

APPLICATION OF THE THINKING PROCESS
IN THE TEACHING OF HOME MAKING

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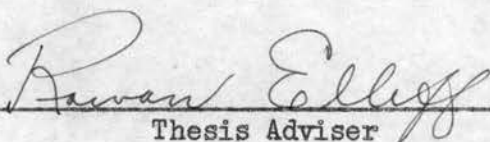
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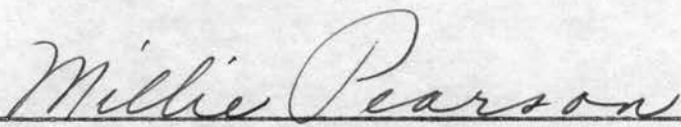
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PREFACE

The purpose for this study was to help teachers learn how to use the process of reflective thinking in the teaching of homemaking in order to guide high school students in the development of the ability to recognize, understand, use, and apply generalizations. It presents an analysis of reflective thinking in terms of teacher guidance and student thinking; outlines a suggested teaching procedure to show how teachers may direct others in a series of experiences designed to develop reflective thinking; and makes recommendations as to how teachers may use the methods suggested in the application of the thinking process.

Material has been assembled in a form so teachers can see how they may guide learning and how the student may learn to think. It suggests how students may be guided in recognizing problems; in stating them; in observing phenomena accurately; in recording observations; and finally, in applying what they have learned in supervised and unsupervised situations and as a result that the teaching-learning experience be mutually profitable and enjoyable. In order to help teachers develop the ability to think an analysis has been made of some of the thinking processes involved in teaching and learning how to assure success in a selected, limited area of food preparation.

Particular acknowledgment is made to Rowan E. Elliff, Associate Professor of Home Economics Education, Oklahoma Agricultural and Mechanical College, for stimulating the writer's thinking by suggestions and guidance; for ideas which were basic to the development of the problem; for an under-

standing of the existing circumstances which brought on the writing of this study, and for her unceasing kindness.

Sincere appreciation is accorded to Millie V. Pearson, Professor and Head of Home Economics Education Department, for thorough reading of the study and constructive suggestions.

Special appreciation is expressed to her husband and children for without their cooperation, understanding, patience, and encouragement, the completion of the study would have been impossible.

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PART I

The development of the individual's ability to do reflective thinking is one of the most important responsibilities of education. This ability is stressed by leaders as one of the important educational objectives. The earlier the person has an opportunity to develop the habit of thinking, the greater the number of learning skills he will have developed to serve him in solving problems as they arise in his life. Our entire educational system is built on the belief that the habit of thinking can be learned just as the habit of speech is learned.

The cultivation of the pupil's ability to think requires teachers who can think. According to John Dewey, thinking involves:

- (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates, and (2) an act of searching, hunting, inquiring to find material that will resolve the doubt, settle and dispose of the perplexity.¹

*The ability of the individual to think is essential to satisfaction, security, self-discipline, tolerance, and to the development of social sensitivity, creativeness, cooperativeness, and self-direction. It must be the purpose of the teacher to help the individual develop the ability to think so that he may realize his potential capabilities, and accept full responsibility in a democratic society. In this relationship Edwin T. Sandberg writes "An individual who has never done any real thinking

¹ John Dewey, How We Think, P. 12.

himself can hardly be expected to know how to stimulate it in his students."² It is obvious that if pupils are exposed to useless disconnected thoughts, they will be able to think only useless inconsequential thoughts and to do only superficial thinking.

Thinking is not a simple gadget that teachers can learn to manipulate in one lesson, or even in one learning situation; it involves many dispositions, skills, and abilities. Each of the elemental parts, such as the ability to discover and define problems, to observe phenomena accurately, to select facts relevant to a problem, to collect and organize facts, to draw inferences from facts, to plan experiments, to test hypotheses, and to apply facts, principles, or generalizations to new situations, requires time for continued practice and opportunity to do so in a variety of learning situations. Thinking is concerned with such human factors as: the disposition to search out and try out a number of approaches and possible solutions in order to solve a problem; the disposition to see a problem through to its solution regardless of the distraction, and it includes skill in expressing hypotheses and in devising experiments.

John Dewey lists the mental activities involved in reflective thinking as:

- (1) suggestions in which the mind leaps forward to a possible solution.
- (2) an intellectualization of the difficulty or perplexity that has been felt (directly experienced) into a problem to be solved, a question for which the answer must be sought;
- (3) the use of one suggestion after another as a leading idea,

² Edwin T. Sandberg, "Teaching The Teacher To Think", Education, LXXI, (June, 1951), 610-611.

or hypotheses, to initiate and guide observation or other operations in collection of factual materials.

- (4) the mental elaboration of the idea or supposition as an idea or supposition (reasoning, in the sense in which reasoning is a part, not the whole, or inference);
- (5) testing the hypothesis by overt or imaginative section.³

One of the major aims of education is to help the individual develop his ability to think; therefore, he must be given an opportunity to cope with problems and concerns that he meets in his daily living. His problems may be solved within a short period of time, or they may require a detailed investigation before a solution is reached.

Regardless of what portion of the process of thinking teachers utilize, they can learn only by experiences and by constant practice. Thinking is experiencing, according to a statement made by H. Gordon Hullfish. It is not an easy matter to learn to draw generalizations from facts or experimental data. It is almost impossible for teachers to learn to think by concentrating entirely on problems in relation to a specific area, or field of study, because they need broad experiences in all areas of living to provide the raw material from which educational concepts emerge.

