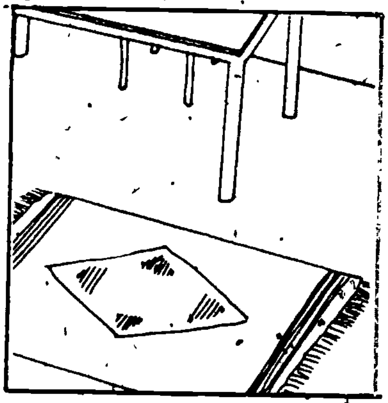
B



C



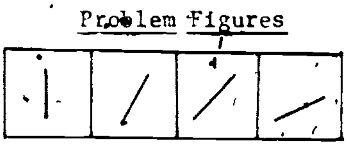
D

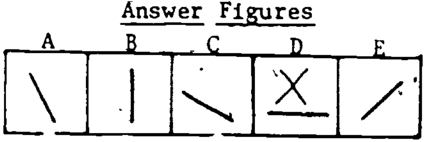


SERIES COMPLETION

In this test you will see rows of designs or figures like those on this page. Each row consists of four figures called Problem Figures and five called Answer Figures. The four Problem Figures make a series. You are to find out which one of the Answer Figures would be the next, or the fifth one in the series.

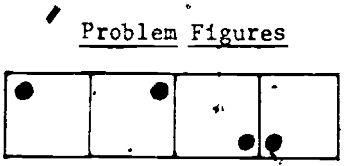
Here is an example:

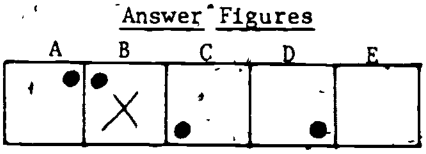

Problem Figures


Answer Figures

In the first block the line is standing up straight. In the other blocks, the line keeps falling to the right. In the fifth block, it would be lying completely flat. Therefore, the correct answer is "D".

Now here is another example:

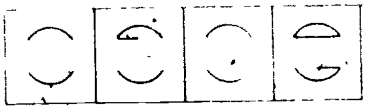

Problem Figures


Answer Figures

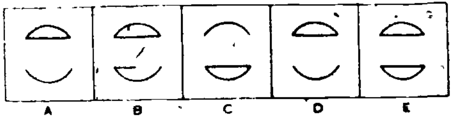
Look carefully at the position of the black dot. You will see the dot moving from corner to corner in a clockwise direction. At the beginning, it is at the top left corner; from there it goes to the top right corner, next to the bottom right corner, and finally to the bottom left corner. Where will it continue to go? It will come back to the top left corner like in the beginning. Therefore answer "B" is the correct one. Please mark an X in the "B" square. Continue in this way on the next two pages.

1.

Problem

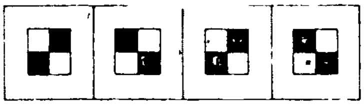


Answer

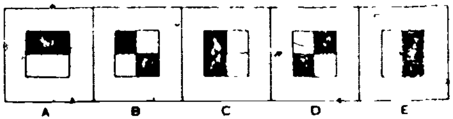


2.

Problem

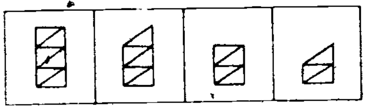


Answer

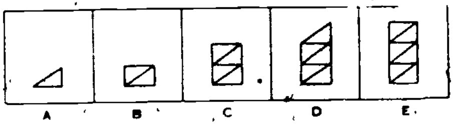


3.

Problem

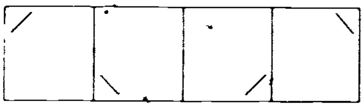


Answer

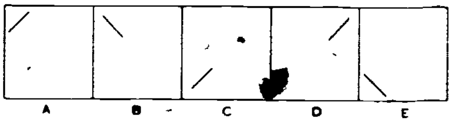


4.

Problem

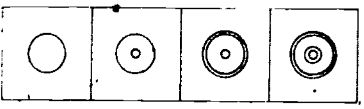


Answer

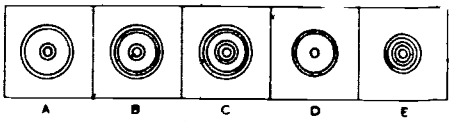


5.

