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ABSTRACT

The process of curriculum development involves two phases: transformation of research findings into curriculum material by external developers and implementation of curriculum materials by teachers. In a study of the development of an eighth grade biology unit in Israel, the authors examined the characteristics of and relationships between the activities of external developers and teachers. Analysis of the first phase, material development by an external group, involved examination of various versions of the curriculum material, minutes of meetings, and comments of development team members. It was found that the developers made changes in transforming research in the field of biology into eighth grade level curriculum material. These changes included simplifications of content, omissions, and changes in style and forms of expression. Analysis of the second phase, implementation of the unit by teachers, involved a survey of the 20 teachers who used the unit. It was found that the teachers spent more time on the unit than was specified in the teacher's guide, used more teaching strategies than were outlined in the guide, and emphasized approximately the same content as was stressed in the guide. Additional research is needed to explore the impact of personal characteristics of developers and teachers upon the process of curriculum development. (AV)

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THE PROCESS OF CURRICULUM DEVELOPMENT: TWO LEVELS OF INTERPRETATION

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Various models of planning are presented in the professional literature which discusses the process of curriculum development. Most of them are of a prescriptive nature and set out the most desirable planning method for curriculum developers (Tyler, 1950; Taba, 1962; Emans, 1966; Robinsohn, 1969). The discrepancy between these models and curriculum reality is often very great. In order to overcome this discrepancy, Walker (1971) suggests the term "naturalistic model of curriculum development," i.e. a model that is based on an examination of curriculum practice in reality. According to Walker such a model will clarify important aspects of the developmental process and will aid in correcting the distortions in the perception of the process. Our approach is pertinent to Schwab's position (1969), which claims that curriculum research should be based on an examination of curriculum reality within the framework of this approach the present authors analyse a curriculum development case with a view toward identifying its various components as well as the interaction between them. The purpose of this paper is therefore to sketch our preliminary outline of a "natural" model of curriculum development based on an examination of curriculum reality as reflected in a curriculum development case study.

Some Basic Assumptions

This curriculum case study is based on a number of basic assumptions:

1. It is possible to distinguish between two separate functions in the process of curriculum development (Connelly, 1972); one function is carried out in curriculum planning centers by members of teams which are situated outside the school and are, therefore, called "external developers". These developers transform ideas into actual curriculum material. The second function is carried out by teachers who implement the curriculum in their

classroom by using the prepared curriculum materials. Their share in the process of curriculum development is defined as the transformation of curriculum materials into teaching-learning settings through the adaptation of the materials to the conditions of their particular teaching circumstances. The teachers who implement curriculum materials are accordingly perceived as "user-developers." Connelly points out that the proximate goals of the two phases -- i.e. curriculum materials in the first phase and teaching-learning settings in the second -- involve different considerations. In the first phase, the considerations are usually of a general, theoretical nature, while in the second phase the considerations are largely particular and practical. Beyond the general characterization of the two phases Connelly does not give details on the nature of the components, processes and procedures typical of each.

In the work presented here an attempt is made to fill in Connelly's conceptual framework with an examination of the characteristics of the two phases, as well as an examination of the connections which exist between them.

2. The development process examined by the authors refers to those curricula which can be seen as being "translations" of scholarly material into curriculum materials (Schwab, 1973). Scholarly materials are perceived as existing knowledge in the form of written documents in the fields of knowledge which are known as disciplines, and include, in addition to the contents, the syntactic characteristics of the methods and processes producing such contents.

In the process of translation, the developers reveal the educational potential embodied in the scholarly material and make decisions relevant to the various aspects of the translation. These aspects are defined by us as "decision cross-sections" in the translation process. At each of

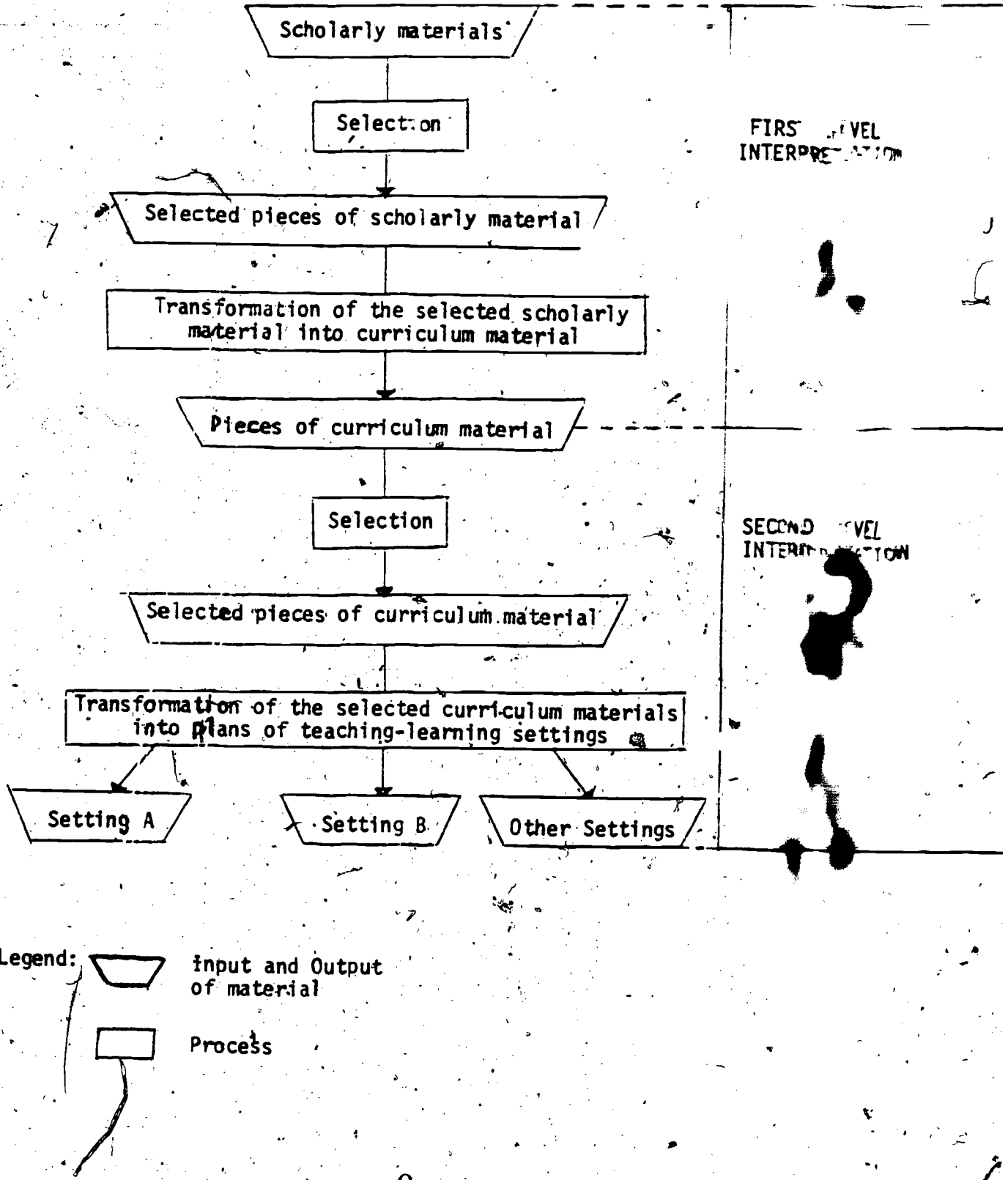
these crossroads, different questions arise and the developers decide which questions to deal with and which of the possible alternative answers to accept, while simultaneously elaborating the curriculum material. For example: one of the important decision crossroads pertains to the clarification and selection of educational messages. Several questions may arise in regard to this latter aspect, such as: which ideas, principles, and concepts are both possible and desirable to be embodied in the curriculum material? Which kinds of information have to be included and which can be omitted, etc.?