The teaching done by many teachers has been ineffective and superficial because the teacher did not have command of the tools of thinking. Facts, principles, and generalizations are these tools, according to Millie V. Pearson, as surely as pots, pans, and silver are tools of manipulation. Without them the teacher cannot hope to develop thinking

³ John Dewey, Op. Cit., P. 107.

in others because she is not acquainted with the necessary tools. If individuals are to be taught to think, they must have a teacher who knows how to use the tools of thinking. This concept was stressed by Hilda Taba in "The Problems in Developing Critical Thinking". She gives an example of such teacher guidance:

The nature of the teachers' questions sometimes forced general appraisal or judgment ahead of allowing the experience of the group to come into play and to be made cumulative, or before allowing a kind of refreshing or memory on details to prepare for generalized judgment.⁴

The teacher's job is to lead students to arrive at understandings and generalizations; to voice them and realize what they mean; and to understand how understandings and generalizations can be used in the future. In order that the teacher may guide the development of thinking on the part of the student, it may be wise for her to analyze the process of thinking along a line or lines of thought considered most likely to be followed by the student, and to compare the teacher's guidance with student thinking. This comparison is presented in the following chart which shows the organization of possible, or even probable, steps in the process of thinking for both student and teacher.

⁴ Hilda Taba, "The Problems in Developing Critical Thinking", Progressive Education, XXVIII, (November, 1950), 45-46.

ANALYSIS OF REFLECTIVE THINKING
(Scientific Method)

Teacher Guidance	Student Thinking
<p>1. Stimulate the interest of the student in problems by setting the stage (lining up many possibilities).</p> <p>Arrange bulletin board in advance to show the possibilities of a particular area.</p> <p>Prepare an attractive exhibit in advance that relates to a proposed problem.</p> <p>Use pre-test to determine further learning needed.</p> <p>Show good examples of desired product.</p> <p>Use other teaching techniques as movies, filmstrips, or field trips. (The teacher is limited only by her own initiative).</p> <p>Cite examples of what other persons have done who have similar problems.</p>	<p>1. Recognize the existence of a difficult situation demanding a solution.</p> <p>Examine displays. Comment on ideas presented and set some goals for self.</p> <p>Ask questions about various products shown.</p> <p>Participate in planning the pre-test. Recognize own needs and problems revealed by the pre-test.</p> <p>Give attention to teacher's presentation.</p>
<p>2. Guide student to become aware of the importance of a well-stated problem. (The teacher encourages student to state problem concisely by her own example.)</p> <p>Guide student in formulating such a generalization as - "Stating a problem helps to define it - thereby pointing toward its possible solution".</p>	<p>2. Decide to solve problem; state the problem in a few simple words.</p> <p>Try to clarify what my problem is and to state the problem concisely.</p>

Teacher Guidance	Student Thinking
<p>3. Make sure the student understands the situation.</p>	<p>3. Analyze the problem.</p>
<p>Encourage the student to look at the situation from many angles.</p>	<p>Check the past experiences that have bearing on the situation.</p>
<p>Guide the student to plan a tentative way to solve the problem.</p>	<p>Formulate a hypothesis, tentative solution, or explanation to serve as a working basis.</p>
<p>Show the students the relationship of previous experiences.</p>	<p>Suggest possible solution based upon facts at hand and suggest ways of validating these assumptions.</p>
<p>Call attention to the direction the analysis tends.</p>	<p>Determine what things that have been learned previously might help solve the problem.</p>
<p>4. Encourage the student to find all necessary information.</p>	<p>4. Investigate and assemble available facts and information.</p>
<p>Have a wide variety of learning materials including books and magazines available for student use.</p>	<p>Make use of such activities as: reading, participation in field trip, experimentation, talking with persons of authority, reviewing films, and examining books to find experimental work which has been done.</p>
<p>Present thought-provoking statements about the particular problem.</p>	<p>Study experimental procedures which seem to be most feasible.</p>
<p>Encourage students to investigate authoritative materials to find what experimental work has been done and to devise original observations and experiments of their own.</p>	<p>Make plans for experimental work and organize possible procedures.</p>
<p>Encourage the student to challenge his own statements and to be able to state tentative solutions or hypotheses as a basis for further study.</p>	

Teacher Guidance	Student Thinking
<p>Suggest experiments or next steps when necessary or desirable.</p>	
<p>5. Encourage students to consider facts with an unbiased view point.</p>	<p>5. Evaluate the facts and the material so as to discard that which is not pertinent or needed.</p>
<p>Present judgment problems that are related to the particular situation.</p>	<p>Weigh values and know reasons for choices in situations involving judgments.</p>
<p>Guide students in organizing experimental evidence secured from reading authoritative literature and/or testing the evidence.</p>	<p>Solve judgment problems.</p>
<p>Guide student in keeping records and in organizing and interpreting data.</p>	<p>Become acquainted with ways of keeping records and decide how to keep them.</p>
<p>Encourage student to evaluate experimental data in light of the original problem.</p>	<p>Study available records and learn how to interpret them.</p>
<p>6. Guide students to consider all possible solutions and select one that seems most feasible or appropriate.</p>	<p>6. Formulate plans for possible solution.</p>
<p>Encourage students to weigh the evidence and make decisions.</p>	<p>Interpret data, analyze findings, formulate solution, and record results.</p>
<p>Lead them in generalizing in several situations until they feel competent to generalize when confronted with collected evidence that points to a valid conclusion.</p>	<p>Verbalize the findings in form of generalized statements.</p>

Teacher Guidance	Student Thinking
<p>7. Lead student to test solution in any or all of the following ways:</p> <p>Try out the solution to see if it works well in a given situation.</p> <p>Compare solution attempted with these used by an authority or authorities.</p> <p>Compare solution with opinions of a trustworthy group.</p> <p>Try out solution to see if it applies in other situations.</p>	<p>7. Try planned solution to see if it works.</p> <p>Use various ways of testing solution.</p>
<p>8. Lead student to summarize findings and to decide whether the solution obtained is valid.</p> <p>Lead students to compare suggested solutions and to try out results obtained.</p>	<p>8. Accept most likely solution.</p> <p>Investigate other solutions if the first does not work.</p> <p>Account for differences.</p>
<p>9. Guide students in verbalizing generalizations developed.</p> <p>Help students visualize possible use of conclusions reached in other situations.</p> <p>Lead students to find many examples in which an application is made of the generalizations.</p>	<p>9. Formulate generalizations about possible use of facts learned and conclusions reached in other similar situations.</p> <p>Be alert to discover examples of the application of generalizations.</p>
<p>10. Guide students in recording generalizations.</p>	<p>10. Record generalizations important enough to remember.</p>

