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OVERVIEW

by GOH SOO TIAN and YEE SZE ONN

A total of 16 abstracts are featured in this issue of REACT, concerned with two themes, namely, (1) Teaching Reading, and (2) the Use of Field Trips in Teaching. The first eight abstracts draw attention to some of the factors that link reading proficiency, reading strategies or the effectiveness of reading programmes to pupils' literacy and reading achievement in school. In the remaining eight abstracts the educational effects of the use of field work on the learning of different school subjects are identified. Additionally, in this issue, as in the previous four issues, we include a colourful broadsheet featuring some key findings in snippet form from research studies not abstracted here. We hope you will find them interesting and thought-provoking, but there is a cautionary note - the findings as stated should not be overgeneralised.

STUDIES IN TEACHING READING

The Teaching of Reading is a very active area in educational research. This is mainly due, no doubt, to the realisation that reading proficiency directly influences literacy and learning in school. Generally speaking, a reading researcher can focus on one of several sets of factors categorized under teachers, learners, methods and the reading programme as a whole. Of the eight studies on Teaching Reading in this issue, two are on methods or approaches, four examine learners' strategies in processing texts as well as their perception of the function of reading, and two take a more global look at reading programmes tried out in primary schools in Singapore and Fiji respectively.

How best can reading be taught in the classroom? Currently, there is much interest in the direct teaching of reading comprehension in which the teacher explicitly explains and models the strategies students should apply in reading. Duffy's study shows that teachers who use the direct teaching approach seem to produce better results. In Sheldon's study, direct teaching takes the form of showing pupils how to reorganise the information contained in a reading passage in a diagrammatic or graphic form.

Understanding how readers, especially primary level pupils, process reading materials presents another challenge to researchers. Beardsly's study examines how young readers use different types of context clues to determine the meaning of unfamiliar words encountered in reading. Whaley looks at how children's knowledge of the overall structure of narrative helps them in their comprehension and recall of stories they have read. Sulzby studies kindergarten children's emergent perceptions of storybook reading and how their experience of books often begins before formal instruction in reading. Parker's study is also concerned with children's perceptions of reading, in particular, the functions of reading and how these perceptions influence the types of reading they do.

The two remaining studies take a more global look at reading programmes. The study of Ng Seok Moi and her team compares the relative effectiveness of the integrated Reading and English Acquisition Programme

(REAP) with the traditional (non-REAP) programme in Singapore schools. Similarly, the study by Elley and Mangubhai compares pupils' reading achievement in Fijian schools using the 'Book Flood' programme and those using the traditional reading programme.

STUDIES IN THE USE OF FIELD WORK IN TEACHING

Teachers have often been urged to conduct for their pupils field trips to museums, the zoological garden, nature reserves and other learning centres in the belief that such experiences are of educational value. However, relatively little is known about their educational effects upon learners. The questions abound. Do students learn on field trips? If so, what do they learn and how do they learn? What are the factors that influence how much and what they learn? Can field trips be justified? The findings of research as reported in the relevant abstracts enclosed suggest that field trips have an important role to play in learning and that children do benefit from field trips.

In their study of the effects of novel settings on the learning behaviour of children on field trips, Falk and Balling found that fifth-grade children who went on a field trip performed better than those who did not but third-grade children who had their lessons in a school setting performed better than those who went on a field trip. Wright investigating the effects of multi-sensory teaching methods in a museum found that they contributed to a much better comprehension and application of knowledge and concepts learnt compared with a classroom revision of the same information.

Similar positive effects were observed in the learning of science subjects. For instance, the effects of teaching biology in two contrasting situations were investigated by Chrouser who found that a course which emphasized outdoor experiences was more effective than a course conducted indoors in helping students achieve understanding of scientific processes and principles. A study by Bat-Sheva Eylon and Avi Hofstein found that students made significant gains in scientific skills and scientific ability in an extra-curricular science course held outside school.

