Even if Red #2 is banned, other synthetic dyes which may be just as harmful will replace it. The answer would be to reduce or eliminate unnecessary coloring from food products, especially as dyes are often used to cover up deficiencies or the absence of natural and often more nutritious ingredients, or are used simply for eye appeal, especially in candies and breakfast cereals aimed at children. Consumers can learn to live without excessive uses of color, and manufacturers can be persuaded by the government if necessary, that consumers do not need an unnecessary food additive.

EXPERIMENTAL:

Theory: Thin layer chromatography is a simple and effective method of separating and identifying Red #2 in food samples. Thin layer chromatography is a method of separating components in a solution using the fact that the various components are retained on an absorbant to differ ing extents when diluted with a solvent. When a solution (in this case a color solution) is spotted near the bottom of a plate coated with a suitable absorbant and placed in a developing tank containing a suitable solvent, the solvent moves up the plate due to capillary action, and the individual components (the colors) of the solution are also carried up the plate at various rates. When the solvent front reaches the top of the plate, the plate is removed, dried, and the separated spots are clearly identifiable.

LAB III.

If a solution of Red #2 is spotted on the same plate as the sample, the sample can readily be identified as Red #2 if the two spots have traveled the same distances up the plate.

Reagents: NaOH - concentrated

acetic acid - dilute (1M)

NH_4OH - dilute (1M)

Red #2 (Ask a food company for a small sample or write to the Product Manager of Certified Colors and Food Acids, Allied Chemical Corp.,40 Rector St. N.Y.,N.Y. 10006

(Reagents - continued)

developing solvent - n-butanol-ethanol-water-conc. NH_4OH (50 25 25 10 by volume)

Apparatus:

white wool (yarn is very good)

blue litmus paper

Bunsen burner and tripod

silica gel chromatography strips

developing chamber - a large sized baby food jar is very good for this purpose

100 m. graduated cylinder

3 small beakers

PROCEDURE:

A. Preparation of Sample for Color Extraction

1. Soft drinks - test with blue litmus paper to determine if the sample is acidic. (Acids change litmus from blue to red.) If not, acidify by adding dilute acetic acid, drop by drop until the solution turns litmus red.

2. Alcoholic liquids - e.g. wines - Boil to remove alcohol and acidify if necessary, as in 1.

3. Soluble food - e.g. jams, sweets, icing - Dissolve in 30 ml. of water and treat as in 1.

4. Starch based food - e.g. cakes, custard powder - Grind 10 grams of sample very thoroughly with 50 ml. of 2% ammonia in 70% alcohol, allow to stand for some hours, and centrifuge. Pour the separated liquid into a dish and evaporate on a water bath. Take up the residue in 30 ml. H_2O containing acid and treat as in 1.

5. Candied fruits - Treat as in 4.

6. Products with a high fat content - e.g. sausages, meat and fish pastes. De-fat with light petroleum and obtain the color in aqueous solution by extracting it with hot water. Acidify as in 1.

In difficult cases treatment with warm 50-90% acetone or alcohol (which precipitates starch) containing 2% ammonia is often helpful. The organic solvent must be removed before acidifying, as in 4.

B. Extraction of Color

Purify a 20 cm. strip of white wool by boiling in 50 ml. of water to which one drop of concentrated NaOH has been added. Boil again in water and remove. Add the purified wool to the sample and boil until the white wool has absorbed as much color as it can hold. Wash the wool in cold water. Transfer to a small beaker and boil gently in 10 ml. of dilute NH_4OH to put the color back into solution. Remove the strip of wool and evaporate to about 1 ml.

C. Preparation of Standard

Dilute Red #2, visually, to the same intensity as the sample.

D. Determination

Make a line across the top of the plate 0.5 cm. from the top. With a capillary tube, spot a dot of the unknown sample and another spot of the Red #2 standard 0.5 cm. from the bottom of the plate, as shown in Figure I below, being careful to keep the spots small. Develop the plate with the developing solvent until the solvent reaches the top line, approximately 40 minutes. To be certain that the chamber is saturated with the solvent, add the solvent to the chamber about 20 minutes before the run and line the wall with a piece of filter paper. The solvent should just reach the bottom of the plate. Remove from chamber and dry. If the unknown and the standard have the same R_f, Red #2 is present.

$$R_f = \frac{\text{distance spot traveled}}{\text{distance solvent traveled}}$$

Thin Layer Chromatography Plate

Discussion: This experiment can easily be carried out in two separate lab periods - one for extraction of the color and the other for the TLC run.

BIBLIOGRAPHY

Alschuler, H. S. and Ham, M., Achievement Motivation Project Final Report: The Motivational Impact of Individualized Instruction, Harvard University, Mass. 1971

Anderson, Gary J., Effects of Classroom Social Climate on Individualized Learning, American Educational Research Journal, Vol. 7, No. 2. March 1970.

Anderson, Gary J., The Learning Environment Inventory, Institute for Research in Education, grant No. 69-AS-11-06, Province of Quebec, Canada, September, 1970.

Burkman, Ernest, An Approach to Instructional Design for Massive Classroom Impact, Journal of Research in Science Teaching, Vol. 11. No. 1, 1974.

Burkman, E. et al, Intermediate Science Curriculum Study, Level III, Investigating Variation, Well-Being, Crusty Problems, What's Up, In Orbit, Why You're You, Winds and Weather, Environmental Science, Silver Burdett, General Learning Corp., Morristown, N. J. 1972.

Caughren, H. J., Construction of an Experimental Measure of Motivation, Final Report, Project #G-1-005, HEW, Office of Education, 1972.

Haring, N. G. and Phillips, E. L., Analysis and Modification of Classroom Behavior, Prentice-Hall, Inc., Englewood Cliffs, N. J. 1972.

Heider, F., The Psychology of Interpersonal Relations, New York, Wiley, 1958.

Litwin, G. H. and Stringer, R. A., Motivation and Organizational Climate, Graduate School of Business Administration, Harvard University, 1966.

Redfield, D. D. and Snyder, W. P. et al, ISCS Individual Teacher Preparation Units: Rationale for Individualization, Evaluating and Reporting Progress, Individualized Teacher Preparation; Silver Burdett, General Learning Corp., Morristown, N. J. 1972.

Ross, J. D., A Study of the Effect of the Learning Environment on Selected Factors Related to Self Concept of School Children: Unpublished Doctoral Dissertation, University of Massachusetts, 1972.

Science Needs Assessments, Search #184, Institute for Educational Services, Inc., Mass., May, 1974.

Stufflebean, et al, Educational Evaluation and Decision-Making, Phi Delta Kappa. Itasca, Ill.; Peacock Publishers, Inc. 1971.

Vernon, P. E., Personality Assessment: A Critical Survey. Wiley, London. 1964.

Wong, H.-K. and Dolmatz, M. S., Ideas and Investigations in Science, Prentice-Hall, Inc. Englewood Cliffs, New Jersey, 1971

ABSTRACT

The purpose of this practicum was to develop an effective ninth grade ISCS program by modifications that would improve motivation and achievement. Classroom environment was assessed. Workshops on curriculum and methodology were conducted. The modifications were introduced and assessed. The CIPP model of evaluation served as the format and general evaluation for this practicum.

INTRODUCTION

This practicum addressed the question, what changes can be made within the definition of the learning environment to cause positive changes in levels of student motivation and achievement?

The setting was West Hartford, Connecticut, a suburban community of 75 thousand predominately white population. The community has generally been considered a "light house" school district with an annual education budget of approximately $20 million for a student population of 12,000 from K to 12. This community has generally been in the forefront of educational change.

The Board of Education adopted district-wide goals that were established in the 1969-70 school year in the content and affective areas after a year of town-wide assessment.

As one tool for use in meeting the science goals and objectives, four pilot classes of Intermediate Science Curriculum Study (ISCS) were initiated in one junior high school with the intent of monitoring the pilot for the three-year sequence. However, administrative pressure to "get a program" resulted in the phasing in of ISCS at all three grade levels in the junior high schools in 1970.

The objectives of ISCS and those which the Board of Education adopted were compatible, if not synonomous.

By the close of the 1972-73 school year, it became apparent to the science teachers of Talcott Junior High that the ISCS - West Hartford goals relating to motivation and achievement were not being met at the 9th grade level (Level III).

The need for modification of content and the learning environment was recognized by the district's administration with some support given for summer and inservice work toward instituting the modifications.

This practicum identified a process of assessing the educational environment of a science classroom as perceived by the students as well as established techniques within the ISCS context that has resulted in increased achievement in the 9th grade science program.

Inherent in these results were the modifications made in the curriculum and the concentration upon teaching methodology as it applied to the learning environment of individual students.

Chapter I

The Problems and Diagnosis

Students at Talcott Junior High School of West Hartford, Connecticut, were enrolled in the Intermediate Science Curriculum Study (ISCS).[1] During the latter stages of the first year of Level III, members of the science staff began to be aware of a lack of motivation among these students as well as a decline in their achievement. Initially, some doubt was raised concerning the compatibility of district science objectives with those of the community which the school serviced as well as those of the ISCS program.

In order to obtain definitive baseline data, it was decided that a determination of community (parent and student) needs with respect to science should be undertaken to provide a basis for future program decisions and to assure ourselves that the district science objectives did, in fact, reflect community needs.

A search for needs assessments in science was initiated.[2] The search provided information upon which a local instrument was designed. An assessment form was devised and randomly distributed to four groups of 50 individuals each. These groups were as follows: students who had completed Level III, ISCS; parents of students who had completed Level III, ISCS; students who had elected to take Level III the coming year; and parents of students who had elected to take Level III the coming year. The assessment contained 40 statements of need based upon the system-wide science goals and ISCS content objectives (see Appendix A). Results of the assessment served to substantiate what had already been expected; namely, ISCS-West Hartford goals for science were compatible with the perceived needs of the clientele (see Appendix A).

Among the stated objectives of ISCS are the provisions for science experiences that generally motivate the child to work at his own speed, referred to as self-pacing by the authors of the program. The authors contend that improvement of the motivational variable combined with training in basic science skills are believed to lead to improved achievement scores. The ISCS program sets up a learning environment that is designed to foster the motivational factor while the child learns to function as an individual (self-pacing).

Evidence indicated that after three years of ISCS, the Talcott students were showing a decreasing trend relative to motivation with a resultant decrease in levels of achievement. This trend was obviously directly opposite to the trends anticipated by the originators of the ISCS program.

The ISCS philosophy promotes the notion that students should assume much greater responsibility for the self-management of their learning activities, rather than be presided over by teachers as disseminators of information.[3]

The ISCS concept of motivation assumes that all students will try hard to solve any problem, regardless of subject matter, if clearly understood and posed at the appropriate level of difficulty.[4] It was assumed by the project founders that frequent questioning requiring some thought but at a reasonable level of difficulty, so as not to be discouraging, "would automatically make the materials interesting" and introduce topics that usually have been previously termed "unmotivating to junior high school students". "Experience has borne this out in that motivation has tended to remain high among most of the students that have used the materials."[5]

It has been shown that a significant relationship occurs between motivation and task orientation and achievement variables.[6] Research further shows that upon analysis, cognitive outcomes refer either to relatively stable or to fluctuating properties of the environment.[7]

Organizational climate, also referred to as behavior setting environments by many researchers, molds and shapes the motivation and behavior of every member of a group through its effect on each member's perceptions of what is expected of him and what he will get for doing a job a particular way. Climate determines motivation and motivated behavior.(8)

Alschuler and Ham (9) indicate that large gains in performance are obtained in restructured classrooms in which:

1) students were given more decision-making power for their own work;
2) the obstacles to success were located within the students, not the teacher; and
3) students were able to get immediate correct feedback on their performance to assist them in goal setting.