Teacher Guidance	Student Thinking
<p>11. Help students to:</p> <ul style="list-style-type: none">A. Apply generalizations when similar situations arise.B. Restate generalizations, as needed, at frequent intervals so that the student may realize continual application.C. Revise generalizations when new and reliable evidence is secured.	<p>11. Use the generalizations when the opportunity arises.</p>
<p>12. Help student to evaluate the meaning of the experiences.</p>	<p>12. Evaluate.</p>

Three terms are used in the professional literature which refer to the thinking process. It has been called The Scientific Method or the process of reflective thinking. Many people think of it as "problem solving". Teachers appear to need help in order to learn how to use this method in their teaching; the problem selected for this study was: "How can the homemaking teacher improve her teaching by guiding high school students to develop the ability to recognize, understand, use, and apply generalizations".

The fundamental hypothesis upon which the study is based assumes that learning is more effective when the student is led to develop the principles involved in a situation and to apply them in actual use.

BASIC ASSUMPTIONS: which guided the study were concerned with the seeming failure of many teachers to make use of problem solving techniques in teaching homemaking and the beliefs that:

1. Many teachers do not recognize the scientific problems involved in the areas they teach.
2. A number of teachers have not learned to generalize in terms of the relationship between scientific fact and actual practice.
3. Teachers need to know how to develop and apply generalizations that relate to the problems they try to help students solve.
4. Teachers need to know how to teach so that they can develop maximum thinking ability on the part of students.
5. Teachers need to know how to develop thinking ability through practice in applying facts and principles to the solving of problems.
6. Teachers need to know how to develop generalizations and understandings which can be applied in solving problems as they arise.

It is a matter of common knowledge that many of the students in high school homemaking classes do not know how to think because they have not been taught to cultivate their powers of observation and, along with their teacher, they have been dependent upon others to do their thinking and supinely accept much that they hear and see. They do not ask why this happens or what can be done about it. They are content with such superficial teaching because they do not know any other kind. This habit of reaction is entirely contrary to that based upon democratic principles. Individuals within the group who think are the salvation of a nation; consequently, teachers must strive to develop each individual's ability to think in order to establish and preserve that type of social order which permits the maximum human development.

In order to help teachers develop the ability to think an analysis has been made of some of the thinking processes involved in teaching and learning how to assure success in food preparation, an important phase of homemaking education. The making of custards as a part of a family meal was chosen for this analysis.

Material has been assembled in a form so teachers can see how the teacher guides learning and how the student learns to think. It suggests how students may be guided in recognizing problems; in stating them; in observing phenomena accurately; in recording observations; and finally, in applying what they have learned in supervised and unsupervised situations -- and as a result that the teaching-learning experience be mutually profitable and enjoyable.

The study presents an example of a specific teaching situation to show how teachers may direct others in reflective thinking. This pro-

cedure is summarized in a chart which provides an analysis of procedures designed to develop the ability to think in terms of a specific situation. Some of the possible procedures which may be used by the teacher to encourage consistent practice in the application of generalizations by both student and teacher are presented.

Teaching success is greatly influenced, or even largely determined, by the teacher's understanding of facts, principles, and generalizations, and that the extent of the development of the student's ability to think is related to specific areas or fields of study. The cultivation of the habit of reflective thinking by the student necessitates that the teacher develop her own ability to think in terms that have a sound psychological basis. Guides for the teacher have been formulated by Mort and Vincent as follows:

1. No one learns without feeling some urge to learn.
2. What a person learns is influenced directly by his surroundings.
3. A person learns most quickly and lastingly what has meaning for him.
4. Interest is a source of power in motivating learning.
5. You start to grow from where you are and not from some artificial starting point.
6. All learning occurs through attempts to satisfy needs.
7. When an organism is ready to act, it is painful for it not to act; and when an organism is not ready to act, it is painful for it to act.
8. A person learns by his own activity.
9. Participation enhances learning.
10. Firsthand experience makes for lasting and more complete learning.

11. Learning is more efficient and longer lasting when the conditions for it are real and lifelike.
12. Abundant, realistic practice contributes to learning.
13. Learning is reinforced when two or more senses are used at the same time.
14. Growth is a steady, continuous process, and different individuals grow at different rates.
15. Interest is an indicator of growth.
16. Security and success are the soil and climate for growth.⁵

Each teacher can improve her teaching by using, and helping pupils to use, these guides in pupil - teacher planning, as well as in developmental teaching, and in evaluating progress.

⁵ Mort, Paul R., and Vincent, William S. Modern Educational Practice, pp. 401-404.

PART II

Teachers who wish to understand the thinking process must analyze what it means in terms of teaching a particular bit of subject matter.

According to Millie V. Pearson:

The success of any teaching is determined by the extent to which the learners in question improve the quality of their thinking, the extent to which they continue to put the principles learned into practice, and the extent to which they are concerned with the continuous development of themselves, their homes, their community and their nation. It is the teacher's responsibility to so plan that all class situations provide students with many opportunities for this kind of growth and development. Such preparation means much and detailed pre-planning. No teacher can satisfactorily guide students in the planning, execution, and evaluation of learning experiences without having first made much preparation for offering suggestions which help students to select and weigh possible courses of action.⁶

It was assumed for the purpose of this study that teachers will provide learning experiences which they believe will meet the needs of the students concerned, and which conform to their usual habits of thinking as well as those which might be introduced to promote better thinking.