Problem

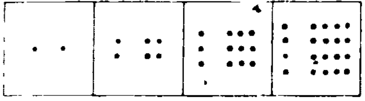


Answer

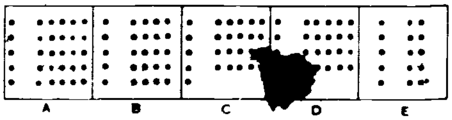


6.

Problem

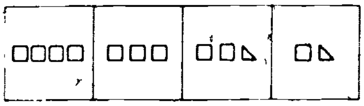


Answer

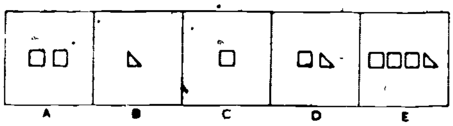


7.

Problem

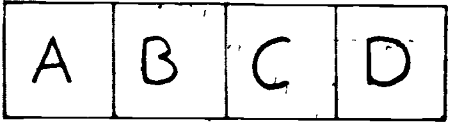


Answer

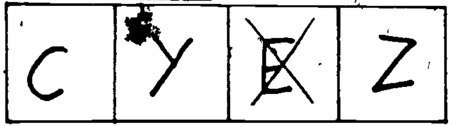


INTERRUPTED SERIES

On the following pages you will see a series of different figures which read from left to right. Each series is incomplete because one figure is missing at the end. After the problem series, there is a series of figures which is the answer series. In the answer series there are four figures: one of these is the missing figure for the problem series. For example, here is a problem series:

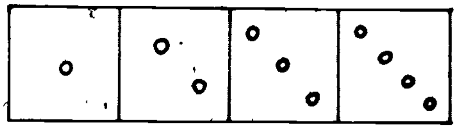


Here is an answer series:

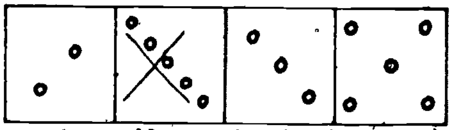


The letter "E" in the answer series is the correct answer to the problem series. Please mark an X over the letter "E", because it correctly completes the problem series. Here is another example:

Problem series:

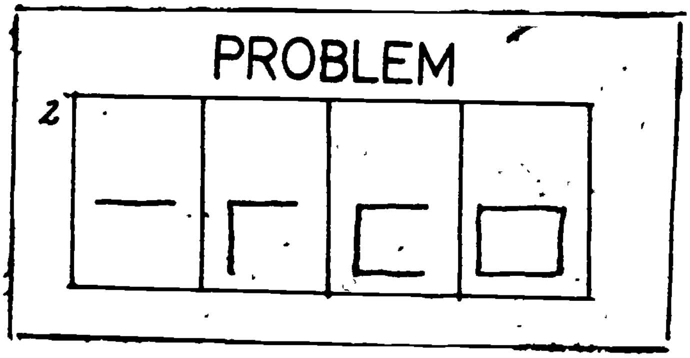


Answer series:



The correct answer to the problem series is the second answer block. Why? Because the problem series begins with one dot, then two dots, then three, and then four dots. The correct answer then is five dots. But also pay attention to the fact that the five dots are on a diagonal and therefore the last answer block is incorrect. There are five dots, but these are not placed on a diagonal.

The answer series will not appear on the same page with the problem series, as in the above examples. Therefore each time you look at the problem series, do so carefully, because between the two series you will complete a short task. Only after you finish this will you be given the answer series. Then you can choose the correct figure that completes the problem series.