Caughren (10) has rephrased Vernon's (11) characteristics that a useful test should possess so as to be appropriate to the motivation domain. These are as follows:

1. The test should be a group test covering a limited number of variables, in order to yield fairly reliable scores in a brief time.

2. The items should be meaningful to, and give consistent results with, older secondary pupils.

3. The variables should be chosen for general usefullness and the items formulated to cover them.

4. Esoteric or highly theoretical constructs should be avoided.

5. Very high item-discrimination coefficients or internal consistency correlations for each variable greater than 0.75 to 0.80 are unnecessary since they tend to reduce the breadth and validity of the variables.

6. External correlates and group differences in profiles should be sought.

The Learning Environment Inventory (12) is an instrument designed to measure the social climate of learning of a class as perceived by the pupils within it. It can be used to describe the structural characteristics of a class. The LEI meets the Vernon-Caughren criteria.

Therefore, it was decided to administer the LEI to all Level III classes in order to determine the validity of the Talcott staff's perceptions.

The LEI subscales of diversity, environment, friction, goal direction, favouritism, satisfaction, disorganization, apathy and speed were selected for this practicum. All of these categories have an effect on pupil learning as substantiated by the foregoing citations.

The following intraclass correlations indicated group reliability according to Anderson.

Table 1

Subgroup	Intraclass Correlations
Diversity	0.43
Environment	0.76
Friction	0.77
Goal Direction	0.71
Favouritism	0.53
Satisfaction	0.74
Lisorganization	0.82
Apathy	0.79
Speed	0.71

The LEI was administered to 128 ISCS Level III, 9th grade students in the fall of 1974 and again to 125 in the spring of 1975 as a trial assessment of group perceptions of their class environment and group differences.(13)

Table 2

Learning Environment Pre-inventory Results

Scale	Norm Group Mean	Talcott Group Mean
2. Diversity	19.9	20.1
4. Speed	17.5	15.7
5. Environment	16.6	19.1
6. Friction	16.4	17.7
7. Goal Direction	18.3	18.5
8. Favouritism	14.1	14.2
10. Apathy	17.8	18.2
13. Satisfaction	17.4	17.4
14. Disorganization	15.4	15.9

Analysis of the LEI subgroups for the Talcott ISCS, Level III, as shown in Table 2 above follows:

1. Since the diversity subgroup is positively related to curriculum and methodology innovation a low score would indicate a lack of diversity showing little effect of a curriculum innovation such as the ISCS program. The mean score of 20.1 against a norm mean of 19.9 indicated no significant difference in this case.

2. Environment is positively related to pupil learning. The score of 19.1 as compared to a norm of 16.6 was significant and consequently showed that achievement could be expected to be positively significant also.

3. When friction is high, learning can be expected to be impaired. A score of 17.7 compared to a norm of 16.4 indicated a significant amount of friction, hence possible impaired learning.

4. Students in highly goal directed classes can be expected to reach the goal more often than students in classes where the goals were unspecified. The preliminary data showed a mean of 18.5 compared to a norm of 18.3. There being no significant difference, it follows that the ISCS might need more goal direction to improve motivation and achievement.

5. The favouritism scale indicates a low academic self concept. The mean of 14.2 showed no significant difference from the norm of 14.1 Since this subscale is essentially a measure of negative effect, according to

Anderson, academic self concept would seem to have had no significant effect on learning in this instance.

6. The satisfaction scale has a positive correlation with the measures of learning. The mean of 17.4 was identical to the norm. There was no significant difference that could have a bearing on learning in these classes as a whole.

7. High disorganization leads to a reduction in pupil achievement. A mean score of 15.9 compared to a norm of 15.4 indicated a slight general disorganization; hence, this factor could have significance to achievement.

8. The apathy subscale indicates a feeling of affinity with class activities. A score of 18.2 compared to a norm of 17.8 indicated a slight degree of apathy. This factor could affect achievement.

9. A class score on the speed scale indicates how well a teacher is able to communicate with and adapt to the needs of the students. An individual student's score would be indicative of his perception of self-pacing. The group mean score of 15.7 compared to the norm of 17.5 would seem to indicate that teachers are not able to communicate well with the students. Also inherent in this score was the fact that some students were realizing that their pace was slower than expected.

In summary, the results of the LEI indicated that the environment was perceived to be favourable to learning yet friction coupled with some disorganization and apathy tended to offset it. It could be expected that a higher diversity score would result in an individualized-self-paced ISCS class as opposed to a traditional science class. The slow pace and communication lack indicated by the speed scale together with an average goal direction score seemed to indicate that self-pacing and motivation through teacher involvement need improvement in order to meet the philosophical goals of ISCS at Level III.

Therefore, a need for change in classroom environment was indicated.

Concurrently, a process for assessing the achievement of the ISCS groups over the previous two and one-half years was decided upon.

Since no standardized achievement testing of the ISCS program had been instituted within the West Hartford School District, no group measurements of achievement had been made with which to compare degrees of success. However, within the district, the letter grade was used as representative of achievement. Massive or individual changes in these grades over the two and one-half year period were assumed by the West Hartford Schools to indicate a change in achievement levels.

Table 3

Science Letter Grade Distribution Changes

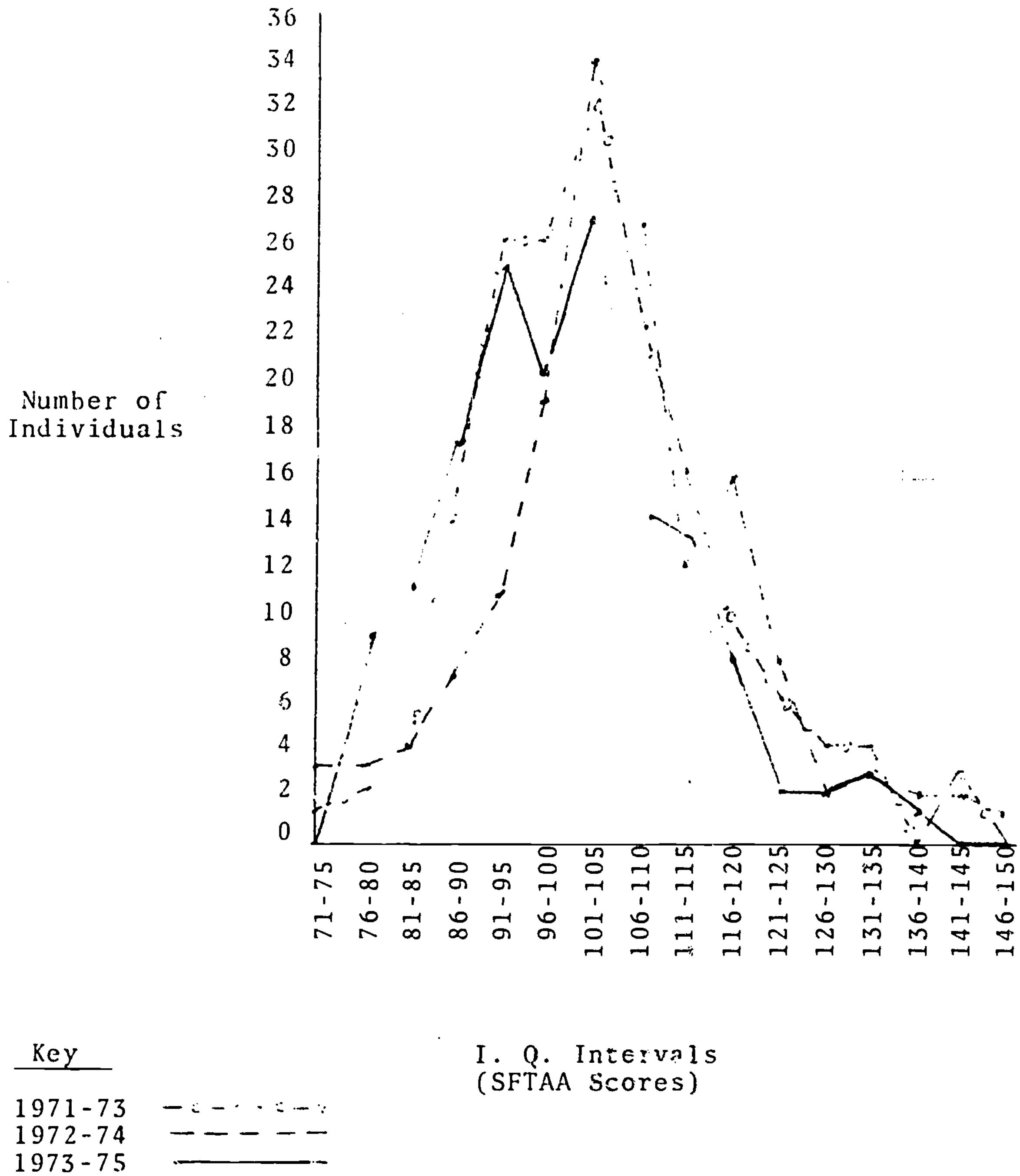
	1971-73		1972-74	
	Number	Percent	Number	Percent
Increase	36	24%	19	17%
No Change	72	48%	27	23%
Decrease	42	28%	68	60%

Examination of the grade sequences of all students in the ISCS program over the three-year span, as shown in Table 3, indicated a substantial downshift of the percent change with the 72-74 students when compared to the first students through the program in 1971-73.

Since the abilities of the Level III Talcott students follow the normal curve, as indicated by Figure 1, it was therefore expected that a majority of the students would have an average achievement of 'C' value and a higher percent of "no change" or "increase" would result after completing the ISCS program.

Figure I

I. Q. Distribution of Talcott Science Students



Further consideration was given to the number of units in Level III that were completed by these students. Of the eight possible units in the program, it was recommended by the authors that an average of six (6) units be completed. The number completed by the Talcott students was between four and five units on the average.

If the problem were allowed to continue without resolution, the learning environment might deteriorate further and students would not meet the district goal of developing scientific literacy or skill in the processes of science. Neither would they become self-actualizing learners. Success in further science education within the district had been predicated upon success at the junior high school level. Therefore, those students who would continue in science would possibly be at a disadvantage.

Predicated upon the foregoing, this practicum addressed itself to the following need: that is, the need to provide a learning environment suitable to stimulate motivation, self-pacing and increased achievement. This learning environment had to consist of appropriate relevant science materials, facilities and teaching strategies designed to provide a pleasant, non-friction, social, intellectual and achievement-motivated climate.

In order to accomplish the task of meeting the identified need, the following improvement oriented objectives were pursued:

1. To review, select, rewrite or adapt curriculum materials that fit the ISCS, Level III, conceptual scheme in relevant science content areas based upon the models and concepts of Levels I and II.

2. To conduct intensive in-service teacher training using the ISCS teacher preparation modules with emphasis upon positive pupil-teacher interaction techniques and achievement strategies.