SUGGESTED TEACHING PROCEDURES

Contacts over a period of years with teachers, administrators in the teaching profession, and agents in the agricultural extension service, led the writer to the realization that something was lacking in the teaching of food preparation.

⁶ Millie V. Pearson, "Teacher Pre-Planning", Foods. H. E. 30-May 1949. Mimeographed. p. 1.

Conversation with college faculty members at a later date confirmed the need for concern about the teaching of food and nutrition. Classes under the guidance of authoritative persons in the field of home economics education led to the recognition that food preparation in a majority of situations is not taught on a sound scientific basis. This conclusion aroused a desire to investigate the possibilities for developing reflective thinking in the field of food preparation.

This investigation led to the conclusion that it would be desirable to limit the study to a single area. The area selected was the preparation of foods which contain a high protein content. This area was limited to the preparation of protein foods which may be used in the service of simple meals. The limitation of the area for study permitted a fairly extensive examination and evaluation of available literature. In order to do this it was necessary to become familiar with facts, principles, and generalizations in food preparation. This was done by investigating many authoritative publications, collecting the facts, and evaluating the material to determine the information which was pertinent to the problem. The facts, principles, and generalizations which were located and which seemed important, different, or new were then tried out in the home and an effort made to learn more about how the thinking process might be applied in the cooking of foods which are high in protein content. Pertinent information and facts were recorded on cards to facilitate the planning of learning experiences which might be used by teachers to help students arrive at generalizations. Statements of approved practices in food preparation were formulated which could be defended through the application of accepted generalizations or principles.

An investigation was made to discover whether or not the statements were sound; after which accepted educational practices were related to them.

For the study a small portion of food subject matter is cited as an example of how teachers can direct others in the development of thinking with emphasis on guiding students in recognizing and stating generalizations which grow out of the teaching situation. The writer limited the study of the use of reflective thinking as applied in protein cookery to the development and application of generalizations related to the preparation of custard.

It was assumed that activities had been planned on a meal basis in a ninth grade class and that the procedures involved the development and application of facts, principles, and generalizations in (1) nutrition, (2) consumer education, (3) marketing, (4) housewifery, (5) home management, (6) cookery, (7) family relations, (8) art, (9) meal service, and (10) manners.

Generalizations that the teacher believed should be developed at this time were selected from the list in her files which related to the making of custards. These generalizations were:

1. Thickening of a protein mixture is caused by a process known as coagulation.
 - a. Coagulation of protein varies with certain controlling factors: proportion of ingredients used, agitation, amount of heat, length of heating, concentration of protein, immediate cooling, sugar, and dilution.
 - b. The length of time to attain coagulation is shortened as the protein concentration of a mixture is increased; consequently, the cooking period is lessened for custards which contain a higher proportion of egg to the amount of milk.

For the purposes of the study it is further assumed that the teacher would (1) develop generalizations that could be applied in each group, (2) use group work for the majority of the laboratory experiences, (3) teach food preparation on a meal planning basis as a part of days requirement, (4) lead students to synchronize manipulative skills, (5) guide students to rotate the use of equipment, and (6) lead students to share responsibilities within a group.

The teaching situation which concerns problems in protein cookery and is discussed in the paragraphs that follow depicts the way in which teachers may develop the ability of the students to think as they discover generalizations that can be applied in teaching specific foods. The particular situation is developed according to the analysis of the process of reflective thinking made by the Committee on the Function of Science in General Education of the Commission on Secondary School Curriculum. This analysis is as follows:

1. A sense of perplexity, or of want, or of being thwarted, followed by identification of the problem. This may, or may not, be formulated in words.⁷

A few days in advance of the new unit, the teacher might arrange a browsing table with such literature as books, bulletins, and magazines which contain authoritative information concerning the preparation of custard mixtures. The bulletin board exhibit might show pictures of custards with a caption such as "Beaus Galore!", "Tasty Custards!", "You Can Do It, Too!".

The teacher might follow the problem stimulators in about three

⁷ Commission on Secondary School Curriculum, Science in General Education, p. 310.

days with a pre-test to discover further learning needs in protein cookery, especially that of milk and eggs, as well as to reveal any misconceptions in the planning, preparation, and service of food. During this period, a display of custard dishes, such as Welsh Rabbit, French Custard, corn pudding, vanilla and chocolate custard, might be prepared and arranged by the teacher and served in order to show a few of the variations of the basic custard and provide an opportunity to sample these dishes and to stimulate interest in learning to prepare them.

Before the class period the next day, the teacher might make a baked custard to show the students a finished product which would be similar to the product that was to be made by them and be the standard toward which they might direct their efforts. With the leadership of the teacher, the students would analyze the custard in order to determine the standards for a well-prepared custard. The teacher's guidance of the discussion might be directed by such questions as:

We have here an example of a well-prepared baked custard which was made this morning. How would you describe its appearance? Could you describe the texture of the custard? How does the custard taste? How would you describe its flavor? What are the characteristics of a good custard? (Investigate authoritative material regarding the standards for a well-prepared custard). According to your list of standards, a well-prepared custard has a smooth, evenly coagulated texture, a tender structure, a soft yellow color, and a delicate flavor. How can we make a custard like this to meet our standard? What will happen if we vary the suggested procedures? In what ways might the ingredients be varied? What difference may we expect in the finished product? How do the custards made differ?

What steps are involved in making a well-prepared custard? What did you observe when watching some individual make a custard? What proportions were used? (2 cups milk, 3 whole eggs, $\frac{1}{4}$ cup sugar, $\frac{1}{8}$ teaspoon salt, and $\frac{1}{2}$ teaspoon vanilla.) Is it always necessary to use these proportions? (Investigate receipes and authoritative references. Compare suggested procedures. Decide on proportions and method for a custard to be prepared in class.)