As sources of scholarly material, developers use research reports, articles, and other publications in the field under discussion. Developers occasionally rely on their own knowledge of a certain discipline, or they draw upon the knowledge of subject matter specialists. Here, we chose to deal with a case study where original scientific research reports were used as a starting point for the development process.

This translation of scholarly material into elaborated curriculum material is defined by us as "first-level interpretation" (see Fig. 1). Within the framework of the present case study, we examine how this "translation" was actually carried out and what the characteristic elements of the first-level interpretation were in a given curricular reality.

3. Teachers play a central role in the process of curriculum development in that the interpretation given by teachers to the curriculum material at their disposal determines the nature of the implemented curriculum (Fox, 1977). Elaborated curriculum materials, the product of external developers, may be viewed as interim materials which need further development through modifications, omissions, additions, supplements, etc., carried out by teachers using them (Silberstein, 1977). In all curriculum material, there lies an educational potential beyond the specific intentions of the developers

FIGURE 1 CURRICULUM DEVELOPMENT: TWO LEVELS OF INTERPRETATION

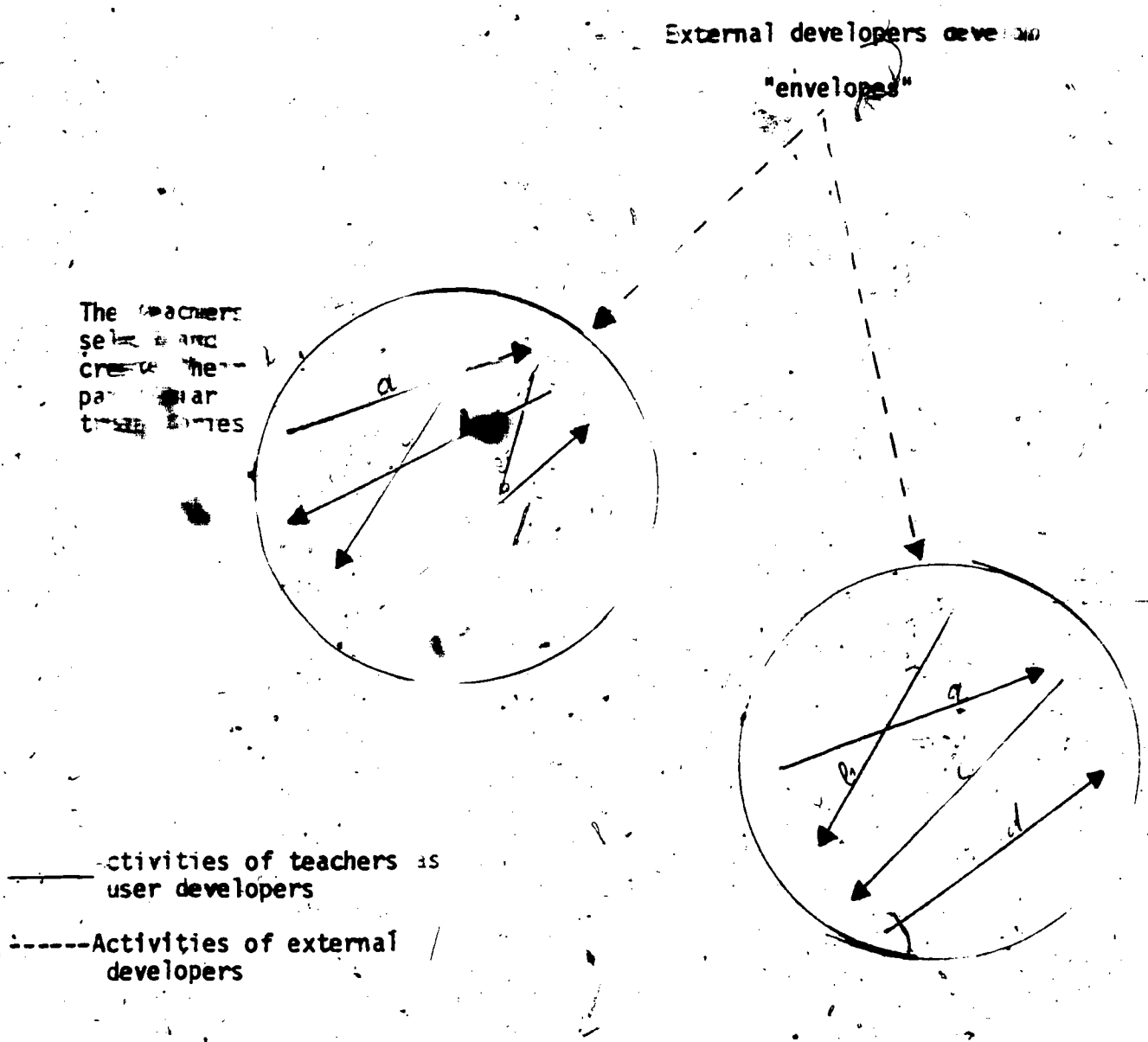


(Ben-Peretz, 1975). This potential may find its expression in the various interpretations which the teachers give to the curriculum material while implementing it in their specific teaching circumstances. The planning of teaching-learning settings by teachers, which is based on elaborated curriculum materials, is denoted by us as "second level interpretation" (see Fig. 1). This level of interpretation pertains to all kinds of curriculum materials except for "teacher-proof" curricula, like programmed materials in which the developing team try to achieve direct communication between curriculum materials and learners, thereby excluding teachers from "interfering" through their interpretation of curriculum materials. In this work an attempt has been made to reveal the various components of the interpretation process carried out by the teachers.