3. To incorporate the modified, updated curriculum materials into the Level III science classes.

4. To produce a series of internally reliable achievement tests based upon the specific modified units in order to more definitively measure achievement.

5. To evaluate the new learning environment using the LEI after implementation of the modified materials and teacher in-service program.

FOOTNOTES

1. Intermediate Science Curriculum Study, Burkman, E. et al, Florida State University, Tallahassee, Florida, 1970.
2. Search #184, Institute for Educational Services, Inc., Bedford, Mass., May 24, 1974.
3. Redfield, D. D. and Snyder, W. P. et al, _ISCS Individual Teacher Preparation Unit_, Silver Burdett, Morristown, N. J., 1972.
4. Burkman, Ernest, _An Approach to Instructional Design for Massive Classroom Impact_, Journal of Research in Science Teaching, Vol. 11. No. 1, 1974. p.56.
5. Ibid.
6. Ross, J. D., _A Study of the Effect of the Learning Environment on Selected Factors Related to Self Concept of School Children_: Unpublished Doctoral Dissertation, University of Massachusetts, 1972.
7. Heider, F. _The Psychology of Interpersonal Relations_, New York, Wiley, 1958.
8. Litwin, G. H. and Stringer, R. A., _Motivation and Organizational Climate_, Graduate School of Business Administration, Harvard University, 1966.
9. Alschuler, H. S. and Ham, M., _Achievement Motivation Project Final Report: The Motivational Impact of Individualized Instruction_, Harvard University, Mass. 1971.

10. Caughren, H. J., Construction of an Experimental Measure of Motivation, Final Report, Project #G-1-003, HEW, Office of Education, 1972.

11. Vernon, P. E., Personality Assessment: A Critical Survey. Wiley, London. 1964.

12. Anderson, G. J., Center of Learning and Development, McGill University, Montreal, Canada. 1970.

13. Learning Environment Inventory was purchased in 1970 by the West Hartford Public Schools from Atlantic Research Institute, Halifax, Nova Scotia, Canada.

Chapter II

Capabilities, Design and Strategies

Once this problem was identified and the objectives delineated based upon the contextual information, it was necessary to identify and assess the capability of the school district to meet the stated objectives.

The upper administrative level of the West Hartford Public Schools had always been receptive to ideas for improvement in educational programs. Funding for summer workshops, mini-grants, new materials and conference attendance had been an integral part of each \$15 to \$20 million annual budget.

A district-wide science vertical team (K-12), composed of secondary science department heads and elementary science coordinators, was responsible for coordination, review and recommendations of priorities relating to any situation that might arise in the science areas. The recommendations of this team were highly valued by the upper administrative level.

Within the administrative structure of each secondary school, the science department head, a twelve-month employee, was given the responsibility for curriculum and supervision together with a substantially-decreased teaching load. This structure allowed for monitoring of the science program through a wide range of activities - one of the foremost being supervision within the science classes.

Prior to the phase-in of ISCS, the science curriculum at Talcott Junior High School had been a traditional Life Science, Earth Science and Physical Science program. During the 1960's, many thousands of dollars were spent in the purchase of equipment to complement these programs. Much of that equipment was in storage within the school.

There existed within the school district a central learning resource center containing a library of films and other software so extensive that a regular rental policy with accompanying catalog existed for the New England area. Separate from, yet related to, this facility was a district-wide graphic arts and printing facility wherein specific needs of the district were provided for.

The science staff at Talcott were an experienced staff with an average of 13 years in science teaching, the least of which was five years of service. Four of the six teachers had participated in ISCS workshops prior to the publication of ISCS training modules by the authors of the program.

Within the district a policy existed for early dismissal for all students from school every Wednesday at 1:30 p.m. This afternoon time was designed to provide for staff improvement through a variety of workshops, team meetings, department meetings, convocations and the like. Curriculum development through in-house activities was possible within this policy.

The next procedure was to determine how the existing staff, organization and facilities might best be utilized to institute a modification of the learning environment and the curriculum decided upon in the context evaluation stated in Chapter I of this report.

The organizational mechanism for submission of proposals, review, recommendations and approval of projects was available for my expeditious use as a science vertical team member. Summer workshop proposals were encouraged by the central administrative staff. Money was available in the budget.

The administrative accountability program in the district incorporated a Management-by-Objectives (MBO) system such that, once approved at the central office, support was given insofar as possible to assist in the accomplishment of the objective. The feasibility of acceptance and support for this project was positive through this MBO mechanism.

The plan for this practicum was to submit a proposal that would: (1) allow for a community needs assessment to be conducted during the late spring and early summer of 1974, and (2) provide for a team of experienced science teachers, ISCS experience included, to evaluate the needs assessment and "to review, select, rewrite, and adapt curriculum materials" to fit the ISCS-West Hartford conceptual scheme in science. With the personnel and budget available, this seemed to be a feasible strategy. Any need for clerical assistance could readily be absorbed among the central office and Talcott personnel without additional expenditures.

Once the workshop had been completed, the resulting materials and recommendations would need to be reproduced, distributed to the science staff members for use in the fall workshops together with the ISCS Teacher Preparation Modules.(1) The Learning Environment Inventory would be administered to the Level III classes in September, 1974. With the cooperation of the district's Director of Research, the LEI data and analyses of the specific subgroups could be available within one week's time. The foregoing appeared to be practicable.

Following the receipt of all materials prerequisite to the in-service work with the staff, a series of Talcott Science department meetings would be scheduled on Wednesdays and such other reasonable times during which the modifications, positive pupil-teacher interaction techniques and other learning environment and achievement-oriented strategies would be dealt with. Within the time available, this action seemed a reasonable expectation.

Concurrent to the in-service work, two additional inputs would occur. First, the materials would be incorporated into the classes immediately, with achievement tests covering these materials being developed by the Talcott teachers and other district ISCS Level III teachers. Second, I would utilize my supervisory capacity to observe classes as a monitoring strategy toward improving the instruction with particular emphasis toward the modifications recommended.

Practically, these strategies could be employed throughout the fall and winter quarters of the school year, 1974-75.

With the assistance of the Director of Research, achievement tests produced as a result of implementing the modifications would be examined for internal reliability and validity. Necessary changes and correction would be made to assure the reasonable reliability and validity of the instrument.

At the termination of the first semester in December, 1975, the LEI would again be administered and analyzed as a post inventory in order to determine any changes in the students' collective perceptions of environment within the same subgroups referred to in Chapter I. These perceptions would be shared with the science staff. Concurrently, the change or lack of change in letter grades over the three-year sequence would be determined as a measure of achievement. Recommendations from the science staff would be entertained as to what future action should be taken in relation to this curriculum and environment modification. A report of the results would be submitted to all levels of the organizational structure.

It seemed feasible that this program plan would provide for a logical response from the vertical team and the central office by March of 1975.

Special notation is made that no specific additional budget item would be necessary. All strategies could be completed within the existing budget with maximum benefit being derived from the already existant organizational structure in the school district.

FOOTNOTES

1. Intermediate Science Curriculum Study Staff, Rationale For Individualization, Evaluating and Reporting Progress, Individualized Teacher Preparation; Silver Burdett, General Learning Corp., Morristown, N. J. 1972.

Chapter III

Process and Implementation

The intent, as outlined in the foregoing chapter, was to utilize the resources and capabilities already available within the school district.

During the spring of 1974, an initial proposal for a writing workshop and a community needs assessment was submitted through the vertical team to the central administration.

This proposal was only partially granted since one person only, myself, was granted the task of devising and conducting the needs assessment as well as identifying the weak areas of the ISCS III content. This was the first of many barriers presented toward the delay in the project outcome.

The consequence of this first delay was to recycle the first objective to school-year time in the fall of 1974 using the Wednesday afternoon and regular departmental meeting times as much as possible. This placed an added burden on staff time.

Concurrent with these meetings, averaging two per month, the staff utilized the ISCS Individualized Teacher Preparation modules together with other resource materials(1) and personnel. Personnel from the Pupil Services Department conducted workshops in assessing classroom behavior and identifying reading difficulties with appropriate strategies suggested for correction and remediation. These workshops were designed as a basis for creating an awareness and initiation of teaching strategies toward building motivation for individual students having reading problems or acting-out behavior.

Through the spring of 1975, these meetings were devoted to developing motivation and evaluation strategies together with designs for improving the appearance and decor of the classrooms.

With the support of the other junior high school ISCS staff in the district, the writing proposal was again submitted and approved, in part, for the summer of 1975. This time a team composed of three science department heads and one ISCS III teacher were employed. However, an additional barrier to success existed since two of the department heads had never taught the ISCS III course but did have ISCS teaching and supervisory experience. Their presence was therefore of questionable value to curriculum modification.

A major procedural barrier to meeting the first objective, therefore, was that of failure to have sufficient funding to hire experienced ISCS III teachers in the summer of 1974 and 1975 to rewrite and adapt curriculum materials. The encumbered funds for paying department heads plus priorities for workshops in areas other than science contributed in large part to the delay and less-than-anticipated results.

A barrier to success that had not been foreseen began to emerge in the spring of 1975. This barrier resulted from the nationwide economic stress in the form of a Board of Education - Teacher Association dispute over the contract.

From October 1974, to mid-spring of 1975, negotiations had been going on for a new contract effective July 1, 1975. The process deteriorated to such an extent that the morale of the science staff was extremely low. This resulted in a reluctance on their part to expend energies toward innovation or change. These contractual disputes continued into late fall resulting in a work slow down and boycott. This action all had its effect upon the outcome of the various meetings held (if held at all) as well as the enthusiasm for work within the classroom.

However, during the spring of 1975, one teacher did develop a complete unit content in consumer chemistry for the ISCS III classes as a result of an NSF teacher in-service institute. All of the ISCS teachers participating in ISCS III understood the need for change and the role that they had in it.

Throughout the spring and fall of 1975, the staff reviewed all of the non-used science equipment with the goal of utilizing it in ISCS III where practical for motivation and in-depth cognition. The available media aids and equipment that could support the program were placed into use within the appropriate areas.

In September, 1975, the recommendations resulting from the summer workshop were introduced to the Level III teachers and the recommendations were implemented in the classrooms. An intensive effort to apply motivating strategies resulting from the previous meetings was made by the ISCS teachers.

Regular supervisory sessions with the individual science teachers were held throughout the spring and fall terms of 1975. An integral part of the supervisory process was the awareness of motivational and evaluation-related classroom strategies.

The Learning Environment Inventory was administered in December, 1975, to determine changes in the selected subgroups for this practicum.

FOOTNOTES

1. Haring, N. G. and Phillips, E. L., <u>Analysis and Modification of Classroom Behavior</u>, Prentice-Hall, Inc. Englewood Cliffs, N. J. 1972.

Chapter IV

Product

It was necessary to investigate the extent to which the objectives had, or had not, been obtained.

Prior to evaluating the results, it was necessary to develop measurable criteria associated with the objectives.

The first criterion, then, was to what extent had the curriculum materials of Level III been modified yet held to the scientific models and concepts of Levels I and II.

The ISCS III units were carefully investigated, researched and discussed. Science staff commentary with specific suggestions, in writing, were solicited and used in making the recommended changes. A major emphasis has resulted in correcting ambiguities in students directions, eliminating redundencies, building vocabulary and using supplemental equipment as demonstrations or additional student enrichment excursions.