In what way might custards be used as a part of the day's meal? Might we not plan a simple meal which emphasizes custard and is planned in accordance with the other two meals of the day:

The students selected for class use one day's menus as follows:

MENU FOR THE DAY

LUNCHEON

Sliced Cold Ham

Cheese and Pineapple Salad

Hot Biscuits

Currant Jelly

Baked Lemon Custard

Cocoa

BREAKFAST

Orange Juice

Soft Cooked Egg

Bacon Muffins

Cocoa

DINNER

Sliced Roast Beef

Mashed Potatoes

Buttered Green Beans

Spring Salad

Hot Rolls

Butter

Applesauce Cake

Cocoa

Milk

The teacher might lead the students to state their problem in a practical form on the basis of the previous group's discussion and activity as "How can I learn to prepare good custard without a recipe?"

2. "Occurrence" of tentative hypotheses. These hypotheses may be based upon a supposed relationship between what is perplexing in the situation and what has been previously experienced.⁸

The teacher would then guide the group in the discussion of the facts, principles, and generalizations related to past experiences which might help to solve the problem. Some of the things previously learned which the group might list on the blackboard to help solve the problem include:

- a. Meals are planned as a part of a days food requirement to meet the needs of all members of the family.
- b. Any meal should be planned in order to insure a balanced diet, appetizing and palatable foods, less expensive meals, and a saving of time and energy.
- c. Food preparation has a scientific basis which makes it interesting.
- d. Thickening of a protein mixture is caused by the process known as coagulation.
- e. Diluted egg mixtures require a longer cooking period to reach the stage of coagulation than those that have a greater amount of egg; therefore, add no more than two tablespoons of unthickened liquid for each egg.

Upon completion of the previous list by the group, a tentative solution would be formulated by the students with the help of the teacher. The tentative hypothesis would probably be: "Individual technique and proportion of ingredients have an effect upon the qual-

⁸ Commission on Secondary School Curriculum, Loc. Cit.

ity of custards".

It would be necessary for the teacher to lead the students to plan a tentative way to solve the problem. The plan might include the activities which follow:

- a. Become familiar with the standard for a good custard.
- b. Learn the basic proportions to be used in making custard.
- c. Plan a days menu including a simple meal which emphasizes custard cookery.
- d. Divide into four groups.
 - (1) Check available authoritative literature for needed information concerning meal planning, preparation and service.
 - (2) Select, evaluate, and record information and facts concerning the making of custards.
 - (3) Develop principles and generalizations or conclusions drawn from information found and recorded.
 - (4) Plan ways to test the proportions recommended. Experiment using one variable in each.
 - (5) Evaluate the results of the experiments.
 - (6) Formulate plans for possible solution of problem.
 - (7) Record the solutions of the problem in form of generalizations.
- e. Verbalize the findings in the form of generalized statements.
- f. Try the proposed recipe to see if it works.
- g. Compare the solutions tried and the results obtained.
- h. Formulate and verbalize generalizations, including conclusions concerned with custard preparation.
- i. Visualize possible uses of generalizations in other situations.
- j. Record generalizations important enough to remember.
- k. Use the generalizations at every opportunity.

3. Testing and elaborating hypotheses, by experiments which may be supplemented by recourse to paper and pencil experiments and on others to even more concrete practical experiments. This process may also require reference to books or other records.⁹

The students would be encouraged by the teacher to investigate available and authoritative reference including magazines and bulletins.

The group might plan, make and evaluate a field trip to visit the kitchen of an efficiently organized and popular eating establishment. During the trip, they might observe the method of preparation and arrangement of custards for service.

A representative of the Home Service Department of a public utilities company might present a demonstration on custard preparation. The students would then be guided by the teacher in the preparation for the demonstration and in the evaluation of the information presented during the demonstration.

The entire group might review pertinent films, including the movie "How To Cook Eggs". The teacher would not overlook the fact that it is necessary to plan and prepare for review of each film as well as to evaluate the information after each has been shown.

The students would examine available reference material to find reports of experimental work which had been done in protein cookery. They would test the hypothesis in a number of ways using one variable and a number of repetitions for each experiment. Some of the tests which might be conducted include:

⁹ Commission on Secondary School Curriculum, Loc. Cit.

- a. Effect of time of cooking upon the quality of custard.
- b. Effect of the proportion of egg upon the quality of cooking.
- c. Effect of the proportion of sugar upon the quality of custard.
- d. Effect of the method of cooking upon the finished product.
- e. Effect of temperature upon the quality of custard.
 - (1) custard baked in an oven set with the recommended temperature and another at a high temperature.
 - (2) custard set in a pan of hot water and placed in the oven; custard baked directly in the oven.
 - (3) custard cooked in a double boiler; custard cooked over a direct flame.

The results of the experiments would be evaluated on the basis of the number of experiments conducted, judgment problems, and the available authoritative experimental evidence.

Each group would make plans for the possible solution of the problem based on past experiences, available facts, experimental data and results of the experiments conducted by the members of the groups. The members of the group would verbalize their plans in order to improve their ability to think. The statements of tentative hypotheses might include the following:

- a. The same proportions of egg and milk are used in a baked custard and a thick soft custard.
- b. Variations in the method of cooking result in differences in the consistency of custard mixtures.
- c. Low temperature of heat and correct length of time of heating effects the texture of the product.

These tentative hypotheses might be recorded by each student in notebooks for the purpose of verifying and verbalizing the facts needed to

form generalizations.

The teacher might guide the students in the development and verbalization of generalized statements. As they reach a final decision on the statement of the generalization it might be written on the black board for student reference. The list of generalized statements which follow point up a few of the generalizations which might be made by the group.

a. Thickening of a protein mixture is caused by a process known as coagulation.