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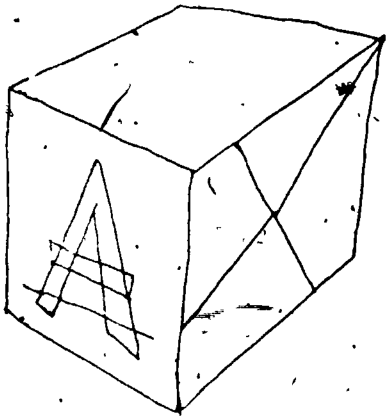
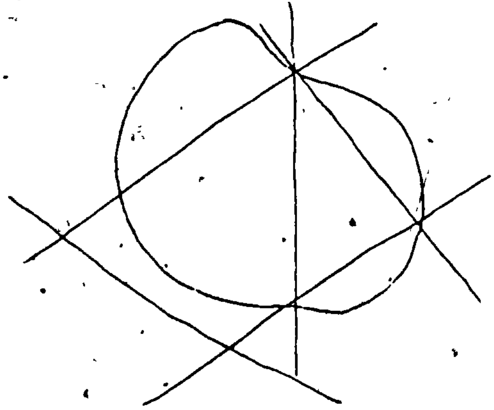
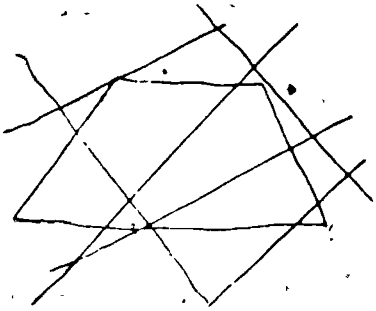
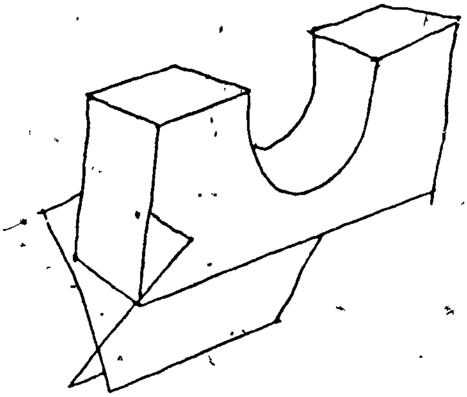
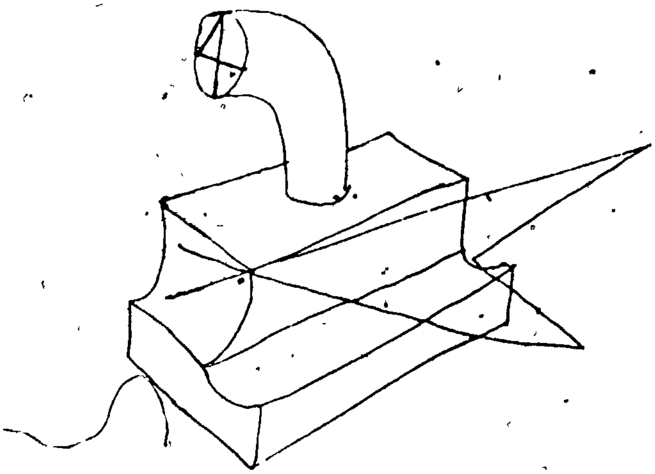
Fill in all the triangles you see on this page.

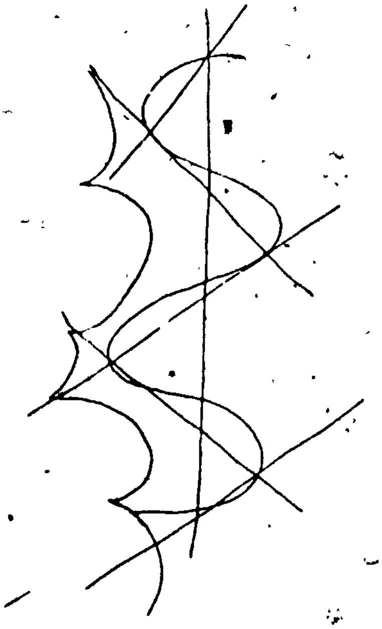




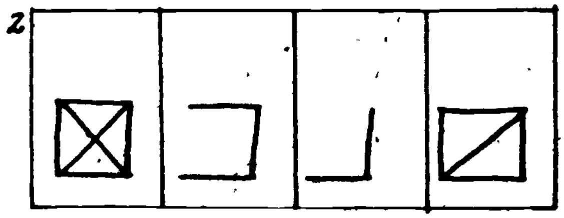








ANSWER



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MIXED STORIES

We shall now read you some short stories. Listen to the stories carefully, and follow along by reading them to yourself as they are read aloud. Afterwards you will be asked some questions about them.

Billy and Johnny loved the row of tall trees in the park which they used to pass on their way to school. The trees provided lots of shade and a cool breeze in the summer, and the children could play hide-and-go-seek between them. One day, Billy was on his way home through the park, and what did he see? Workmen were about to chop down the beautiful trees in order to widen the road. Billy was very concerned and ran to Johnny's house to tell him about it. The following day, on his way back from school Billy heard loud noises coming from the park. He quickly approached the park and suddenly saw the people from the neighborhood assembling for a large demonstration to protest the plan to widen the road. Billy was so happy, he ran to the nearest phone and called Johnny to give him the good news.