4. Eraut (1972) suggested viewing new curricula introduced into the educational system by external developers "envelopes" enclosing a variety of possible solutions to problems which were defined by the developers: "New curricula can be thought of as trajectories through pedagogic space; they are properly defined not by single lines in that space, but rather by envelopes containing an infinite set of 'allowed' solutions to the problems envisaged by the curriculum designers" (p. 64). Teachers using elaborated curriculum materials select the solutions that seem appropriate to them. In other words, at the second level of interpretation, exploitation of the potential hidden in the curriculum takes place within the framework of envelopes designed by the external developers. Exceeding the bounds of the envelopes would transfer the teachers beyond their function as "user developers" to that of "external developers."

Figure 2 illustrates the way external developers and teachers participate in the creation of curriculum envelopes and in the selection of trajectories within the envelopes.

FIGURE 2 - CURRICULAR ENVELOPES



Distinguishing between the special characteristics of the two levels of interpretation will provide a distinction between the various functions of the team of external developers on the one hand, and the implementors (the teachers) on the other. This distinction has implications relevant to understanding the development process of curriculum materials and their implementation, as well as to the planning for the training of curriculum developers and of teachers.

5. In the curricular reality of Israel, a team of writers develops curriculum materials within the framework of a curriculum syllabus prepared by special committees. Often the developers are also partners in the preparation of the syllabus. The guidelines of the syllabus are considered by the writing team as curricular constraints and are accepted as such.

Definition of the Problem

The research problem presented by the authors is therefore: What are the special characteristics of the developmental activities at the two levels of interpretation, and what are the relations between these two levels as illustrated in the curriculum case here analyzed?

RESEARCH METHOD

Documented materials are of major importance for case studies. The more comprehensive and reliable the documented material, the better the chances for an objective and valid reconstruction of the processes. Walker (1971) recorded the deliberations of the developing team of an art education project for the pre-school age (Kettering Art Project) and based his analysis mainly on the recorded material.

However, our post-hoc analysis of a curriculum case which had proceeded without advance planning for documentation of curriculum deliberations, forced us to adopt a research method utilizing only existing documentation - that is, various versions of the material plus written documents such as minutes of team sessions, summaries of meetings, written comments of team members, advisers, and evaluators, and the like. Since our interest focused on the events connected with the decisions and considerations related to the transition from scholarly material to curriculum material, this documentation together with structured interviews with the developers seems to provide a reasonable basis for reconstructing the processes. Indeed, this is the only practical

way to replicate research based on documented evidences. Moreover, recordings made during the course of the regular work of the development team could arouse opposition on the part of members of the team who might see it as interference by researchers, and this would therefore be likely to influence the natural course of deliberations.

For this case study, the unit of curricular materials selected was concerned with: "Is it possible to reduce the amount of water intended for irrigation?" This unit is included in the subject "Plants and Water" (Silberstein, 1974) with the framework of the biology curriculum for the Junior High School in Israel.

For our examination of the first level of interpretation the following procedures were used:

1. Content analysis of the material in its various transitions from scholarly material through interim stages to the final edition of the curriculum material. The aim of this analysis was to identify the changes that had been incorporated into the material in its transition from one form to another. These changes were summarized and classified into categories. The classification of categories underwent content validation by independent judges. The classified changes enabled us to draw conclusions regarding the "decision crossroads" used in the process of transformation of the material.

2. Analysis of the written documents, reports, minutes of meetings, and comments of the team members, advisers, and evaluators.

3. Structured interviews with members of the curriculum developing team.

The latter two procedures enabled us to reveal the considerations and the kinds of the factors influencing the decision-making which

resulted in the changes introduced into the material at different stages.

In our examination of the second level of interpretation, we utilized questionnaires for the teachers who implemented the curriculum materials.

Our only source of data about the second level of interpretation is the self-report of teachers who implemented the above-mentioned curriculum material. This report should be interpreted as the teachers' perception of the teaching-learning settings as-planned and executed. Without taking concurrent validation steps, we cannot determine the degree of reliability of this self-report. It seems to us that within the framework of the present research this is not a serious omission, since we limited the scope of the research to the curriculum planning process. We are interested in the teachers' report on their perception of the second level of interpretation. Therefore, the extent of congruency between this perception and the actual events in the classroom is beyond the scope of our research.

FINDINGS - First Level of Interpretation

Choice of Scholarly Material for Development

Since the case examined by us is of the kind of curriculum development in which units of scholarly material are the starting point for development of curriculum materials, our first question was: How were the units of scholarly material selected in the case under study? We found that both the developing team and subject matter specialists were involved in the selection process. Their selection was influenced by curricular constraints originating in the syllabus for Grades 7-12 Biology (Ministry of Education & Culture, 1968) and, more precisely, in the section dealing with "Plants and Water," one of the topics within a series of ecology topics planned for Grade 8 classes of regular pupils. Acceptance of the syllabus restricted the scope of selection of the scholarly material to contents connected with the

relationship between plants and water.

Lewy (1976) has called the selection of contents guided by the constraints of the general framework of the syllabus "macroplanning," as opposed to "microplanning" which is related to the selection of specific contents at a later stage when the team asks itself what knowledge could be generated from the contents which were selected at the macro-level. In the selection of contents at the macro-level, factors originating in the team's platform[1] play an important part. Thus, for example, opinions accepted by the members of the team as to characteristics of the curriculum materials likely to stimulate a high level of motivation in the target population (in this case, regular pupils of junior high school age) influenced the selection of scholarly material to a great extent, as was evident from minutes of team meetings. It appears that this question concerned the members of the team, since at the same time a number of research findings were being published claiming that the extent of junion high school pupils' interest in botanical subjects was very low (Mayer & Tamir, 1973). Reports were found of various proposals reflecting the personal outlooks of the developers with regard to the question of what might increase motivation among pupils. There were those who felt, for instance, that presentation of a scientific problem such as "why water rises in plants contrary to what we would have expected from what is known of the force of gravity" might attract the pupils' attention. Others raised proposals such as: a trip to irrigated and non-irrigated fields using landscape photos from different parts of the country, discussing the national water system, etc. One suggestion was to use an article on actual research about the relationship between plants and water which had contributed

[1] A term defined as a system of beliefs, opinions, attitudes, and preferences which team members bring with them when they discuss the ways, possibilities, and the desiderata with regard to the image of curriculum materials, target populations (pupils and teachers), teaching methods, forms of learning, etc. The term is found in Walker (1971).

to the planning of water supply in Israel. The team members opted for this last proposal assuming that curriculum material demonstrating the connection between research and its contribution to a solution of a socio-economic problem might interest the pupils. This assumption was based on the general position accepted by members of the team that stressing the relevance of the subject will arouse the pupils' interest. Among a series of articles and other sources reviewed, the most relevant articles were found to be those of Shmueli (1971) and Shmueli et al. (1971).