The unit on consumer science departed from the specific format of ISCS at this stage of development in that the self-pacing strategy has yet to be built into it. More collective group interaction, lecture-discussion methodology has been employed in that unit. A document of general and specific recommendations was produced and has been used by the teachers. (See Appendix B).

It has been recognized that the ISCS III program should not be the only program offered to 9th grade students at Talcott. The self-pacing strategy has not worked for some students. Therefore, one aspect of the curriculum change was to recommend that a complete textual and program change be made for some students in order to meet their needs, yet stay within the West Hartford science philosophy.

The change was made to give the IIS Biology course (Ideas and Investigations in Science)[1] to a few selected students who met the following criteria:

1. The student was of average or above intelligence but was culturally deprived.
2. The student was academically deprived - a recurring history of failure, coupled with reading difficulties.
3. The student had found it difficult to learn in an ISCS setting.

The course was limited to a class size of 15 students. The IIS was chosen primarily because there was very little difference in the biology content between the ISCS III units and the IIS units. It was felt that the biology areas were of more import than earth science or physical science to the student that met the above criteria.

A criterion associated with the second objective was to what extent had the practicum succeeded in developing positive pupil-teacher interaction techniques and achievement strategies through in-service training. Throughout the practicum period the emphasis was upon conscious effort by teachers to improve the student's rate of progress by utilizing goal directing techniques and developing one-to-one teacher-pupil interaction.

Since the ISCS materials seemed to give initial stimulation and numerous instructional cues, the emphasis for teacher action concentrated on events and situations relating to the response areas of interaction. The need for immediate feedback by either the teacher, another student, text materials or equipment was realized.

Consequently, each teacher had a daily goal of positive immediate response with as many students in the class as possible without using negative reinforcement responses. Of course, other external influences made this goal difficult but class sizes were sufficiently small to have this be met more often than not.

A wide variety of motivational strategies have resulted and are presently practiced within the classroom. A conscious effort has been maintained to recognize the self-pacing aspect of the program, with the exception of consumer science, yet the maintenance of continual progress for all students has been sustained.

Motivational strategies have taken many forms. For example, students who have satisfactorily completed a unit have had a choice of the next unit they studied. Or, students who have completed their own weekly goal in advance have the option to "take a break"; that is, work on some other task of their choice, not necessarily in the science field. For another student, it may have been that a film loop was used as a substitute for the actual activity required in the unit.

Goal direction techniques were also emphasized. A few of the techniques that have been used are:

1. Unit goals were posted in a prominent place within the class room as well as given to each student as handouts.
2. Students were required to set their own daily or weekly goals.
3. Teachers specifically stated an activity, chapter or unit goal to individuals or teams.
4. Students were required to search out, state and write the goal before proceeding with the activity.

Other motivational techniques have included the use of interim self-evaluation reports of work style indicators to parents (see Appendix B), use of various media (video-tape, film, slides), spelling tests, current science reporting, and special science topic research projects. Frequent use of the small discussion group upon completion of a chapter of work has occurred prior to testing or the start of a new chapter within a unit.

The modified, updated curriculum materials in the Units of Investigating Variation and Well Being have been completed by 119 students out of a possible 144, in less than one semester. Of the 119, 14 of the more enterprising students have completed one-fourth of the unit Crusty Problems as their choice. One class of 25 students was less than one week from completion of the second unit. Thus, the third objective of this practicum was partially met.

The extent of the reliability and validity of the achievement tests designed would be a measurable criterion for the fourth objective. The design of achievement tests for the ISCS III units was not completed beyond the rough draft stage for the two units already introduced. This objective has not been met. The test production delay was the result of the time limitations placed on the summer workshop, the recycling of other work into the school year monthly meetings and the deterioration of teacher incentive throughout the contractual dispute.

However, it is the present intent of the author to pursue this objective to completion beyond the termination of this practicum as a part of the Management-by-Objective task for this school year.

Since the initial achievement data was based upon the student letter grades, these grades have served as a basis for determining changes in achievement.

Table 4

Science Letter Grade Distribution Changes

	Pre-Practicum Group 1972-74		Practicum Group 1973-75	
Grade Change	Number	Percent	Number	Percent
Increase	19	17%	43	29%
No Change	27	23%	69	46%
Decrease	68	60%	37	25%

Since the groups of students involved in the pre-practicum grade distribution and the practicum group (Table 1) were mutually exclusive and exhaustive, it was possible to apply the Chi-square test of significance. A Chi-square value of 32.74 with two degrees of freedom was found to be highly significant with the obvious largest contributor being the change at the decrease grade level.

Based upon the above, it can be stated that the objective to improve achievement at Level III was achieved.

The final criterion by which the last objective could be measured was to determine to what extent the learning environment had positively changed as a result of this practicum. The LEI was administered to the fall students as a pre-post inventory. Table 2 indicates the subgroup results, both pre and post together with the net change.

It is recognized that the data used in this analysis has not stood the test of strict statistical analysis based upon individual student data including I. Q., sex, standardized science achievement tests and the like since it was not the purpose of this practicum to be a research project. The scoring, class data and total group mean determination were accomplished by proper statistical methods. The means were used as representative of the total group. It is recognized that different classes, with different teachers, did in fact have means that when considered separately would be contrary to the general findings. However, the purpose here was to determine trends for the total ISCS group both in the pre and the post inventory.

Table 5

Pre-Post LEI Subgroup Scores

Subgroup	Norm	Pre	Post	Change
Diversity	19.9	20.1	19.4	-0.7
Speed	17.5	15.7	17.4	+1.7
Environment	16.6	19.1	18.0	-1.1
Friction	16.4	17.7	18.4	+0.7
Goal Direction	18.3	18.5	19.1	+0.6
Favouritism	14.1	14.2	15.9	+1.7
Apathy	17.8	18.2	17.8	-0.4
Satisfaction	17.4	17.4	16.8	-0.6
Disorganization	15.4	15.9	16.1	+0.2

An analysis of the above results follows:

1. Diversity declined. This factor indicated that, although slight, there was a trend away from the innovativeness of ISCS. This could be considered to reflect the use

of a few "traditional" techniques; i. e., homework demands, teacher-oriented goal setting and deadlines limiting the self-pacing concept. One would expect an increase in the diversity score if the modifications had been extraordinarily different from the ISCS format.

2. There was a perceived increase in the speed mean score of 1.7. This indicated the success of one of the major processes in accomplishing the objective relating to positive teacher-pupil interaction since the speed score indicated that the teacher is able to communicate with and adapt to the needs of the group. It also indicated that the students realized they were keeping up with the pace of the class.

3. Since environment is positively related to pupil learning, this score should have increased with the increase in achievement already noted, yet a marked decrease took place. Even though the mean was still substantially above the norm to indicate positive achievement, the author was at a loss to account for the decrease. Several factors that might affect this score could include the fact that many students are together class-after-class, the newness of the physical environment had worn off after a period of time or that there were no outstanding physical environmental changes between the pre and post inventory periods.

4. The friction score increased. Dependent upon the

makeup of the specific classes, this could be interpreted as a positive relationship to learning. Since the makeup of the ISCS classes were heterogeneous in this practicum and evenly split between the sexes, the high friction must be interpreted in a positive manner. Competitiveness among the average and above average I. Q. students could be indicated by the high friction score. This would correlate positively to the increase in achievement. Conversely, the high friction score could reflect the conflict existent among the lower-ability students but not substantially enough to have affected their achievement.

5. The increase in the goal direction score reflects the results of one of the objectives of this practicum for motivating students. The intent was to institute more goal direction, hence, motivation. A high goal direction score tends to indicate a more traditional type of course. The students were able to understand and reach the goals more often as a result of this practicum which was also reflected in the increased achievement.

6. The favouritism mean score increased markedly. This score indicated a trend opposite from the expectations of this practicum; namely, a decrease in student self-concept rather than an increase. The favouritism score represents a low academic self-concept and is a measure of negative effect. This increase was incongruous with

the apathy, friction and speed scale results. However, according to Anderson, learning would not be significantly affected by this subgroup score.

7. Apathy decreased slightly. This also was recognized as a necessary outcome if this practicum were to be successful. The slight decline indicated that the group norms of behavior in ISCS were probably more acceptable now than at the time of the pre inventory. Achievement results were also possibly affected since apathetic students tend not to achieve.

8. A decrease of the satisfaction mean score of 0.6 would indicate that learning should be affected negatively, but there was no indication that this was so. This trend remained unexplainable to the author except that some dissatisfaction exists but not at such a degree as to have affected overall student achievement.

9. Disorganization should lead to reduction in pupil learning. A slight decrease in the mean should not have any significantly different effect in this case. However, the mean was still substantially above the norm showing that a degree of disorganization still existed throughout the practicum period. This might be interpreted to mean that disorganization as perceived by students can exist in a self-paced, individualized course yet have no marked effect on achievement. This would seem to be a notion contrary to current accepted educational thought.

Obviously, careful research would be needed to substantiate this notion.

In summary, this practicum intended to decrease friction, disorganization, apathy and favouritism in order to increase motivation and achievement which would be reflected in increased speed and goal direction scores. The general environment score was to increase as well. As evident from the foregoing analysis, the trends were not all up to expectations.

The resulting increases in speed and goal direction and the decrease in apathy and diversity appeared to be factors that performed as expected. The decrease in the environment-satisfaction subgroups and the increase in disorganization were not desired outcomes. The factors that caused these latter outcomes are unexplainable by this author. It remains a further task for some researcher to investigate the several individual student variables within ISCS classes that might affect those variables yet produce overall group increases in achievement.

The friction variable increased rather than decreased as expected but the factor of competitiveness, not measured in any other subgroup, could well account for this and thus contributed to the increase in achievement.

It has been shown that the LEI is an instrument that can be used for general group diagnosis in ISCS Level III and could be used as a determiner of general classroom environmental change.

Thus, several accomplishments and allied decisions have resulted from this practicum.

1. The ISCS Level III curriculum has undergone some modification through a process that, due to district organizational structure, was workable yet encumbered by lack of funds and different priorities beyond the control of this author. The decision was to continue to change Level III by adding relevant material to each unit and utilizing old and new science equipment and media that complement the concepts of ISCS.

2. The IIS Biology was substituted for ISCS Level III for certain students meeting established criteria. This will continue.

3. Achievement was improved. Although specific achievement tests were not completed, the decision to complete them as intended by this practicum has been made.

4. The Learning Environment Inventory has served as a valuable indicator of classroom environment and will continue to be used as an aid to teachers.

5. Teaching methodology was improved by limiting but not eliminating self-pacing, using more goal directing techniques and one-to-one teacher-pupil interaction strategies. The decision has been made to continue the major emphasis of supervision to be that of monitoring these strategies.

FOOTNOTES

1. Wong, H. K. and Dolmatz, M.S., Ideas and Investigations in Science, Prentice-Hall, Inc. Englewood Cliffs, New Jersey. 1971

APPENDIX A

NEEDS ASSESSMENT
STUDENT FORM

Directions: Place a check (✓) in the space that represents the importance of the need expressed.