Next to the only public telephone booth in the small resort town were several people lined up to wait their turn to use the phone. Inside the booth stood a young girl speaking to someone. She did not even bother to notice the people who were waiting for her to finish. Finally, after a long wait, one man who was waiting to call a doctor completely lost his patience. He knocked lightly on the door of the booth and asked the girl to hurry up, but she pretended not to hear him and continued talking. Several other people joined the man in asking her to end her conversation, but she just went on and on. When she was finally done, she stepped out of the phone booth and said, "What's wrong?! I got here first, and I've got a right to use the phone just like you do." **"You have terrible manners!" cried one of the** people. "Don't you know that the public telephone is here for everyone to use?"

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Joey and David were brothers about the same age. When graduation was near, both wanted bicycles. But bicycles were expensive, and they didn't have enough money to buy them. Joey said to David, "Why don't we go out to work after school so we can earn money to buy bikes?" Both children decided to ask the florist if they could deliver flowers the next day.

The next afternoon, when it was time to go out to work, David said, "I think I'll come tomorrow... I want to play outside today with one of my friends." That day Joey went to work alone. On the following day he asked David to join him but David said,"I'll come tomorrow." And so it was on the third and fourth day, and David's "tomorrow" never came. Joey was jealous that his brother stayed home to play with his friends, but his sorrow lasted only a short while. After several weeks, Joey came home riding his new bicycle.. And now just imagine how sad David must have been.

One day during the Easter vacation Dick stood waiting for Tim near the movie theatre box-office. Both boys had planned to go to the movies together. Dick waited for Tim but Tim didn't arrive. The movie had already begun and Tim still hadn't arrived, and Dick was getting angrier by the minute. After a long while Dick decided to return home and give up the movie. Dick said to his mother, "Boy, is Tim a nasty and irresponsible friend! I don't want to be his best friend any more." The next day,on his way to school, Dick decided to tell Tim what he thought of him, and that he didn't want to be friends any more. Dick was very suprised to find out that Tim didn't come to school either. After school Dick hurried to Tim's house and found him there laid up in bed with bandages on his hand and leg. Only then did Tim tell Dick that as he was running to the movie theatre in order to be on time, he slipped on the road and never made their appointment. Dick said to himself, "Wow, I was really quick to accuse my friend. I should have waited first to see what had happened." Dick then smiled in relief.

Below you will find five questions about the stories you have just heard. Each question has four answers, but only one is correct. Please circle the number of the correct answer for each question.

You may begin now.

1) Why was the girl's behavior an example of bad manners?

   1. Because she didn't pay attention to the line of people outside
   2. Because she didn't keep her promise and go to work
   3. Because she didn't arrive on time to her appointment
   4. Because she joined the demonstration

2) What was the exciting news that the child told his friend on the phone?

   1. That there was a long line near the telephone and people were angry
   2. That both of them had work at the florist's
   3. That he wasn't a good friend because he didn't come to the movies on time
   4. That there was a demonstration in the neighborhood to protest chopping down the trees

3) What can we learn about the meeting near the movie theatre?

   1. That a good friend calls his friend to tell about the demonstration
   2. That one has to wait patiently
   3. That one should not jump to conclusions about people
   4. That the industrious person is rewarded for his labor