Types of Changes found in the Transformation of Scholarly Material into Curriculum Material

Content analysis of the unit in its various versions revealed many changes that were introduced in the process of translation of scholarly material into curriculum material. These changes were expressed in omissions, additions, abbreviations, simplifications of contents, combinations of existing content items, and changes in style and form. An attempt to classify the changes into categories from the standpoint of types of decisions yielded what seemed to us to be three main "decision crossroads":

1. Decisions regarding clarification and definition of educational messages included in the material.
2. Decisions regarding the method of transferring the messages to the pupils, i.e. the instructional strategies.
3. Decision regarding the context of teaching the material.

Illustrations of Decisions Taken Concerning Education Messages (mainly changes in content): These decisions refer to the opportunities for learning which the contents might offer the students. In making these decisions, the developers referred to questions such as: Which ideas, principles, and concepts appearing in the scholarly material are suitable for inclusion in the curriculum material?

Which information are we interested in, and which should be omitted? What should be emphasized and what played down? What meaningful aspects for the student and society can be dealt with by means of the content? What opportunities for cognitive development, values, attitudes, and interest can be incorporated into the curricular material?

Herewith are a number of examples illustrating the range of decisions which were made involving clarification and definition of educational messages (the considerations leading to these decisions will be examined later):

1. Omissions:

A portion of the scholarly material explained the importance of the integration of basic and applied research. In the trial version of the curricular material, an attempt was made to refer to this relationship; however, in the final edition, this reference was deleted.

2. Reductions:

The scholarly material reported on 13 experiments carried out on different kinds of citrus trees in various parts of Israel. In the final edition of the curriculum material, only one representative example was given.

3. Combinations of Existing Content:

In the scholarly material, the quantity of water that a single tree consumes over a year was not dealt with explicitly. In the curriculum material, there is a section dealing with the average quantity of water that a single tree ostensibly "drinks" throughout a day. This quantity was reckoned on the basis of various data found in the scholarly material.

4. Additions:

In the scholarly material, no reference was made to any possible conflict of interests between the private grove-owners and the public. The curriculum material explores a situation wherein such a conflict could arise and the issue is raised as to how decisions are made in such a case and by whom.

5. Simplifications of Content:

In the scholarly material, a particular research is described as having a multifactorial experimental design referring to a number of independent variables manipulated by the researchers. In the curricular material, the experimental design was simplified to a one-factor design, referring to one independent variable.

Also, in the scholarly material, a detailed description of the experimental design is given, including a total of 17 parameters of the plant and the soil which were measured; in the curricular material only four of these are mentioned.

In the scholarly material, scientific terms such as "parameter" and "water dosage" were used. In the curricular material, the term "parameter" is not used, while the term "water dosage" is used, but only after a preliminary explanation.

6. Changes in Style and Forms of Expression:

In the scholarly material, a particular set of data is presented in tables and graphs. In the curricular material, the data are presented in the form of an illustration, and pupils are asked to organize the data into a table and then translate them into a graph.

Illustrations of Decisions Taken as to the Instructional Strategies

These decisions were based on preferences as to teaching methods and modes of learning. The advantages and disadvantages of teaching methods and modes of learning and their adaptation to a given situation were considered. Often a decision regarding the method of transmitting a message was integrated with a decision about the selection or definition of a message. For example, both aspects were involved in the decision to leave to students the task of organizing data into a table and to express them as a graph instead of simply presenting the data in a table or graph as was done in the scholarly material.

Following are a number of illustrations of decisions which relate to instructional strategies:

1. The scholarly material was written as a scientific review article presenting the reader with information and conclusions. The curricular material was written as a narrative of inquiry, a writing technique which gives the pupils an opportunity for more active involvement in the inquiry. In the narrative of inquiry, partial data are given and the pupils are asked to reconstruct the research procedures, to explain the steps taken, interpret results, and draw conclusions.
2. The text is accompanied by work-sheets for individual and group work - the recommendation being to combine individual work with group work and classroom discussion.
3. The conflict between private and public interests such as noted above, considered by the authors as central from the standpoint of educational message, is written in the form of a section called "Stop and Think," a writing technique employed by the team to stimulate reflective thinking amongst pupils and to draw the teacher's attention to the focus of the lesson.
4. Part of the information is transmitted by visual means.

Illustrations of Decisions Taken with Regard to Contexts

1. The teaching unit was designed to form as an introduction for the entire textbook, arousing motivation for studying the topic. However, it is not dependent upon defined previous knowledge, and it is not a necessary prerequisite for the following units - thus, its place in the instructional sequence can be changed.

2. Decisions taken regarding contexts are relevant not only to the place of the unit within the framework of the whole subject, but also to the development of the unit itself. Thus, we find that the section on the amazing quantity of water that a single citrus tree supposedly "drinks," which in the interim version appeared as part of the instructional unit studied here, was moved in the final version to a preceding unit where it had a better sequential fit.

Considerations Guiding Deliberations and Decisions in the Translation of Scholarly Material into Curricular Material

Considerations which led to the decisions that were taken were discovered, in part, by an examination of written documents such as reports, summaries of meetings, remarks of the team members, advisers, and evaluators, as well as by means of a reconstruction from memory by team members involved in preparation of the unit.

We distinguished those considerations originating in the team's platform, opinions, attitudes, and preferences from those based on constraints of the curriculum guidelines or on evaluation findings gathered in the course of developing the material.

The following paragraph is an illustration of those considerations having their source in the constraints of the Curriculum Syllabus:

The unit under discussion was written in the context of the teaching of biology; this fact influenced the selection of content. Thus, for example, details related to the differences between the kinds of citrus trees, the adjustment of water quantities to the various areas of the country, the types of soil, differences in orchards of different ages, etc. were not included in the curricular material since the developers did not see any importance in dealing with those subjects in context of the teaching of biology.