	Very Important	Important	Necessary	Unimportant	Irrelevant
1. Need to prepare the student for a scientific or technical career.					
2. Need to develop an inquisitiveness.					
3. Need science only to graduate from high school.					
4. Need for a better understanding of the world around us.					
5. Need for a greater variety of science courses.					
6. Need an understanding of the human body and its functions.					
7. Need the knowledge and skills to operate and make minor repairs in home appliances and fixtures.					
8. Need to interpret graphed representations of science related information.					
9. Need to understand the relationships among all living things.					
10. Need to understand the physiological and psychological effects of alcohol, drugs and smoking.					
11. Need to understand the fundamental model for explaining inherited characteristics.					
12. Need to explore and understand the skills and techniques of measurement.					
13. Need to understand the reporting of the results of many measurements.					
14. Need to understand the proper emphasis between man and his environment as critical for survival.					
15. Need to understand the basic factors that effect the weather.					

	very important	important	necessary	unimportant	irrelevant
16. Need to explore that solutions to environmental problems are usually difficult and require the considerations of many points of view.					
17. Need to understand and recognize common geological features that structure our earth's surface.					
18. Need a practical applied science course.					
19. Need no science course at all.					
20. Need a basic understanding of general scientific facts.					
21. Need homework in science.					
22. Need out-of-school classes in science.					
23. Need science to know more about ourselves in order to adjust to new situations.					
24. Need more class time in science.					
25. Need to understand the range and limit of man's control over nature.					
26. Need to change my approach toward solving problems in everyday life.					
27. Need the application of scientific methods to every day life.					
28. Need the process of classification and generalizing particular to science.					
29. Need to plan and carry out an experiment.					
30. Need to be able to use information gained from facts and experimental results to reach a decision.					
31. Need to make reasonable predictions from un known information and observations.					
32. Need the basic knowledge and understandings of the study of living things in all forms, the formation of the earth (past and present) and movements of objects in the universe.					

	very important	important	necessary	unimportant	irrelevant
33. Need to understand and use scientific vocabulary to state questions and problems of science.					
34. Need to reach conclusions from use of math and measurement skills.					
35. Need certain fundamental scientific principles.					
36. Need to be willing to challenge statements whether made in books or by people.					
37. Need for skill in manipulating science devices and materials necessary to acquire a knowledge of nature.					
38. Need to have an understanding of different matter-energy relationships.					
39. Need to function successfully in our present technological society.					
40. Need a basis for understanding the causes and effects of the pollution of our environment.					

NEEDS ASSESSMENT
PARENT FORM

Directions: Place a check (✓) in the space that represents the importance of the need expressed.

	Very Important	Important	Necessary	Unimportant	Irrelevant
1. Need to prepare the student for a scientific or technical career.					
2. Need to develop an inquisitiveness.					
3. Need science because I never had it myself.					
4. Need for a better understanding of the world around them.					
5. Need for a greater variety of science courses.					
6. Need an understanding of the human body and its functions.					
7. Need the knowledge and skills to operate and make minor repairs in home appliances and fixtures.					
8. Need to interpret graphed representations of science related information.					
9. Need to understand the relationships among all living things.					
10. Need to understand the physiological and psychological effects of alcohol, drugs and smoking.					
11. Need to understand the fundemental model for explaining inherited characteristics.					
12. Need to explore and understand the skills and techniques of measurement.					
13. Need to understand the reporting of the results of many measurements.					
14. Need to understand the proper emphasis between man and his environment as critical for survival.					
15. Need to understand the basic factors that effect the weather.					

	Very Important	Important	Necessary	Unimportant	Irrelevant
16. Need to explore that solutions to environmental problems are usually difficult and require the considerations of many points of view.					
17. Need to understand and recognize common geological features that structure our earth's surface.					
18. Need a practical applied science course.					
19. Need no science course at all.					
20. Need a basic understanding of general scientific facts.					
21. Need homework in science.					
22. Need out-of-school classes in science.					
23. Need science to know more about themselves in order to adjust to new situations.					
24. Need more class time in science.					
25. Need to understand the range and limit of man's control over nature.					
26. Need to change approach toward solving problems in everday life.					
27. Need the application of scientific methods to everday life.					
28. Need the process of classification and generalizing particular to science.					
29. Need to plan and carry out an experiment.					
30. Need to be able to use information gained from facts and experimental results to reach a decision.					
31. Need to make reasonable predictions from known information and observations.					
32. Need the basic knowledge and understandings of the study of living things in all forms, the formation of the earth (past and present), and movements of objects in the universe.					

	Very Important	Important	Necessary	Unimportant	Irrelevant
33. Need to understand and use scientific vocabulary to state questions and problems of science.					
34. Need to reach conclusions from use of math and measurement skills.					
35. Need certain fundemental scientific principles.					
36. Need to be willing to challenge assertions whether made in books or by people.					
37. Need for skill in manipulating science devices and materials necessary to acquire a knowledge of nature.					
38. Need to have an understanding of different matter-energy relationships.					
39. Need to function successfully in our present technological society.					
40. Need a basis for understanding the causes and effects of the pollution of our environment.					

NEEDS ASSESSMENT ANALYSIS

The items in each form were grouped into three categories: items reflecting the district and ISCS goals; items reflecting specific ISCS goals; and, other goals.

Table I

Assessment Item Categories

I District and ISCS Goals	II Specific ISCS Goals	III Other Goals
1,2,4,8,9,12,13, 14,16,20,22,23,26, 27,28,29,30,31,32, 33,34,35,36,37,38,39	6,8,10,11,15 16,25,40	3,5,7,18,19, 20,21,24

The items in the first category were deemed the most important for the purposes of giving evidence that the science program at Talcott was, in fact, in tune with the community it was servicing.

Table II

Needs Assessment Results

	Parent Form		Student Form	
	Completed ISCS	Elected ISCS	Completed ISCS	Elected ISCS
Percent Return	84	94	94	88
Percent Agree (Category I)	87	82	78	84
Percent Agree (Category II)	78	83	75	75
Percent Agree (Category III)	8	2	16	22

The items answered with a response of necessary, important, or very important were considered to be in agreement with the West Hartford-ISCS goals. The items answered with unimportant or irrelevant were considered to be not in agreement with the West Hartford-ISCS goals. Table II indicated the overwhelming response from the community to the document as well as their positive support for the West Hartford-ISCS goals in science.

PROGRAM MEMORANDUM

for

SCIENCE

(Goals and Subgoals)

West Hartford Public Schools

West Hartford, Connecticut

Program Characteristics

Science instruction in West Hartford involves sequential activities in the four major areas of science knowledge: Matter, Energy and Forces, Life and Universe. Learning experiences are provided that spiral through these four knowledge areas, gradually increasing in sophistication from kindergarten through grade 12.

Whenever practical, concepts are taught through experience. From the earliest age, children are given the opportunity to manipulate equipment and gather data illustrative of the principle or generalization being taught through experience. While it is not expected that many students will become scientists, it is assumed that all will be living in a society oriented to science and technology and that as citizens they will participate in decisions which require some knowledge of the capabilities and limitation of science in solving the problems of society.

GOAL 1 - Students will understand the conceptual structure of science knowledge.

1.1: Students will recognize that science knowledge can be organized into four major conceptual schemes: Energy, Matter, Life and Universe.

1.1.1: Students will understand that concepts enlarge and change in meaning as they are nourished by new data and insights.

1.1.2: Students will learn that science knowledge grows by embracing all that was known before.

GOAL II- Students will understand the investigative procedures of science.

2.1: Students will develop competence in rational thought and action.

2.1.1: Students will learn that science knowledge has been obtained by observations of nature, drawing inferences from these observations and verifying the inferences.

2.1.2: Students will learn observation techniques pertinent to scientific inquiry.

2.1.3: Students will be willing and able to draw inferences from observations and to explore for relationships that tie together ideas and information.

2.1.4: Students will be willing to challenge assertions whether made in books or by people.

2.1.5: Students will interact and question.

2.1.6: Students will display skill in manipulating science devices and materials necessary to the acquisition of knowledge of nature.

GOAL III - Students will be personally concerned about science.

3.1: Students will understand the ramifications of the social integration of science and technology.

3.1.1: Students will understand, forecast, shape and adapt to technological change.

3.1.2: Students will recognize the cultural conditions under which science thrives.

3.1.3: Students will view science within the broad perspective of culture, society and history.

3.1.4: Students will recognize the potential satisfaction and intellectual stimulation of the study of science.

ISCS LEVEL III GOALS

The major goals of ISCS that were used to formulate the ISCS-West Hartford combination were as follows:

1. Science instruction in the junior high schools should serve a general education function.

2. Science instruction should require active investigative behavior on the part of students, not passive studying about science.

3. Science content should be encountered according to logical sequences of problem-oriented activities and that science subject matter together with the processes of science should be presented simultaneously.

4. The goal and design of instruction should be to meet realizable needs of every student.

For a more definitive compilation of ISCS III objectives the reader is referred to Performance Objectives ISCS Level III by Silver Burdett, General Learning Corp., Morristown New Jersey.

LEARNING ENVIRONMENT INVENTORY

Directions

The purpose of the questions in this booklet is to find out what your class is like. This is not a "test." You are asked to give your honest, frank opinions about the class which you are now attending.

Record your answer to each of the questions on the IBM sheet provided. Please make no marks on the booklet itself. Answer every question.

In answering each question go through the following steps:

1. Read the statement carefully.

2. Think about how well the statement describes your class (the one you are now in).

3. Find the number on the answer sheet that corresponds to the statement you are considering.

4. Blacken one space only on the answer sheet according to the following instructions:

   If you strongly disagree with the statement, blacken space 1.
   If you disagree with the statement, blacken space 2.
   If you agree with the statement, blacken space 3.
   If you strongly agree with the statement, blacken space 4.

5. You will have approximately 40 minutes to complete the 105 questions in the booklet. Be sure the number on the answer sheet corresponds to the number of the statement being answered in the booklet.