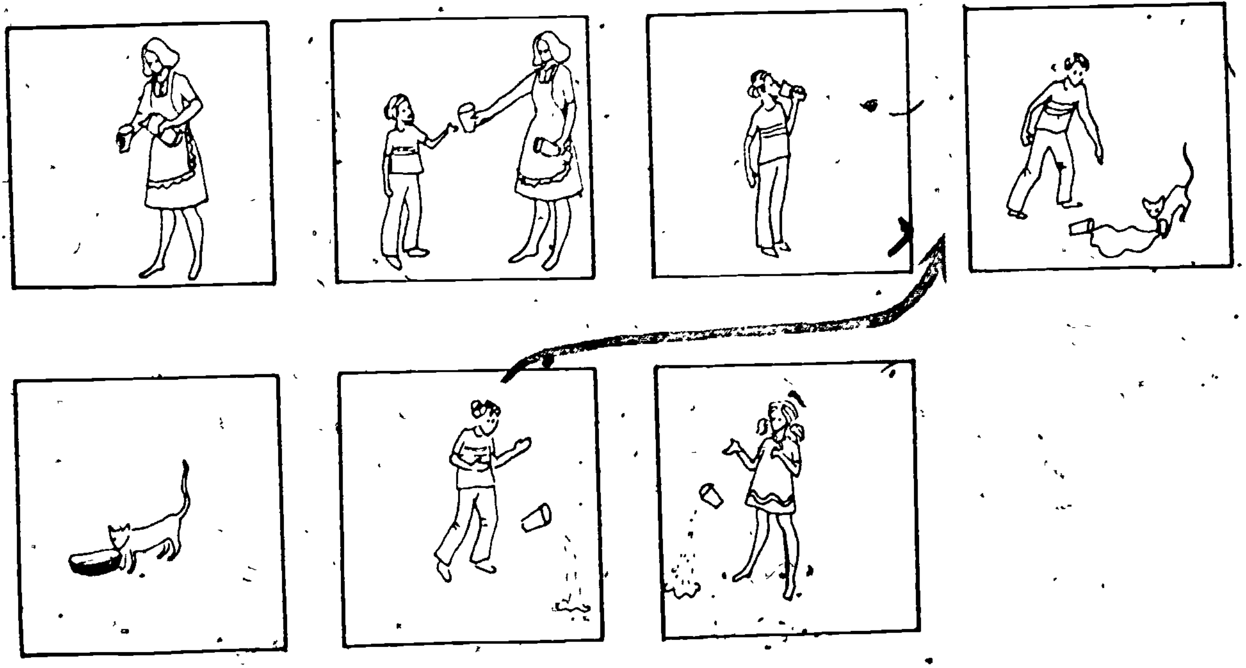
VISUAL GAPS (Story Completion)

On the following pages there is a row of pictures at the top of each page. These pictures tell a story, but the story is incomplete. There are missing pictures. The missing pictures appear among the pictures in the bottom row. Please draw arrows from the missing pictures, in the bottom row, to the top row. Make each arrow point to where it would help complete the story. Make sure it points between two pictures. Sometimes you will need only one picture from the bottom row to complete the story, and sometimes you will need more than one.

The top row of pictures begins on the left and goes to the right. Don't change the order of the pictures in the top row. Now here is an example:

In the top row you see pictures which tell about a boy who gets a glass of milk and spills it. But the story is incomplete. If you look carefully you will see that one of the pictures in the bottom row completes the story at the top. It is the middle picture which completes the story because it shows how the boy drops the glass. The other pictures do not belong in the story. The cat drinking from the dish and the girl dropping the glass do not belong to the story.

Please remember that not all of the pictures in the bottom row belong to the story. Sometimes you will need to add only one and sometimes as many as three or four. In each case, please draw arrows which show exactly where in the top row the pictures goes. Please remember that none of the bottom pictures can be placed at the beginning or at the end of the story.



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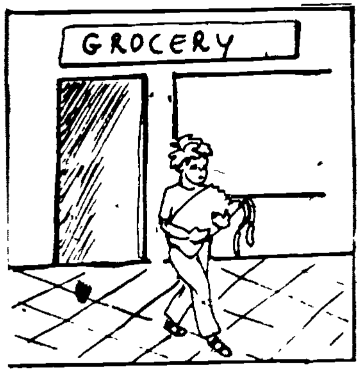