It may be that another team developing curricular material in the context of the teaching of agricultural sciences would have given different weight to these subjects and would have decided not to not only include them but to emphasize them.

Illustration of the Considerations Stemming from the Team's Platform

Considerations stemming from the team's platform may be classified according to images that the participants had in mind when voicing their opinions in the course of the deliberations leading to actual decisions. This classification is based on the assumption that team members (and this also holds true for other participants in deliberations and decision-making processes such as those who reviewed the material at its various stages) call upon a specific set of beliefs, opinions, attitudes, and preferences when they discuss possibilities, necessities, or desiderata with regard to:

- target populations, i.e. the pupils for whom the curricular materials are intended and the teachers expected to implement the curricular materials;
- instructional strategies related to modes of learning, methods of instruction to be followed, and appropriate teacher-pupil relationships;
- curricular materials, their form and content; and
- instructional objectives.

The following examples give specific illustration to the ways in which images implicit in the team's platform affected the unit:

1. Image of pupils:

The developers assumed that Grade 8 pupils would not be able to analyze multifactorial experimental designs which require very complex statistical treatment; accordingly, in an example noted above, they decided to simplify the proposed experimental design in the curricular material into a monofactorial design.

2. Image of teachers:

The developers perceived the teacher as an autonomous skilled professional person, i.e., as one who should select and adapt the curricular material to the specific instructional circumstances. Therefore, the Teachers' Guide states that the teacher should determine which points are worthwhile stressing in classroom discussion - from a list including analysis of the experimental conditions, interpretation of findings, conclusions the grove-owner will draw, conflict of interests, etc.

3. Image of instructional strategies:

The developers preferred active involvement in the learning process, so, as noted above, they decided to develop the text as a kind of "narrative of inquiry." This is how the research was described and the data presented, asking the pupils to reconstruct the reasons for the steps taken in the research, to interpret results obtained and draw conclusions.

Secondly, since the developers felt that reflective thinking enhances the possibilities for the transfer of learning, they focused on a central point like the conflict situations in the framework of "Stop and Think."

4. Image of curriculum materials:

It was clear that the developers were concerned with the importance of giving a proper treatment of the subject being taught. Although they did not give an explicit formal definition for "proper treatment," an implied viewpoint indicated that a suggestion should not be made to teachers if one knows in advance that the majority of teachers won't be able to handle it. For example, when faced with the decision whether to take up the question of the relations between basic and applied research, the developers decided to omit this topic in the final version (after an attempt to include it in the

interim version), since for various reasons they did not succeed in gathering the relevant information to present to the teachers. Under those circumstances, the developers felt it was preferable to ignore that topic altogether.

5. Image of instructional objectives:

The developers asserted their own opinions about the instructional objectives they considered both desirable and possible to achieve through biology teaching. They were guided by a feeling that curriculum material in biology should provide opportunities for learning which would prove to be relevant to the student as an individual or as a member of the society. Biology teaching should provide opportunities for developing cognitive skills, attitudes, interests, and the like. For instance, in the unit under study, the following learning experiences were included:

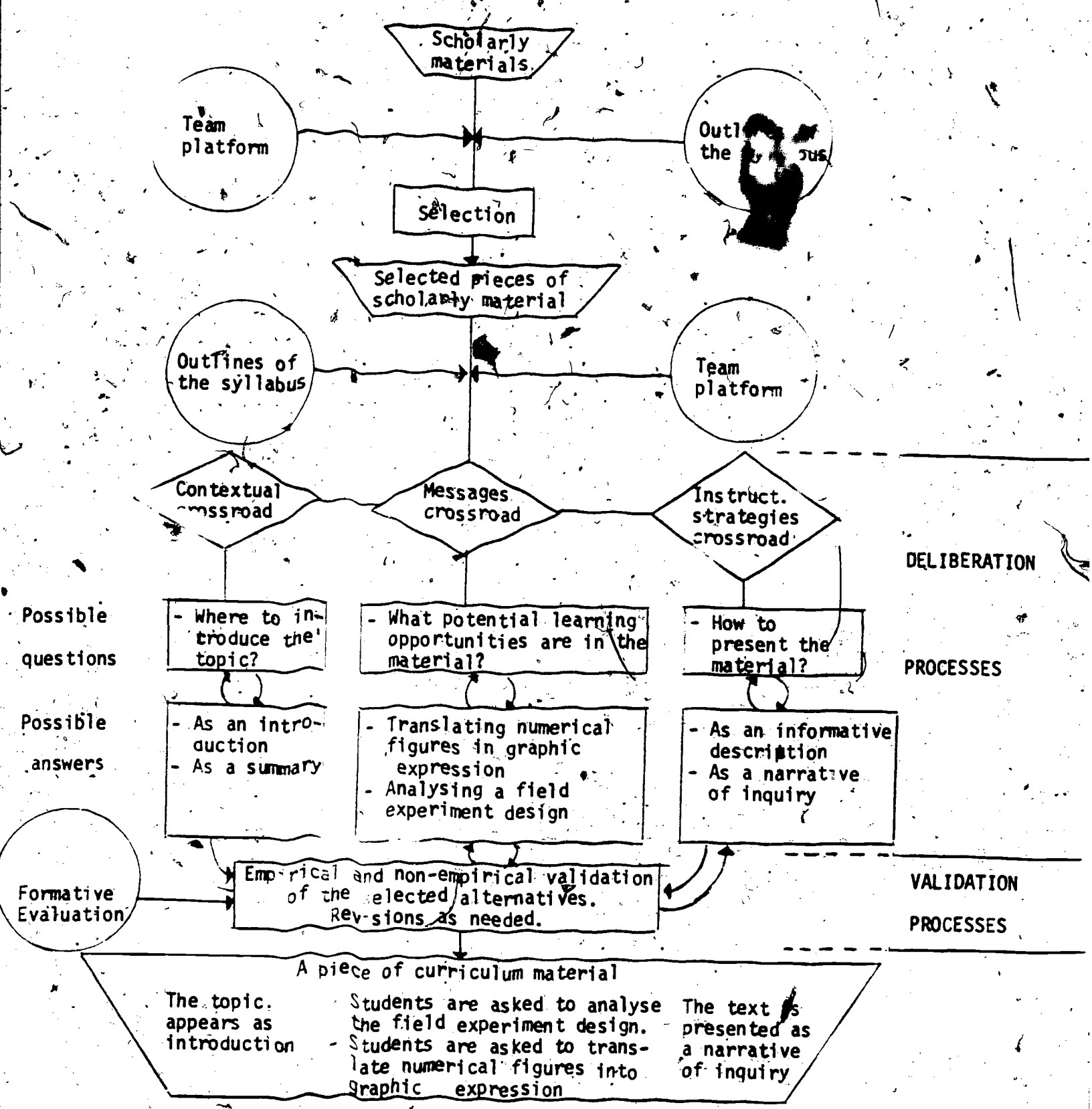
- translation of data given in figures to graphs;
- distinction between economic alternatives in different situations; and
- calculation of economic input-output considerations.