		Strongly disagree	Disagree	Agree	Strongly agree
1.	Members of the class do favours for one another.	1	2	3	4
2.	The books and equipment students need or want are easily available to them in the classroom.	1	2	3	4
3.	There are long periods during which the class does nothing.	1	2	3	4
4.	The class has students with many different interests.	1	2	3	4
5.	Certain students work only with their close friends.	1	2	3	4
6.	The students enjoy their class work.	1	2	3	4
7.	Students who break the rules are penalized.	1	2	3	4
8.	There is constant bickering among class members.	1	2	3	4
9.	The better students' questions are more sympathetically answered than those of the average students.	1	2	3	4
10.	The class knows exactly what it has to get done.	1	2	3	4
11.	Interests vary greatly within the group.	1	2	3	4
12.	A good collection of books and magazines is available in the classroom for students to use.	1	2	3	4
13.	The work of the class is difficult.	1	2	3	4
14.	Every member of the class enjoys the same privileges.	1	2	3	4
15.	Most students want their work to be better than their friends' work.	1	2	3	4
16.	The class has rules to guide its activities.	1	2	3	4
17.	Personal dissatisfaction with the class is too small to be a problem.	1	2	3	4
18.	A student has the chance to get to know all other students in the class.	1	2	3	4
19.	The work of the class is frequently interrupted when some students have nothing to do.	1	2	3	4
20.	Students cooperate equally with all class members.	1	2	3	4

		Strongly disagree	Disagree	Agree	Strongly agree
21.	Many students are dissatisfied with much that the class does.	1	2	3	4
22.	The better students are granted special privileges.	1	2	3	4
23.	The objectives of the class are not clearly recognized.	1	2	3	4
24.	Only the good students are given special projects.	1	2	3	4
25.	Class decisions tend to be made by all the students.	1	2	3	4
26.	The students would be proud to show the classroom to a visitor.	1	2	3	4
27.	The pace of the class is rushed.	1	2	3	4
28.	Some students refuse to mix with the rest of the class.	1	2	3	4
29.	Decisions affecting the class tend to be made democratically.	1	2	3	4
30.	Certain students have no respect for other students.	1	2	3	4
31.	Some groups of students work together regardless of what the rest of the class is doing.	1	2	3	4
32.	Members of the class are personal friends.	1	2	3	4
33.	The class is well organized.	1	2	3	4
34.	Some students are interested in completely different things than other students.	1	2	3	4
35.	Certain students have more influence on the class than others.	1	2	3	4
36.	The room is bright and comfortable.	1	2	3	4
37.	Class members tend to pursue different kinds of problems.	1	2	3	4
38.	There is considerable dissatisfaction with the work of the class.	1	2	3	4
39.	Failure of the class would mean little to individual members.	1	2	3	4
40.	The class is disorganized.	1	2	3	4

		Strongly disagree	Disagree	Agree	Strongly agree
41.	Students compete to see who can do the best work.	1	2	3	4
42.	Certain students impose their wishes on the whole class.	1	2	3	4
43.	A few of the class members always try to do better than the others.	1	2	3	4
44.	There are tensions among certain groups of students that tend to interfere with class activities.	1	2	3	4
45.	The class is well-organized and efficient.	1	2	3	4
46.	Students are constantly challenged.	1	2	3	4
47.	Students feel left out unless they compete with their classmates.	1	2	3	4
48.	Students are asked to follow strict rules.	1	2	3	4
49.	The class is controlled by the actions of a few members who are favoured.	1	2	3	4
50.	Students don't care about the future of the class as a group.	1	2	3	4
51.	Each member of the class has as much influence as any other member.	1	2	3	4
52.	The members look forward to coming to class meetings.	1	2	3	4
53.	The subject studied requires no particular aptitude on the part of the students.	1	2	3	4
54.	Members of the class don't care what the class does.	1	2	3	4
55.	There are displays around the room.	1	2	3	4
56.	All students know each other very well.	1	2	3	4
57.	The classroom is too crowded.	1	2	3	4
58.	Students are not in close enough contact to develop likes or dislikes for one another.	1	2	3	4
59.	The class is rather informal and few rules are imposed.	1	2	3	4
60.	Students have little idea of what the class is attempting to accomplish.	1	2	3	4

		Strongly disagree	Disagree	Agree	Strongly agree
61.	There is a recognized right and wrong way of going about class activities.	1	2	3	4
62.	What the class does is determined by all the students.	1	2	3	4
63.	After the class, the students have a sense of satisfaction.	1	2	3	4
64.	Most students cooperate rather than compete with one another.	1	2	3	4
65.	The objectives of the class are specific.	1	2	3	4
66.	Students in the class tend to find the work hard to do.	1	2	3	4
67.	Each student knows the goals of the course.	1	2	3	4
68.	All classroom procedures are well established.	1	2	3	4
69.	Certain students in the class are responsible for petty quarrels.	1	2	3	4
70.	Many class members are confused by what goes on in class.	1	2	3	4
71.	The class is made up of individuals who do not know each other well.	1	2	3	4
72.	The class divides its efforts among several purposes.	1	2	3	4
73.	The class has plenty of time to cover the prescribed amount of work.	1	2	3	4
74.	Students who have past histories of being discipline problems are discriminated against.	1	2	3	4
75.	Students do not have to hurry to finish their work.	1	2	3	4
76.	Certain groups of friends tend to sit together.	1	2	3	4
77.	There is much competition in the class.	1	2	3	4
78.	The subject presentation is too elementary for many students.	1	2	3	4
79.	Students are well satisfied with the work of the class.	1	2	3	4
80.	A few members of the class have much greater influence than the other members.	1	2	3	4

		Strongly disagree	Disagree	Agree	Strongly agree
81.	There is a set of rules for the students to follow.	1	2	3	4
82.	Certain students don't like other students.	1	2	3	4
83.	The class realizes exactly how much work it has to do.	1	2	3	4
84.	Students share a common concern for the success of the class.	1	2	3	4
85.	There is little time for day-dreaming.	1	2	3	4
86.	The class is working toward many different goals.	1	2	3	4
87.	The class members feel rushed to finish their work.	1	2	3	4
88.	Certain students are considered uncooperative.	1	2	3	4
89.	Most students sincerely want the class to be a success.	1	2	3	4
90.	There is enough room for both individual and group work.	1	2	3	4
91.	Each student knows the other members of the class by their first names.	1	2	3	4
92.	Failure of the class would mean nothing to most members.	1	2	3	4
93.	The class has difficulty keeping up with its assigned work.	1	2	3	4
94.	There is a great deal of confusion during class meetings.	1	2	3	4
95.	Different students vary a great deal regarding which aspect of the class they are interested in.	1	2	3	4
96.	Each student in the class has a clear idea of the class goals.	1	2	3	4
97.	Most students cooperate equally with other class members.	1	2	3	4
98.	Certain students are favoured more than the rest.	1	2	3	4
99.	Students have a great concern for the progress of the class.	1	2	3	4
100.	Certain students stick together in small groups.	1	2	3	4

	Strongly disagree	Disagree	Agree	Strongly agree
101. Most students consider the subject matter easy.	1	2	3	4
102. The course material is covered quickly.	1	2	3	4
103. There is an undercurrent of feeling among students that tends to pull the class apart.	1	2	3	4
104. Many students in the school would have difficulty doing the advanced work of the class.	1	2	3	4
105. Students seldom compete with one another.	1	2	3	4

APPENDIX B

SCIENCE DEPARTMENT
TALCOTT JUNIOR HIGH SCHOOL Date________________

Dear Parents,

This year ______________________has been participating in the 3rd level of the Intermediate Science Curriculum Study (ISCS). This is a self-paced approach to learning science.

This is an elective course for high school credit. In this program, students have an opportunity to practice self-discipline, scholarly behavior and responsibility. Below is a list of progress indicators which show you your child's and the teacher's estimation of progress at this time. After reading and discussing this with your child, will you please sign your name in the designated place and return it to the science teacher.

	Student Evaluation: acceptable progress	Student Evaluation: improvement possible	Teacher Evaluation: acceptable progress	Teacher Evaluation: improvement possible
1. Makes full use of class time.				
2. Demonstrates a responsible a attitude.				
3. Writes legible answers to questions in his record book.				
4. Shows confidence in recording from his own observations.				
5. Demonstrates the motivation to work independently.				
6. Studies a problem carefully before asking questions about it.				
7. Writes well thought out answers in his record book.				
8. Shows an attitude of helpfullness, cooperation and respect for others.				
9. Demonstrates ability to understand and apply specific science concepts.				

See reverse side for comments:

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Teacher:______________________ Parent:______________________

ISCS LEVEL III

Work Session Summer 1975

GENERAL AND SPECIFIC RECOMMENDATIONS

SUBMITTED BY

Philip A. Hall
Alfred E. Chrzan
Robert E. Olmstead
Louis G. Salvio

WEST HARTFORD PUBLIC SCHOOLS
West Hartford, Connecticut

ISCS LEVEL III

Work Session Summer 1975

After three years of ISCS, Level III, in the science curriculum of the West Hartford Public Schools at the ninth grade level, feedback from teachers, students, and parents has pointed to the need for taking a careful look at the program and enrichment materials. The intent and purpose of the summer work session was to develop enrichment and alternative materials. Each unit was carefully investigated, researched and discussed. The literature from the ISCS project and publishers indicates that the number of units covered in one year and the preference of units vary with student interest and capability. Teachers may mandate that certain units be covered by all students. A minimum requirement of six units seems reasonable for most students. With this in mind, as well as the ISCS-West Hartford philosophy regarding junior high science, the results of this work session are the following General and Specific Recommendations.

GENERAL RECOMMENDATIONS

1. That more frequent goal-setting by students and/or teachers be continually undertaken. This is based upon the general concern that self-pacing by many individual students needs corrective treatment.
2. That the ISCS performance objectives, performance assessment resources and "Notes to Teachers" in the teacher's editions be used to as great an extent as intended by the program writers.

3. That the Investigating Variation unit be the first unit taught to all students followed by the Well-Being unit.

4. That the other units be presented in whatever sequence the individual teacher or department desires.

SPECIFIC RECOMMENDATIONS

Each of the units will be presented containing sections according to the following outline:

I. Vocabulary Lists: These are words of importance within the chapters in order of appearance. These lists may be duplicated for insertion at the back of each student's record book. These lists also contain the Math Hints for the chapter.

II. Chapter Material Lists: These are for student and teacher use. It has been found that time is saved in classroom management by each student having these for quick reference. Sections having no equipment are easily noted and may be accomplished out-of-class.

III. Recommended Changes: These include corrections, deletions, or additions, together with helpful hints to aid in learning. Upon the decision to use a specific unit, it would be advisable to make the corrections mentioned in the teacher's edition of the text and record book. Special note is made of Andrew Gibson's Consumer Science section. It is recommended that it follow Well-Being.

IV. Supplementary Materials:

A.1. Film Lists: These suggested films are from the West Hartford LRC.

2. Other software

B. Enrichment Equipment: These items lend themselves to enrichment demonstrations and in-depth study by students. Most of the equipment is available in the schools and is not specific ISCS equipment.

C. Major areas for In-depth Study:

1. Topics
2. Scientists associated with unit content

D. Other (trips, speakers etc.)

Note: It is recommended that a bibliography be compiled of all books in each library for the following fields of science. This will facilitate the transfer of books under the inter-school library loan plan and help in ordering books, thus maintaining up-to-date library resources in all areas.