- (1) Coagulation of protein varies with certain controlling factors: proportion of ingredients used, agitation, heat, length of heating, concentration of protein, immediate cooling, sugar, and dilution.
- (2) The length of time to attain coagulation is shortened as the protein concentration of a mixture is increased; consequently, the cooking period is lessened for custards which contain a higher proportion of egg to the amount of milk.
- (3) Diluted egg mixtures require a longer cooking period to reach the stage of coagulation than those that have a greater amount of egg; therefore, add no more than two tablespoons of unthickened liquid for each egg.
- (4) Albumin coagulates around 150° F.; therefore, cook protein mixtures in a double boiler over water which is held below the simmering temperature.
- (5) If albumin is exposed to coagulation temperature for too long a time, it tends to shrink and squeeze out the liquid, and if exposed to high temperature, it contracts and toughens.
- (6) Sugar retards the coagulation of egg protein; consequently, protein mixtures which include larger amounts of sugar must be heated to a higher temperature so as to reach the desired consistency.
- (7) Dilution of protein mixtures with liquid causes a precipitate to form at boiling temperature; consequently, protein mixtures which have been diluted should be cooked at a low temperature.
- (8) The standard custard product has a smooth and evenly coagulated texture, a tender gel structure, a delicate flavor, and a soft yellow appearance.

- (9) The custard baked in the oven is placed in a container in a pan of hot water to insure even heating and to prevent overcooking the outside while heat reaches the center.

4. Devising more and more rigorous tests to which the resulting hypotheses may be subjected. Testing the hypotheses in these situations either solves the problem or reveals that the hypotheses do not stand the test of action.¹⁰

In order to try the planned solution, members of some of the groups might give a demonstration to the class to observe and evaluate. The preparation group might make a further test by preparing the luncheon which had been planned by the class.

5. Arriving at a satisfactory solution and acting upon it. This may include devising a form of statement by means of which the conclusions may be expressed and communicated with the highest possible precision.¹¹

It may be necessary for the students with the guidance of the teacher to evaluate the procedure by comparing the results obtained. Evaluation of the activities at this stage would not be sufficient to complete the process of thinking. The students should be led by the teacher to clarify their thinking by generalizations and by suggesting their possible uses in other situations.

Some of the ways which the students might suggest for use of the generalizations are:

- a. Plan, prepare, serve, and act as a hostess for a simple luncheon which includes a custard to be served to Mothers.
- b. Present demonstration on "Lunch in a Jiffy" or "Let's Eat", to men or women groups in the community stressing milk and egg cookery.

¹⁰ Commission on Secondary School Curriculum, Loc. Cit.

¹¹ Commission on Secondary School Curriculum, Loc. Cit.

- c. Prepare and distribute an interesting, illustrated newsletter regarding "What's Cooking?" or "What's in the Oven?" for the homemakers in the community emphasizing egg and milk cookery.
- d. Prepare, and arrange, an interesting custard exhibit in a prominent place in the community.

The students would then record important generalizations in their notebooks for future use because the generalizations reached would not become a part of their thinking unless they were used frequently in other situations. The teacher then would have the responsibility for guiding students to apply the generalizations when similar situations arise; to restate generalizations, as needed, at frequent intervals so that the student may realize continual application; and to revise generalizations when new and reliable evidence is secured.

STAGES OF TEACHING

In specific problem solving situations, the processes involved may vary according to the nature of the problem. The teacher encourages pupils to think for themselves by guiding them in developing attitudes, intellectual ability, intellectual skills and interests rather than merely exposing them to a specified amount of subject matter. The pupil should be able to see his inward growth instead of placing the entire emphasis on the end product.

Another idea of the similarity of student procedure and teacher guidance in thinking may be considered in order to clarify the relationship of the two. According to Quillen and Hanna,¹² the phases in the process of

¹² Quillen, James I. and Hanna, Lavone A., Education for Social Competence, p. 200.

thinking may be compared with the three stages of learning experiences in teaching. During the initiatory stage, the problem is recognized, stated, analyzed and a tentative solution is formulated; during the developmental activity, authoritative information is investigated, assembled and evaluated on the basis of experimental data; and during the culminating stage, the solution is formulated, tested and applied. From the previous comparison the teacher may see the importance of initiatory, developmental, and culminating activities.

INITIATORY STAGE

During the initiatory activity, the teacher strives to (1) stimulate interest in problems, (2) provoke a desire to recognize and solve problems, (3) provide necessary background information, or desired experience, essential to learning, (4) lead the pupil to define objectives, and (5) guide the individual to investigate the problem. This stimulation of pupil's interest in recognizing and solving problems should tend to erase the teachers ill advised and over-worked question: "What do you want to do?". A good teacher is alert to establish a situation in which the pupil wishes to solve the problem because of its meaning to him. The learning situation planned is real and true to life. It meets pupil needs, pupil interest, and is based on his maturity and past experiences. If a teacher desires the pupil to learn she must fit the setting to the person. There must be something about the surroundings that have meaning for him and he must feel at home in the setting. The teacher needs to provide situations which add interest, zest, and uniqueness to learning experiences. In such a situation students may be stimulated to activity by the surroundings and the methods used in presentation. In setting the stage for a learning

situation, the teacher might plan and prepare an attractive exhibit to be used at the beginning of a class period. In foods classes the exhibit might be composed of appetizing protein salads of which perhaps the eggs, meat, or similar protein food is prepared both by approved practices and "trust to luck" practices. These salads would be conspicuously exhibited in the homemaking room so that the student's curiosity and interest would be aroused. The teacher then would guide the student in recognizing the difference between the well prepared products and ones prepared in a haphazard way.