The above-mentioned components characteristic of the first level of interpretation of the curriculum development process are shown in Figure 3, as is their interaction network.

Discussion of Findings for First Level

From a comparison of the material in its various versions by means of content analyses, certain types of changes could be discerned and followed-up as the material was developed. These changes were characterized as omissions, additions, abbreviations and reductions; simplifications of content; combinations of existing content as well as changes in style and forms of expression. The changes were found to be related to three decision crossroads

FIGURE 3 TRANSFORMATION OF SCHOLARLY MATERIAL INTO CURRICULUM MATERIAL BY EXTERNAL DEVELOPERS



(a) clarification and definition of messages;

(b) development of instructional strategies; and

(c) contextual decisions.

Most of the changes were related to the first two decision areas.

A comparison of the transition of scholarly material into preliminary and interim versions versus the transition of the latter into the final version reveals an interesting general finding: An outstanding difference exists between these two transitions. In the interim edition there appeared only contents which could be located in the scholarly material. Although these were not exactly the same contents since they had undergone a selection process - i.e., many had been deleted, others reduced and simplified, etc. - there was a great deal of similarity between the interim version and the scholarly material from the standpoint of the contents being dealt with.

On the other hand, in the final version, besides the contents which originated in the scholarly material, there appeared new contents originating in the platform of the developers and of the evaluators who were not directly concerned with scholarly material. In interviews with the developers, they explained that these contents were added, as a result of their desire to exploit the instructional and educational potential of the topic. For example, in the final version, a situation highlighting the conflict between individual and public interests was elaborated upon. Students were required to take a stand after having explored possible ways of decision-making in similar situations. The addition of such material can be viewed as an expression of the team's effort to develop the potential of a piece of curriculum material (Ben-Peretz, 1975) through creation of additional content from the material at the micro-level of development (Lewy, 1976).

The decisions that were made regarding the development of instructional strategies determined the character of the curricular material to a great extent. It seems that in the process of translating scholarly material, which is written in a communicative language for professionals, into curriculum material which must be written in a communicative language for pupils, many decisions have to be taken. In the instructional unit which was analyzed, the "language" of the curriculum material is indeed different from the language found in the scholarly material which served as a starting point for development.

The considerations which were the basis for decision-making were found to stem mainly from the teacher's platform - only a small part being related to constraints of the syllabus. They involved the team members' images of the pupil, the teacher, the curriculum material, instructional strategies, and objectives. However, we found no regular interrelationships between the kinds of considerations and the categories of decisions.

FINDINGS: Second Level of Interpretation

In order to determine how the teachers interpreted and translated this instructional unit into learning-teaching settings, a questionnaire was prepared to examine the following factors:

- description of the school and the student population;
- indication of the time devoted to teaching the unit;
- extent of the teacher's adherence to the recommendations in the teachers' guide;
- indication of messages emphasized by the teacher;
- description of instructional strategies used by the teacher; and
- indication of context in which the unit was taught.

Teachers were requested to describe the considerations that guided them in their decisions. In our pilot research, the answers of 20 teachers were analyzed.

As indicated, data were based on self-reports of the teachers and were not validated by observations. Since our aim was an examination of the characteristics of planning teaching-learning settings on the second level of interpretation, and not the actual classroom implementation, self-reporting by the teacher was considered to be an adequate instrument.

Background Data on the Student Population

In 35% of the classrooms the teachers referred to in the questionnaires, the student population was described as being "disadvantaged," and the teachers tended to view this fact as an important constraint on teaching the unit.

Data Pertaining to the Time Devoted to Teaching the Subject

In the teachers' guide it is recommended that 2 hours be devoted to teaching the unit. Fifty percent of the teachers who were questioned indeed devoted between 1-2 hours to teaching the unit. However, 25% devoted 3 hours, and the final 25% devoted 4 hours and more to teaching it.

Data Relevant to the Extent of Teachers' Adherence to the Handbook

Twelve out of the 20 teachers replied that in the process of their teaching of the unit they adhered to the teachers' handbook.

Messages Emphasized by the Teachers

The teachers' guide indicates four instructional messages to be emphasized in teaching the unit. Analysis of the data reporting which instructional messages the teachers chose to emphasize indicated the following selection patterns (shown by percentage of total references to all messages stressed):

1. Issues involved in the solving of a problem wherein there is a conflict between the individual and the public good - 29%
2. Understanding research design and its various components - 23%
3. Distinction between interpretation of data collected in an experiment and the drawing of conclusions - 23%
4. The relationship between research and the need to contribute to societal needs - 18%

In addition to stressing the above four messages which were indicated in the teachers' guide, another 7% of the reported messages concerned issues not explicitly listed in the teachers' guide.

Instructional Strategies Employed by Teachers

The teachers' guide recommended four instructional strategies. Teacher responses indicated that they utilized many of these strategies but also often supplemented them with additional teaching methods. The following strategies recommended in the guide are shown with their percentage of all references:

1. Classroom discussion - 24%
2. Reading in the classroom with preparatory reading at home - 24%
3. Individual pupil use of worksheets - 12%
4. Group work on worksheets - 12%

The supplementary methods reported by the teachers were:

5. Simulation-debates between pupils representing different positions - 7%
6. Introductory presentation of the topic by the teacher - 6%
7. Using transparencies or other audio-visual methods - 4%
8. Written homework summarizing topic - 3%
9. Presentation of related scientific articles - 2%

10. Quiz - 2%
11. Oral reports by pupils, prepared as homework - 2%
12. Guest lecture - 2%

Although it is clear that teachers varied their methods and added their own ideas (eight new ones against the four recommended in the guide), however, it turns out that little proportional weight is given to the new instructional strategies. While 72% of the reported references pertain to the recommended instructional strategies, only 28% were the new strategies.