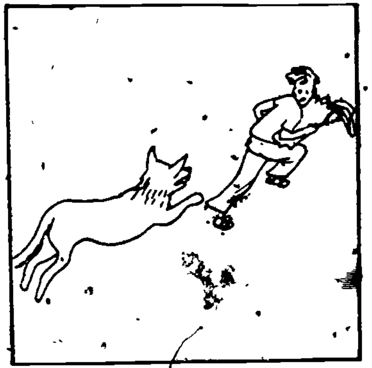

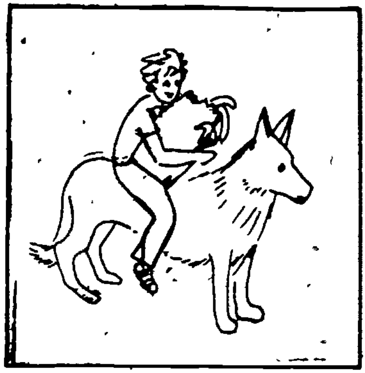

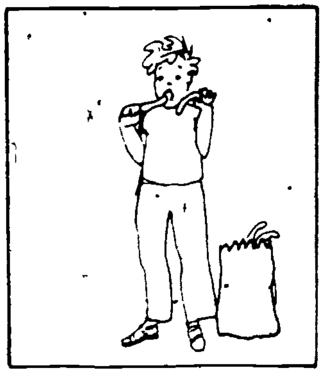

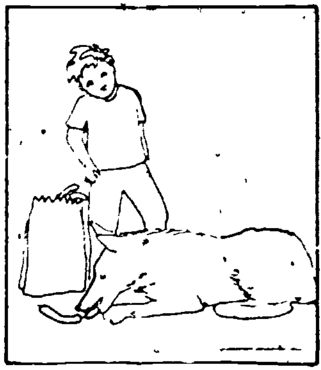

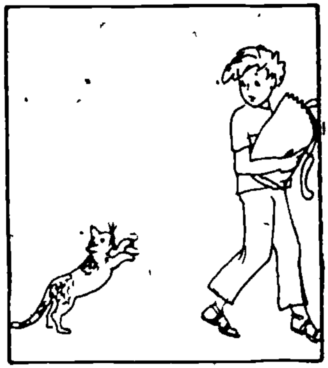

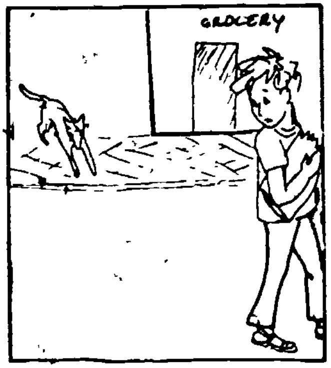

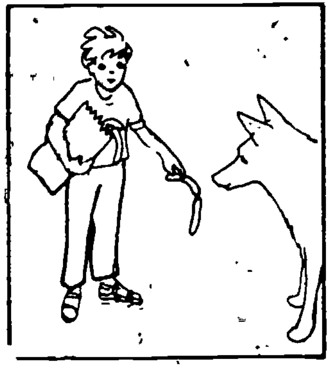

Sample Items from LL Questionnaire

Time: from 1:00 to 1:15

I did not watch TV at this time. ☐

7

Ch. 2 Decades of Decision

At the beginning of the program:

1. There was a meeting of the townspeople.
2. The American Soldiers were winning the battle
3. The American soldiers were almost defeated
4. There was a party in celebration

Ch. 4 Grandstand

The narrators talked about:

1. Were one can buy a closed-curcuit T.V.
2. Billy Jean King's new tennis racket
3. Major sports events of the weekend
4. [illegible] a fish pond in one's yard

Ch. 5 Good Morning

The arrival on the show was:

1. A cow
2. An elephant
3. A dog
4. A seal

Ch. 7 Movie - The Caddy

What did Jerry Lewis (the caddy) do to shake the dogs?

1. ran as fast as he could
2. jumped over a wall
3. Dressed up in someone else's clothes
4. Drove away in a car

Ch. 10 Movie - Devil at 4 o'clock

The movie opened with men in:

1. A sailboat
2. A submarine
3. An airplane
4. A car

Ch. 38 Donovan's Reef

The man:

1. played tennis
2. Bought a horse
3. Kissed the lady
4. Stole some jewelry.

Ch. 44

Ch. 56 Movie - A Summer Place

In this movie Molly:

1. Played ball with her friends
2. Had a little baby girl
3. Was in love with Johnny
4. Lived in a dormitory

I watched a program not listed on this page ☐

Channel number _____ Name of program ______________

Name ____________________

Class ____________________

School ____________________

As part of the study we are conducting, we would like to ask you some questions about what you did yesterday.

Please do not write in the margins.

6. Did you read the newspaper yesterday (not including the comics)?

1 No

2 Yes

7. Did you read a book yesterday?

1 No

2 Yes

8. Did you listen to the radio or to records yesterday?

1 No

2 Yes

9. Did you read the comics or comic books yesterday?

1 No

2 Yes

10. How long did you watch TV yesterday?

0 I didn't watch at all

1 Less than one hour

2 One hour

3 Two hours

4 Three hours

5 Four hours

6 Five hours

7 Six hours

8 Seven hours

9 Eight or more hours