After the pupil recognizes the existence of a difficulty which demands solution, the teacher guides him in considering questions similar to the ones suggested here: (1) Do I understand the problem? (2) Is the problem definite? (3) Is it difficult? (4) Is the problem of interest to me? (5) Will it have value for me? The pupil's answers which in all probability will be made mentally will determine his course of action. If the pupil answers "yes" to each of these questions, the teacher leads him to state his problem in his own language. The pupil should be lead to understand the danger of poorly stated problems. It is as important for the pupil to use words which are understandable as it is for the teacher to use leading questions which are correctly stated in guiding the student's thinking.

Oftentimes a teacher may find that confusion exists in the mind of the student between a job and a problem. Upon thorough investigation the situation which is considered a problem may be no more than a job which has to be done. Likewise the teacher must be alert to direct student thinking through questions which require thought or investigation and cannot be answered with yes or no, rather than through questions which

imply the answer.

Following a statement of the problem, the student should be encouraged to analyze the problem in order to make certain he understands the situation. He is led by the teacher to check his past experiences, and to check the things previously learned for a possible answer. It may be necessary to state objectives, formulate a score card, set up standards or analyze the problem in some other manner. It is entirely possible that the student will need to do some reading or to talk with people of authority in order to secure information which will help him in analyzing the problem. This places responsibility upon the teacher to provide the student with the necessary background information and experience or to direct the individual toward sources suitable as background information.

This initiatory activity holds a very definite place in the teaching and thinking process. If the teacher does not make a special effort to plan possible student learning activities before they are needed, the pupil's interest may never be aroused. As a result of the lack of careful planning, the pupil may lose interest in the problem especially when encouraged or asked to carry on nonessential and uninteresting activities. This fact should lead the teacher to realize that it would be far better to plan more activities than may be needed, rather than to under-plan.

Beaumont and McComber suggest that

Probably inadequate teaching procedures and failure to provide the proper materials are responsible for more failure to learn than is the lack of pupil ability. The problem of providing materials at the pupil's level of maturity and of developing less academic and more psychologically sound learning experiences is one of the great challenges to educators.¹³

¹³ Beaumont, Henry and Macomber, Freeman Glenn, Psychological Factors in Education, p. 294.

Teacher readiness as exemplified in careful planning makes it possible to propose many variations in learning experiences and thereby provides opportunity for students to exercise judgment in selecting personal and class activities.

DEVELOPMENTAL STAGE

Upon completion of the planning or initiatory period, the developmental activities take place. If the teacher analyzes the term "developmental", she realizes that it means to unfold completely or to bring out the latent possibilities in a student through a series of steps. Thus, developmental activities would be of such nature as to unfold, or bring out step by step the possibilities of the problem which originated during the initiatory period. These developmental activities center around some of the steps in reflective thinking, namely: investigation of authority and assembling of available information, as well as the evaluation of this information. Pupil activities encouraged by the teacher during this period might be any one or all of the following: (1) reading authoritative literature, (2) participating in class discussions based on challenging guidance questions, (3) the preparation and evaluation of bulletin board arrangements, (4) the preparation of attractive exhibits, (5) experimentation, (6) making field trips, (7) listening to outside speakers, (8) observing educational films, and demonstrations, and (9) participating in practical demonstrations. The teacher should not lose sight of the fact that the pupil oftentimes has an original or unusual idea which will aid his search for a possible solution of the problem. Originality on the part of the pupil, plus the initiative of the teacher, encourages the selection of practical learning experiences.

If the teacher has considered a number of activities which might be used during the developmental period, she is in a better position to encourage the pupil to investigate all available information, to experiment during the investigation, and to evaluate the material which has been assembled. A question may arise as to how this may be accomplished. First of all, the teacher's initiative and her ability to express herself, enters into the situation. It may be necessary for the teacher to challenge the pupil's thinking in order to get him to search further for information. The teacher may question the statement of the student or may make a thought provoking statement. Regardless of the technique used to motivate the pupil's activity, the teacher should express her own opinion only with reservations concerning the situation. It is the teacher's responsibility to develop both the ability and the determination of the student to think. This would seem to indicate that mistakes might be made by the pupil during the process of thinking or problem-solving. The teacher must remember that some mistakes may be desirable since first hand experience on the part of the pupil is frequently the best teacher, provided the reasons for making mistakes are clearly understood.

CULMINATING STAGE

In preparation for the culmination period, the following steps of thinking should have been developed: (1) recognition of the existence of a problem situation or a difficulty demanding solution, (2) a decision to solve the problem, (3) an analysis of the conditions, (4) investigating and assembling all available facts relating to the problem, and (5) evaluating facts and discarding irrelevant material. In the culmination period the result of the gradual development of the process of think-

ing is reached.

It should be clearly understood that the way in which learning experiences are organized is of great importance in achieving the characteristics of behavior necessary for the full realization of educational values. The . . . teacher must keep in mind not only potential understandings which may grow out of a given learning experience, but also the need for organizing learning so as to achieve the habits, attitudes, special abilities, and skills important in realizing the educational values of a democratic society.¹⁴

The nature of the learning experiences of the previous periods --- initiatory and developmental --- determine the value of the culmination activities. Since this is true the purpose of the culmination period is to lead the pupils to try a possible solution, to formulate generalizations regarding the results of action and to recognize ways to use these generalizations in new situations. Parallel steps of the process of thinking for the culmination period are: (1) to try a possible solution, and (2) to test the solution to see if it works.

A workable definition for the term generalization has been suggested by Ruth Stratemeyer:

A complete thought which expresses an underlying truth, has an element of universality, that is, applies to many situations and usually states relationships existing.¹⁵

Teachers need guiding principles for developing generalizations and help in using them in teaching students to generalize and to state their own generalizations.

Six guiding principles follow:

1. Whenever possible, generalizations should be stated as working ideas used by the student in determining his behavior.

¹⁴ Commission on Secondary School Curriculum, Op. Cit., p. 450.