Context In Which the Unit was Studied

Only seven out of 20 teachers referred to this aspect. Six of these mentioned that the placement of the unit in the sequence of the subject seemed logical, since the textbook began by emphasizing the need to save water. The text went on from there to tell about research and its contribution to saving water in agriculture and continued on to topics related to studying the water system in the plant. Only one teacher thought the unit would be a more fitting conclusion to the study of the subject "Plants & Water."

Considerations Reported in the Second Level Interpretation

First, we must note that the teachers did not indicate their reasons for or deliberations involved in the majority (66%) of the curricular decisions they reported. For purposes of analysis, of the many reasons given by each teacher, we considered only those reasons which were fairly explicit - e.g., those including such phrases as "my considerations/motives were..." or "I did this because..." Classification of the reasons according to various key works yielded the following breakdown:

a) Roughly 54% of the reasons and deliberations cited stemmed from considerations of the attitudes and needs of their pupils, i.e., they originated in the image of the pupil.

b) Another 24% stemmed from a consideration of their own attitudes and needs as the teacher teaching the unit, i.e., they originated in the image of the teacher.

c) Another 11% stemmed from consideration of the instructional objectives as conceived by the teacher, i.e., they originated in the image of the objectives. There key phrases here were: "it relates to the instructional objectives," "in accordance with a definition of the objectives," "it is important from a social standpoint," etc.

d) The origin of the final 11% of the reasons and deliberations mentioned was not clear.

Discussion of Findings

Since the unit examined was one of the first in the textbook, this may account for much of the extra time devoted to its instruction. Teachers did not yet feel the pressure of time and tended to go on dealing with the first unit. Decisions regarding instruction time may be based on considerations pertaining to the particular teaching circumstances of the teachers (pupils' needs, etc.) or their personal platforms (personal priorities, etc.).

Perhaps the most interesting aspect of this finding concerning a most basic aspect of instructional planning is what it says about the degree of adherence to the teacher's guide. More than 50% of the teachers claimed full adherence to the guide, yet by their own testimony they, in fact, deviated from it substantially. One possible explanation is that this is part of the teacher's platform and can be viewed as an expression of the

self-image of the teacher who wishes to be considered as realizing the intentions of the developers. On the other hand, it may be that the teachers are not aware of the changes they introduced as compared to the teachers' guide.

In contrast to the degree of freedom they permitted themselves in allocating time to the unit, teachers generally adhered to the teachers' guide with regard to the curricular messages they handled in the course of their instruction. Only 7% of the messages stressed by the teachers exceeded the suggestions in their teachers' guide. It should be added that while the teachers did not in fact reveal a significant variety of new messages in the curriculum material, they did express their professional autonomy in deciding which of the messages out of those indicated in the teachers' guide they emphasized.

The teachers' adherence to the messages can be interpreted in a number of ways:

- Although the guide does not reveal all possible curricular messages inherent in the unit, the teachers do not have the ability to elicit additional messages from the material.
- The teachers actually see in the curriculum material a variety of additional messages but prefer to remain faithful to the teachers' guide which expresses the developers' intentions.
- The guide indeed exhausted the main messages of the unit, and it is not surprising that the teachers did not exceed the recommendations.

In the selection and combination of messages, one can see an expression of the teachers' personal platforms, on the one hand, and their abilities to perceive curriculum materials on the other.

As for the instructional strategies, the teachers did show initiative and ingenuity, in varying the teaching methods beyond what was specified in the teachers' guide and 8 out of 20 teachers reported changes in teaching methods. Unfortunately we were unable to draw conclusions on the basis of available data as to the proportion of time devoted to these instructional activities in the classroom. With regard to instructional strategies, one can view the planning of teaching-learning settings by teachers as an expression of three main factors: their personal platform, considerations stemming from their particular circumstances, and their skills in revealing curriculum potential.

Only one out of 20 teachers who participated in the study expressed concern with the context in which the unit should be taught. Nearly all the teachers accepted the sequence presented in the textbook as a given fact and did not express independent considerations about possible alternative contexts.

We feel that information about the teachers' considerations and reasons in planning teaching-learning settings is most important for the understanding of the second level of curriculum interpretation. However, in most cases, no reasons were given for the teacher's curricular decisions. We have no explanation for this phenomenon. Should this fact be seen as evidence that the teachers plan their work intuitively without any explicitly conscious deliberation? Perhaps, too, the teachers found it difficult to phrase the reasons and motives behind their actions and hence the scant response. Revision of the questionnaire, in order to distinguish clearly between a narrative of decision-making and the considerations leading to decision

may probably elicit more information. With these limitations of the data in mind however, our analysis of the available data indicates that teachers are mainly guided by considerations stemming from their image of the pupil. It seems that the teachers are mainly bothered by the problem of how to adapt the curricular material to the pupils' needs. These can be viewed as adaptations within the boundaries of the curricular envelope.

Characteristics of the Second Level of Interpretation

The various components of the second level of interpretation are presented in Figure 4. The findings of this exploratory study indicate that teachers exercise their autonomy mainly at two of the curricular crossroads:

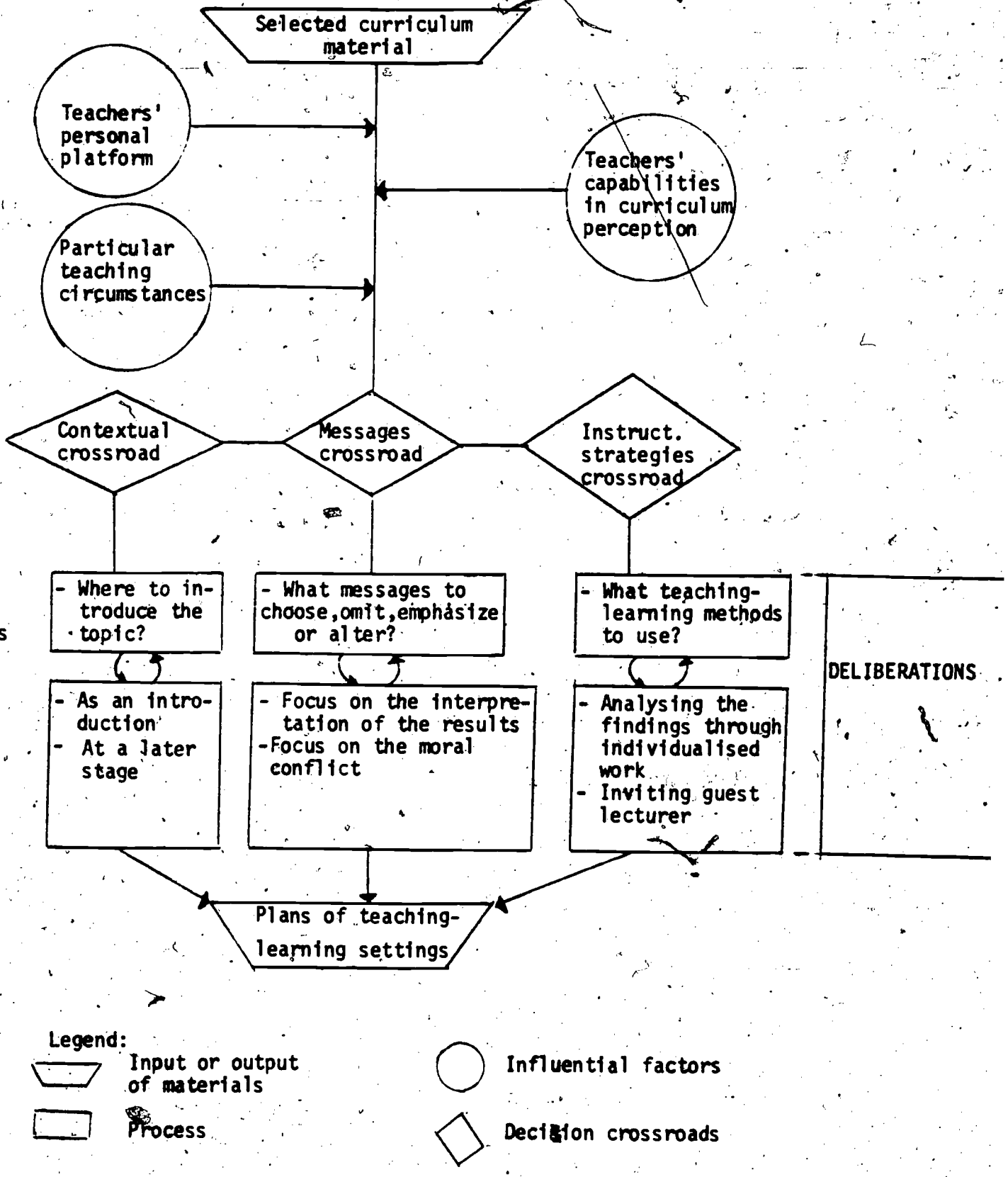
a) the messages crossroad at which they select and decide upon the relative emphasis of curriculum messages; and
b) the instructional strategies crossroad at which they select among the recommended instructional strategies and vary them by adding new ones. Planning the teaching-learning settings is conditional upon the abilities of the teachers to perceive the curricular material, and conditional upon their personal platform and the constraints imposed upon them by the circumstances of their work in any given classroom and school

The following are a few examples of general considerations stemming from the teacher's personal platform and referring to images of teachers and pupils as conceived by the teachers: "In teaching the unit for the first time, one must adhere to the recommendations in the teachers' guide, while the second time around, the experienced teacher is free to change;

"it is not desirable to explain everything myself" ; or "Most of the pupils have difficulty in doing independent homework."

As to the constraints stemming from the particular instructional circumstances, the considerations were connected mainly characteristics of the pupils, the school, or the community, e.g.: "In a class of moshav (a type of village) children, there was a special interest in the topic of irrigation problems."

FIGURE 4. TRANSFORMATION OF CURRICULUM MATERIAL INTO TEACHING-LEARNING SETTINGS BY THE TEACHERS



SUMMARY

On the basis of this exploratory study, we can arrive at a preliminary summary regarding the similarities and the differences between the first and second level of interpretation.

The elements common to two levels of interpretation are as follows:

(a) The external developers and the user developers make decisions at three main crossroads: the curricular messages crossroad, the instructional strategies crossroad, and the contextual crossroad. The number of decisions at the third crossroad on the second level of interpretation is relatively small, however.

(b) Among both the external developers and the user developers, a major portion of the considerations guiding their decisions originate in their personal platform.

The characteristics unique to each level of interpretation can be summed up as follows:

First Level of Interpretation	Second Level of Interpretation
1. Team members representing different backgrounds of expertise participate in the process of curriculum development. We refer to the team as a group having its own platform apart from the personal platform of each participant.	One single teacher or group of teachers transform curricular material into teaching-learning settings, and usually there is no representation for different areas of expertise.

2. Development process is convergent in the sense that it ends in the creation of designed curricular material defined by certain features.	The development process is divergent and leads to different and individual teaching-learning settings by different teachers and also by the same teacher in various circumstances.
3. Curricular decisions are submitted to validation criteria (empirical and non-empirical) in the process of trials and revisions.	Empirical validation of decisions is not possible since each instructional instance occurs only once. The teachers' feelings of success regarding their decisions can motivate them to repeat the same decisions in subsequent instructional situations.
4. External developers make decisions regarding the placing of the unit in the overall instructional sequence and regarding the sequence of messages within the unit.	Teachers usually make decisions involving the sequence of messages within the unit only.
5. The personal platform of the external developers involves the general characteristics of pupils and teachers.	The teacher's personal platform involves mainly the particular and concrete image of the pupils in the class.
6. The constraints originating in the syllabus have great influence on decision-making.	The constraints originating in the teaching-learning circumstances in which the teacher operates have great influence on decision-making.

7. The external developers are largely concerned with the definition and clarification of possible instructional messages. The decisions made by the external developers largely determine at the messages crossroad the scope of the curricular messages for the teacher.	Teachers are less concerned with the definition and clarification of possible instructional messages. They select and decide on emphasis of instructional messages.
8. External developers propose a relatively limited variety of instructional strategies	Teachers are aware of the importance of instructional strategies and the need for adapting them to their particular instructional circumstances and initiate new strategies beyond the suggestions of the external developers.
9. The general considerations which guide the external developers pertain to the image of the pupil, the teacher, the curriculum material, instructional strategies and instructional objectives.	The general considerations which guide the teachers mainly pertain to the image of the pupil, the teacher, and the instructional objectives.

This study is an attempt to sketch out the outlines of a model for studying curriculum development, the purpose of which is to clarify the functions which external developers and user-developers fulfil and the interrelation between these functions. Replications of case studies of the kind suggested in this study may produce additional evidence to the findings reported in this study.

Further studies need to tackle a number of questions such as:

- To what extent is the development process dependent on the specific subject matter of the curriculum.
- In what ways does the personal make-up of the team influence the process of development.
- What is the impact of personal characteristics of teachers on the second level of interpretation.

Further research will hopefully reveal more substantial implications for the training of external developers and user-developers in the carrying out of their specific functions.

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