FIELD OF SCIENCE	ISCS TEXT
Astronomy	What's Up
Biology-heredity	Why You're You
Biology-health	Well Being
Environment	Environmental Science
Geology	Crusty Problems
Mathematics-statistics	Investigating Variation
Meteorology	Winds and Weather
Rocketry and Space Science (moon)	What's Up

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EQUIPMENT ITEMS TO BE SUPPLIED LOCALLY - Generally not available in unit packages

Amount	Item
12	Aluminum pie plates
4	Bricks
4	Blocks, wooden, 2 x 4 x 12"
1 box	Bands, rubber
1 pkg.	Blades, razor
	Beans, Brown & white, dried
	Bags, sandwich
	Corks for test tubes
2 boxes	Clips, paper
1 box	Chalk, white & colored
60	Cups, paper
	Cups, styrofoam
	Cans, coffee
	Charcoal, crushed
	Cotton
	Coins
	Combs
	Clay
	Compass, drawing
	Cards, index 3 x 5, 5 x 7
	Cardboard, shirt
	Containers, planting
	Cigarettes
	Cloth, wool
	Detergent, liquid
	Droppers, medicine
	Envelopes
	File, metal
	Folders, Manila

Amount	Item
10	Glass, 2" x 2" squares
1 quart	Gravel
12	Hacksaw blades
	Ice, cubes and crushed
	Jars, baby food with lids
	Knife
	Light, fluorescent
	Masonite, 10" x 10"
	Matches, wooden
	Marshmallows
	Magnifiers, hand
	Milk, powdered
	Methylene blue
	Magnet, bar
	Maps, contour
	Microscopes
	Nail
	Needle
	Nuts
	Newspapers
	Onions
	Paper, colored white lined
	Pencils, colored
	Protractors
	Pins
	Pond water
	Potholders
	Plywood, 10" x 10"
	Pen, marking fine point
	Rulers

Amount	Item
	Scissors
	String
	Sinkers, lead
	Sandpaper
	Styrofoam
	Soil mixture
	Soil, potting
	Slides, microscope
	Slips, cover
6 gals.	Sand
	Tape, "scotch" 7 masking
	Towels, paper
	Thread
	Test tube racks
	Teaspoons, plastic
	Tanks, fish
	Tweezers
	Thumbtacks
	Water, distilled
	Wire, aluminum
	Wire coat hangers

CONSUMER SCIENCE

Ninth Grade I.S.C.S. Level III Supplement

by Andrew Gibson

1975

I. OBJECTIVES FOR STUDENTS

A. General Objectives - As a result of participating in this program of consumer science, a student will:

1. be aware that chemical compounds and elements form the ingredients of ingested materials
2. realize that some ingested compounds or elements may be hazardous to his health
3. by practical experience, realize that there are rather simple laboratory methods of detecting compounds and elements in foods and drugs and that scientists do have the ways and means of establishing tests for chemicals
4. understand the need for identifying hazardous chemicals and whether or not they are present in foods and drugs
5. understand the need for reading labels
6. recognize the importance of citizen participation and alertness toward legislative control of food and drug ingredients.

B. Specific Objectives - As a result of participating in this program of consumer science in ninth grade, a student will be able to:

1. identify and list ingredients from package labels
2. select at least three package label ingredients and categorize them as follows:
   a. Common name
   b. Chemical name
   c. List two elements that are included in each of the

three ingredients

d. Classify them as organic or inorganic compounds

3. identify from a group of prepared elements and compounds those which are lead and mercury

4. prepare a thin layer chromatography plate, develop it and point out location of identifiable spots

5. calculate R_f in chromatography

6. test for pH in samples, using test strips and comparing with standard color charts

7. identify the presence of a halogen in a compound using a flame test

8. identify the presence of particular ingredients in substances using simple standard chemical or physical tests

9. name one agency which is responsible to a degree for public safety and protection in food and/or drugs.

II. BASIC CONTENT

A. Package labeling - identification and familiarity with ingredients of foods and household chemicals

B. Chemical descriptions of ingredients

C. Organic vs. inorganic compounds

D. Simple and practical test and separations for some ingredients, detergents, metals. (Chromotography, pH, etc.) (Laboratory work).

E. Outline of determined effects of ingredients, detergents, metals, on population

III. LABORATORY EXERCISES

A. <u>Introduction</u> - Package Labeling

1. Two weeks prior to formal beginning of this course, students will be required to gather or collect with parental consent at least one ingredient label (or empty package) in each of these categories:

a. Pain reliever
b. Stimulant
c. Cold tablet
d. Laundry detergent
e. Beverage
f. Label indicating a food dye is present
g. Toothpaste
h. One food product, i.e. bread, cake mix, snack

2. Each student examines his household (or relative's or friend's) to possibly select such items as:
   a. Glazed or unglazed ceramic ware, cups, pottery etc.
   b. Empty milk, pet food cans
   c. Paint cans containing some paint (preferably early vintage
   d. "Unrinsed" dishes (include detergent name)

B. Chemical Descriptions of Ingredients

1. Labels are initialed and pooled together

2. Ingredient names are extracted from labels and listed under categories of part III. A.1

3. Research is conducted in class by students in small groups (3,4) to identify the ingredients as to:
   a. Common name
   b. Chemical name
   c. Molecular or Empirical Formula
   d. Element names
   e. Possible effects on animal and/or plant tissue, physiology

4. Research on ingredients is pooled and collated onto ditto masters to be duplicated and issued to students individually

C. Organic vs. Inorganic Compounds

1. Review by question and answer, worksheets, the chemical concepts pertaining to the items on duplicated sheets and as supposedly learned in eighth grade I.S.C.S. Level II curriculum. (This review is minimal and touches such concepts as atomic structure, Periodic table, simple bonding, functional groups, and differences between inorganic and organic compounds.) Practice learned concepts by categorizing listed compounds and elements as either organic (simple forms) or inorganic (table salt).

2. Make every attempt to collect pure sample of identifiable elements and compounds, i.e., lead, mercury, chloroform, salt, sodium nitrate, etc. Display, label and familiarize students by association with labels and ingredients previously collected.

D. Laboratory Experiences

1. Introductory lab practices

   a. Solubilities, pH, Functional Groups, Flame Test for Halogens and for Household Items

   b. Experiences with separation methods

      (1) Chromatography (thin layer)
         (a) Components of fluid in felt pens

      (2) Paper Chromatography
         (a) Components of dye solutions

2. Phosphates in detergents

   a. Colorimetric method - Consumer Science 507 (S.J.C.) Lab IV, Part II, Using Standard Color Comparer

   b. Simple phosphate ion test using sodium carbonate, filtering, nitric acid, and ammonium molybdate. Look for yellow precipitate. (PO_4)

3. Lead in cans and pottery

   a. Tests for lead in common household items

      (1) Pottery (2) Paint Chips (3) Canned Foods

4. Caffeine

   a. Caffeine content in over-the-counter-drugs. Caffeine Extraction - thin layer Chromatography

   b. Determination of caffeine in "coke"

5. Synthetic Colors

   a. Red #2, Lab III, Red #2, Synthetic Colors

6. Detergent Residues

   a. Detection with Methylene Blue

7. Mercury

   a. Determination of mercury in food products

      (1) Consult with Connecticut Agricultural Experiment Station in New Haven

8. Antacids

   a. Quantitative Analyses of Antacid Tablets - Chemistry, April 1972

9. Others To Be Considered

   a. Food tests (sugar, starch etc.)

   b. Qualitative determination of Pollutants in water samples - Refer to Lab-Aids Kit #19 - Student Worksheet and Guide. (Includes tests of pH, ammonia, nitrogen, chlorine, chromium, copper, cyanide, iron, nitrate nitrogen, phosphates, silica, sulfide).

CONSUMER SCIENCE

Lab I   Solubilities, pH, Functional Groups, Flame Tests for Halogens and for Household Items

INTRODUCTION:

This l [illegible] divided into five parts, each part concentrating on a certai[illegible]ect of various basic substances found in household cleaners, gasoline etc.

In the first part of this lab you will determine which substances are soluble in water, which are soluble in an acid, a base, and Naphtha Solvents. Also, in part I, as in all experiments, you should be observant - it is advisable in this section that you notice the appearance, the color and odor of the various chemicals. You may find similarities and/or differences which might be helpful. Also in part I, you will measure the pH of the dissolved solutions by using hydrogen paper.

In the second part of this experiment you will check the pH of ten common household items to determine if they are acidic or basic.

You will conduct, in the third part, a flame test for halogens in standard chemicals as well as in commercial cleaning fluids.

Finally, you will test small samples of standard chemicals and household products to determine their flamability.

MATERIALS:

Apparatus:

10 small test tubes
eye dropper
hydrogen paper
6-inch piece of copper wire
Bunsen burner
matches
tripod
clay triangle
crucible cover
burning splint

Chemicals:

- naptha solvent
- 6MNaOH
- 6MHCl
- methanol
- isopropyl alcohol
- iso-octane
- acetone
- propyl amine
- carbontetrachloride
- aniline
- castile soap
- distilled water

Household Items:

- milk
- coke
- vinegar
- lemon juice
- shampoo
- nail polish remover
- men's hair lotion
- orange juice
- corn oil
- dishwashing liquid
- various cleaning fluids and spot removers

WORDS YOU SHOULD KNOW:

solute solvent acid base soluble halogens pH

PROCEDURE:

Part I: Fill 8 test tubes with 5 ml. distilled water. To each of the test tubes add the certain substance and amount as described in the table below.

TABLE I

Test Tube	Solvent	Solute
1	5 ml H_2O	5 drops methyl alcohol
2	"	5 drops isopropyl alcohol
3	"	5 drops iso-octane
4	"	5 drops acetone
5	"	5 drops propyl amine
6	"	5 drops carbon tetrachloride
7	"	5 drops aniline
8	"	5-10 grains of castile soap

Now, swirl each test tube gentle for a few seconds.

Which substances are soluble in water?

Which are insoluble?

Check the pH of the soluble solutions by using hydrogen paper. Are there any similarities or differences among the tested solutions?

To the solutions that were insoluble in water, add one ml. of 6M NaOH. Are any of the solutions soluble in this basic solution? If so, check the pH of the solutions.

Are there any substances that still haven't dissolved in the solutions? If so, then go back to Table I and instead of using water as the solvent, use 6M HCl. Are any of the solutes soluble in HCl? If there are, then check the pH of the solution.

Again, do the experiment over again, this time using naphtha solvent as the solvent. Which are soluble? Which substances are not? Check the soluble solutions for their pH.

Finally, do the experiment using acetone as the solvent. Which substances are soluble? Which are not? Check the pH.

PART II. <u>pH of Household Items</u>

PROCEDURE: Into 10 test tubes add 2 ml. of the following liquids:

1 2 ml. of milk
2 " " coke
3 " " vinegar
4 " " lemonade or lemon juice (unsweetened)
5 " " shampoo
6 " " nail polish remover
7 " " hair lotion
8 " " orange juice
9 " " corn oil
10 " " dishwashing liquid

Using the hydrogen paper, test each sample to determine whether it is acidic, basic, or neutral. Which solutions are acidic? Which are basic? Which are neutral?

PART III. Flame Tests for Halogens

PROCEDURE: Cut about a six-inch piece of copper wire. Make a small loop at one end of the wire. Turn on the Bunsen burner. In order to clean off the wire loop, place it in the flame for a few seconds, or until the loop turns bright red.

Now, dip the loop into a cleaning fluid sample and place the loop in the flame. If a green flame appears, then a halogen is present. Keep the loop in the flame until it is bright red again, signifying that it is clean enough to dip into the next cleaning liquid without having a trace of the previous fluid on the loop. Continue this procedure for all the samples. If the cleaner is a solid, try and get a few particles to adhere to the loop. These should be enough to make a green flame if the halogen is present. Which fluids contain a halogen? Which do not?

PART IV. Flammability Test

PROCEDURE: Set up a tripod, clay triangle and a crucible cover, with the triangle resting on the tripod, and the crucible cover resting on the triangle. Place a few drops of isopropyl alcohol in the crucible cover. Burn a splint and carefully bring the splint near enough to the alcohol in the crucible to ignite it. Note if the substance is flammable and also observe the color of the flame.

After the flame has gone out from the substance, allow the crucible cover to cool for a few minutes and clean the cover off so as to use it for the next substance.