¹⁵ "Generalizations and Their Relation to Learning". Home Economics Educational Service. (mimeographed Release) Office of Education.

2. Generalizations . . . should be interpretative . . . Interpretative generalizations apply the results . . . to the elucidation of problems of wide and rather common human concern . . .
3. Each generalization . . . should be stated clearly and concisely, so as to convey a "whole idea" to the teacher who is engaged in developing suitable learning activities. In general, the statement should be complete in a single sentence.
4. The level of generality upon which the generalization is formulated will depend upon the use to be made of it in teaching and learning situations . . .
5. The generalizations should be so formulated as to avoid indoctrination or finality in interpretation.
6. Generalizations should be scrutinized carefully to see whether they do actually have promise of meeting real student needs, or whether they tend to represent adult-interest in subject matter only.¹⁶

The first step for the pupil in the culminating activity of a learning situation is to try a possible solution stated as a generalization. Then, as soon as possible, follows the second step - test the solution to see if it works by applying these generalizations to other situations.

If there is a lapse of time between the teaching of skills and facts and the use of those skills and facts, then much will be forgotten before it can be put to use . . . Wherever facts and skills can be presented as part of a useful activity their learning is more lasting and efficient. So it is too with . . . the attitudes which form character, the abilities which make for sound thinking.¹⁷

The constant application of generalizations previously arrived at by the student to the solution of new and similar but different problems or situations cannot be stressed too emphatically. The resourceful

¹⁶ Commission on Secondary School Curriculum, Op. Cit., pp. 451-452.

¹⁷ Mort, Paul R., and Vincent, William S. Modern Educational Practice. p. 98.

teacher guides the student to avail himself of every opportunity to test the validity of the solution and to make use of these generalizations in similar experiences. At the time the pupil applies a principle to actual usage, the learning will be more effective if he can feel with his hands, taste with his tongue, and see with his mind, as well as with his eyes.

An alert teacher fully realizes the fact that the conclusions which are drawn by the pupil as a solution to the problem must be generalizations based on pupil thinking. True, the pupils may not list the generalizations which the teacher thought might serve as a solution, but the teacher must remember that the pupil desires an opportunity to discover things for himself. She would not want to hand out her list of generalizations, since such action would critically hamper the pupil's growth in the process of thinking.

If learning is to be effective, the pupil needs to take a picture of himself at frequent intervals during the process of solving a problem so as to criticize his growth in terms of the ability to think. This self-criticism by the pupil is one form of evaluation. Other characteristics of evaluation which the teacher and pupil as well as the parent must consider are:

1. Evaluation includes all the means of collecting evidence on student behavior.
2. Evaluation is more concerned with the growth which the student has made than with his status in the group . . .
3. Evaluation is continuous, it is an integral part of all learning and teaching.
4. Evaluation is descriptive as well as quantitative.
5. Evaluation is concerned with the total personality of the student and with gathering evidence on all aspects of personality development.

6. Evaluation is a cooperative process involving student, teachers, and parents.¹⁸

Many teachers recognize only one form of evaluation - pencil and paper tests. This may be, and frequently is, a very poor way to secure evidence of the pupil's weaknesses and strengths; however, such tests may be used as a pre-test, in initiatory stage, to gain information about the background of the pupil in food preparation. Pre-tests help the student and teacher to determine goals and objectives which meet the needs of the pupil in as much as possible. It is essential to obtain information concerning the pupil's attitudes, skills, and understandings. It must be remembered that the evaluation activities will influence the student, whether the techniques are developed by the students, by the students with the guidance of the teacher, or by the teacher alone.

It should be noted that there is no set order in the process of reflective thinking. It must be cultivated through repeated and varied opportunities to discover and define problems, through an unbiased selection of facts which are essential to the problem from numerous sources of reliable authority, through the use of proof by planning and carrying on worthwhile experiments, the conducting of numerous investigations of the problem in order to test hypotheses, through formulation of conclusions and generalizations, and through continual application of the understandings achieved to other situations.

¹⁸ Quillen and Hanna, Op. Cit., p. 343-346

PART III

The ability of the teacher to apply the thinking process to the teaching of homemaking is greatly influenced or even largely determined by the teacher's understanding of facts, principles, and generalizations. The teacher will be able to realize desirable development within the student in the thinking process if the learning situations provide opportunities for the student to define, select, and analyze problems, to investigate and assemble available facts and information, to use proof in planning and testing hypotheses, to evaluate facts, and to formulate, verbalize, verify and apply generalizations.

CONCLUSIONS

The study has presented for consideration the fundamental hypothesis which assumes that learning is more effective when the student is led to develop the principles involved in a situation and to apply them in actual use. The guidance of the student in such learning requires the teacher's application of the process of reflective thinking in teaching. In order that teachers may help the student to develop the ability to think they need:

1. To know how to think.
2. To be able to recognize the problems involved in the areas in which they teach.
3. To study continually, because accepted facts, principles, and generalizations, as well as the method of teaching are ever changing.

4. To make a continuous effort in trying to state facts, generalizations, and principles.
5. To know how to apply the process of reflective thinking when they teach.
6. To know how to apply facts and principles to the solving of problems.
7. To be able to develop and apply generalizations in similar situations.
8. To develop the ability to recognize, formulate, and use generalizations so as to reduce the amounts of facts as such to be learned.

RECOMMENDATION

A study of an application of the thinking process in the teaching of homemaking has led to the recommendation that:

1. Teachers develop their own ability to think.
2. Teachers analyze their method of teaching in the terms of the process of reflective thinking.
3. Teachers procure recent books and periodicals that are authoritative references.
4. Teachers encourage students to develop their maximum thinking ability.
5. Teachers make sure that they know and understand the pertinent generalizations in the subject matter in each area they expect to teach.

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