Follow the same procedure for the following substances:

iso-octane	aniline
methyl alcohol	HCl
acetone	NaOH
propyl amine	the cleaning fluids and spot removers
carbontetrachloride	

Lab II

PART I. Chromatography

Absorbent papers, such as paper towels, attract water to the extent that water will flow against the pull of gravity to wet the paper. If a spot of ordinary washable ink is placed in the path of the moving water, the ink will be miscible and move along with the water. However, some substances in the ink will move faster than others since they are more easily attracted by the water. Beads of color will develop on the absorbent paper as the ink mixture separates. This technique of separation is called PAPER CHROMATOGRAPHY.

In Part II you will use two types of chromatography techniques - paper chromatography, using cellulose filter paper as the absorbent, and also thin layer chromatography, which uses silica gel, a thin layer of absorbent, on a plastic strip. You will use these techniques to determine the constituent colored dyes in the ink in flair pens and ball point. You will also be given solutions which are a mixture of several dyes. By using the chromatographic methods, you will also be able to separate the various colors.

PART II. Thin Layer and Paper Chromatography

Place a piece of filter paper on a watch glass. In the center of the paper add a drop of one of any several dyes. Allow the drop to dry. Now add a few drops of methanol, and observe what happens. Allow this to dry. Next add a few drops of 6M NaOH. What happens? Allow this to dry, and finally add one or two drops of concentrated HCl. Was there any result? What colors were present in the dye? This type of separation method is called paper chromatography.

For thin layer chromatography, use a chromatography chamber and silica gel chromatography strips, methanol as the solvent and various colored dyes. Put a small drop of dye, or a spot of ink from a pen or flair pen about ½ " from the end of a chromatography strip.

Place the strip, ink end down, in the chromatography chamber, which contains about one-eighth to one-quarter of an inch of methanol in the bottom. Allow for the methanol to travel to within one-quarter of an inch from the top of the strip. Then remove the strip from the chamber and let it dry. What colors are present in the dye or ink?

APPENDIX: Standard Tincture of Iodine Solution

Into a 100 ml. volumetric flask add 2 g. Iodine (I_3-) and 2.4 g. sodium iodide (or 2.4 g. potassium iodide can be used). Add 46 ml. of ethyl alcohol (ethanol) and dilute to 100 ml. distilled or de-ionized water. Mix thoroughly.

CONSUMER SCIENCE

Tests for Lead in Common Household Items

Reagents Needed: vinegar (or 4% acetic acid)
potassium dichromate solution, 5% (5 g./100 ml.)
soluble ammonium sulfide reagent
standard lead solutions (1000, 100, 10, 1 ppm.)

I. Glazed Coffee Mugs or Pottery

To see if glazed pottery is safe for use with food or beverages, soak it overnight (or for several hours) in vinegar. Vinegar is a dilute solution of acetic acid and will leach out the lead, usually in proportion to the time it stands in contact.

PROCEDURE:

1. Use a graduated cylinder to measure out 10 ml. of the vinegar you brought from home. Pour the 10 ml. of vinegar into a test tube.

2. Measure out 1.0 ml. of 5% potassium dichromate and add it to the vinegar in the test tube. Place your thumb over the test tube mouth and shake test tube gently a few times. Look for a yellow precipitate in the vinegar.

3. Take your test tube to the desk where you will find four test tubes containing standard color samples of precipitate. Compare your test tube of vinegar to each of the standards to tell the rough amount of lead possibly found in your sample.

QUESTIONS:

1. Did yellow precipitate form in your vinegar sample from home?_____

2. If so, what do you estimate to be the concentration of lead in your sample after comparison with the standards(in parts per million-ppm)?______________

3. What was the item from or at home which you used to take your vinegar sample? ______________________________

II. ADDITIONAL: Try this section of lab if soluble ammonium sulfide reagent is available - ask your teacher.

1. As a check on the presence of lead in your vinegar sample, measure out 10 ml. of the vinegar sample from home as you did in PROCEDURE 1 above. Add to test tube.

2. Add a few drops of ammonium sulfide solution to the vinegar in the test tube. Look for a darkening of the solution in the test tube. If a darkening does occur, it may indicate the presence of lead in the amount of less than 1.0 parts per million.

3. Write down here the results of ADDITIONAL test for lead:

____

III. Tests for Lead in Paint Chips

Paint chips are scraped carefully with a razor blade to remove from supporting material. Place a small chip on a watch glass. Add a drop or two of ammonium sulfide solution. Look for a darkening of the chip. If the darkening appears only at the edges, the chip may need to be ground more finely to be certain.

TITLE: CAFFEIN EXTRACTION

INTRODUCTION: Caffeine, what it does. Caffeine exerts four important actions on the body. Caffeine is a very potent central nervous system stimulant, with influence occurring upon the cerebrum. It affects the quality and duration of sleep, and improves muscular and mental activity. The capability f[illegible]longed work is increased and the recovery rate from exhaustive [illegible] lessened. It is believed that caffeine stimulates the s[illegible]n of acetylcholine, a chemical secreted at the synaptic junctions when nerve impulses are being transmitted.

Since it is a stimulant, dependence on caffeine can result from habitual use. Withdrawal symptoms, such as restlessness and headaches can develop when deprived of caffeine containing products. In excess, caffeine can cause over-excitability, insomnia, and tremors. One gram of caffeine can yield mental confusion, shivering, rapid heart beat, vomiting and diarrhea. Ten grams of caffeine can be fatal.

Caffeine exerts a diuretic effect upon the kidney. There is a marked increase in the quantity of urine, most of it resulting from retarded absorption of water in the kidney tubules. Medically, caffeine is used to stimulate kidneys when they are not functioning normally.

Use of caffeine results in a stimulating action on the striated muscles. It increases the irritability and contractibility of voluntary muscles, and augments the amount of work which can be performed before occurrence of fatigue.

Caffeine also influences the cardiovascular system. Medically, caffeine is used as a heart stimulant in certain disorders. After moderate doses, the blood pressure is increased slightly (about 10 mm. of mercury). It increases the amplitude of cardiac contraction, which increases the rapidity through which blood flows through the coronary artery and accelerates the pulse.

Caffeine in the body has many other effects. It stimulates the production of pepsin and free hydrochloric acid in the gastric juices. It elevates the serum cholesterol level, which can be a promoter of heart disease. It increases the amount of blood sugar, especially in diabetics. Caffeine also stimulates the release of certain fever producing hormones which keep up the body heat. This poses the question as to why caffeine is used in several aspirin compounds, since caffeine raises fever and blocks the cooling properties of aspirin.

Caffeine is found naturally in plants such as tea, coffee and cola nuts. It is also incorporated in many products such as pain relievers, stimulants, diet pills and cold tablets.

EXPERIMENTAL

Apparatus:

mortar and pestle	2 silica gel strips
test tube	developing chamber
pipette	centrifuge
cork	

Solvents:

concentrated ammonia
chloroform
developing solvent (1:1 acetone/chloroform)

PROCEDURE:

Choose one of the several tablets to be the brand that you wi[ll] analyze. Grind the tablet to a fine powder. Place the powder in the test tube and add 3 ml. of concentrated ammonia. Stopper the test tube with the cork and shake the test tube until the solution is thoroughly mixed. Add one ml. of chloroform and mix the solution again. Allow the mixture to stand for a few seconds or until solutions begin to separate. Place the test tube in the centrifuge and let the centrifuge run for about a minute. Using a pipette, extract some of the lower layer of the solution in the test tube and spot the silica gel strip with about one drop of this solution. Now place the chromatography strip into the developing chamber and allow the strip to develop. When the solvent has reached about 1/2" from the top of the developing strip, remove it from the developing chamber. There will not be any visible colors on the strip. Therefore, place the strip in an iodine chamber and wait a few minutes. You will see distinct spots. Remove the strip from this developing chamber and outline the spots with a pencil. Calculate the Rf values for the spot or spots that you have on the strip.

Rf values for certain compounds present in most analgesic drugs

Caffeine	.5
Propoxyphene	.3
Aspirin	.5
Phenacetin	.7-.8

PART II. Antacids

Choose three of the antacids provided by the teacher. Using pH paper, check the pH of the compounds and record the results.

THIN LAYER CHROMATOGRAPHY OF RED #2

Red #2 - A Synthetic Color

FD & C Red No. 2, or amarynth, is a coal tar dye, one of many colors derived from coal. Coal, when heated in the absence of air, is converted to coke, coal gas and coal tar. The coal tar, a viscous black liquid, is a mixture of organic compounds out of which many brilliant synthetic colors can be derived.

Red #2 was one of the seven original coal tar dyes accepted in 1906 and was one of the few azo coal tar dyes which had universal acceptance in the countries where food colors were permitted. Until recently, it was on the GRAS list and is found also in sherbet, dairy products and cereals. It is often blended with other dyes and even may be used to give an exact shading to white icing. An FDA official said, "FD & C Red #2 is so ubiquitous that if every food with Red #2 self-destructed tomorrow, a lot of people would starve."

Red #2 was delisted from the GRAS list in 1972 because of studies indicating cancer, birth defects, and fetal deaths in laboratory animals, but it has not been banned or even restricted, except tokenly.

Red #2 had been tested in the past for carcinogenic effects,with negative results. However, in 1970, a Russian study found tumors in 13 of 50 male rats that had been fed a diet high in Red #2, but the study was questioned because the control group did not show any tumors, a condition that suggests the study was not valid since tumors are common in colonies of aging rats. The FDA is conducting more carcinogenic tests, tests which expect to be completed in 1974.

Another 1970 Russian test examined the effects of Red #2 on reproduction. Female albino rats which were fed low levels of Red #2 for 12 to 14 months, showed a reduction in fertility and an increase in stillbirths and deformed fetuses. The number of rats in each group was very small, so the FDA does not think the study was statistically valid.

Though the FDA did not accept the study as valid, it did spur them on to do their own reproduction studies, studies that had never been done before. Three studies were undertaken. A long term multi-generation study has not been completed. A chick embryo test showed high death rates and deformed embryos when Red #2 was injected into the eggs, but the impact of the test in terms of human reproduction is still a subject of controversy. The third study showed that pregnant rats experience a higher incidence of fetal deaths when fed Red #2 than identical rats getting no Red #2. The rats were fed the Red #2 from conception until the 19th day of gestation, at which time they were sacrificed. The feeding was administered through a stomach tube, a method called gavage, which is thought to closely approximate human consumption of beverages.

A dosage of 7.5 mg. per kilogram body weight was found to be the no-effect dosage level, the level at which no toxic effects were noted. By applying the hundredfold safety factor, the FDA scientists recommended a maximum daily intake of 0.075 mg. of Red #2 per kilogram of body weight or about 4.5 mg. for a 132 pound human. (A single can of cherry soda contains as much as 62 mg. Red #2.)

The FDA did not take their own scientists' advice. Data disputing the FDA's findings were received soon after from industry-sponsored studies and from research done under contract to the FDA. Consumers Union reviewed these negative findings and came to the conclusion that some of the test did show a reoccurring pattern of early fetal deaths. In addition, administration of the dye was begun on the 6th day of gestation in these tests, rather than on conception as in the FDA study. Therefore, the Consumers Union group felt that if these tests had started administering Red #2 at the onset of gestation, their results might have shown a clearer pattern of fetal deaths.

Because of these negative findings, the FDA revised their limits upward to a maximum of 1.5 mg. per kilogram of body weight per day, a limit twenty times their scientists' recommendations and hardly a ban at all.