Equally positive results, arising from the use of field trips, were also observed in subjects like history and geography. In history, for example, Pond found that students were able to reconstruct the past and empathise with people of a different age on a field trip. Mackinley's findings support the view that field experiences help pupils develop rational explanations and better understand such concepts as continuity and change.

Finally, the research of Mackenzie and White showed that well-designed geographical field trips can lead to new learning and reinforce what has been learnt in the classroom. The information acquired on a field trip is probably remembered for a long time.

ENDNOTE

As you read each abstract, you may find that the richness of detail is somewhat lost in the attempt to be concise. This is unavoidable. You are therefore encouraged to read the original articles, reports or papers, all of which are deposited in the IE Library.

THE EFFECTS OF FIELDWORK ON LEARNING AND RETENTION OF GEOGRAPHICAL FACTS AND SKILLS

by A A MACKENZIE and R T WHITE

Abstract by Yee Sze Onn

INTRODUCTION

Though the use of fieldwork in teaching has frequently been emphasized yet little is known about its educational value and effects on learning.

WHAT WAS THE PURPOSE OF THE STUDY?

R.M. Gagne and R.T. White, two well-known psychologists, postulate that new knowledge and skills are retained better if they are linked with events or episodes that are readily recalled. Well-conducted fieldwork should provide students with clear episodes and therefore improve retention of knowledge and skills learnt. Two Australian researchers, Andrew Mackenzie and Richard White, examine the effects of fieldwork on secondary students' retention of geographical knowledge and skills.

HOW WAS THE STUDY DONE?

To help students learn 35 objectives about coastal landforms and plants, programmed instructional materials supplemented with 60 slides of geographical features were first used but there were no follow-up activities to the course for one-third of the students or the control group as they were called.

The other two-thirds were taken on a field trip to a coastal area. One-half of this group, called the traditional group, did not participate actively in the field trip. At each site, the teacher directed students' attention to what they were to observe and asked each student to verify what they heard by checking off the information against a field guide. No recording was done.

In contrast the second or the active group were involved in a number of activities. They were continually asked to observe, sketch, record and answer questions. In addition they participated in unusual experiences that explicitly linked what they saw and did with principles of geography. For instance, to estimate the salinity of mangroves participants were required to taste the foliage.

Although students in the traditional group spent the same amount of time at the study site and observed the same things, they were not asked to perform as many physical and mental activities.

An achievement test was administered to each of the three groups immediately following their instructional experiences. A few months later a retention test was administered to all students. A multiple choice test was also given to assess how well those who participated in the unusual learning events were able to apply the information they had gained.

WHAT WERE THE FINDINGS OF THE STUDY?

The results of the tests showed that students who participated actively learned more of the 35 objectives on the first test. They scored 33.1 while the traditional group averaged 29.2 and the non-participating group scored only 26.3. There were also significant differences in the test of retention. The active group achieved scores of 29.7 while the traditional group obtained a low of 17.2. The control group retained the fewest facts (with a score of 13.5). These data show that of the three groups, the active group retained the largest amount of information.

The active group also performed well in the 'unusual episodes' test. They answered 60 per cent of the questions correctly. Thus students who had direct experience of unusually vivid events not only remembered the principles illustrated in the episode but also had better retention of new knowledge gained. It is therefore apparent that the novelty and uniqueness of the episodes resulted in greater long term retention of information.

WHAT ARE THE IMPLICATIONS FOR TEACHING?

The findings of Mackenzie and White show that well - designed fieldwork can lead to new learning and reinforce what has been learned in the classroom and aid in the retention of related factual knowledge and skills. The same study has also shown that active involvement in field activities leads to better recall.

In planning and conducting fieldwork teachers should bear in mind the importance of providing novel experiences and organizing new information in such a way that it is linked with knowledge previously learnt.

This abstract is based on the article by A.A. Mackenzie and R.T. White entitled "Fieldwork in Geography and Long-Term Memory Structures" in American Educational Research Journal. 1982, 19(4): 623-663. The journal is available in the IE Library.

THE EFFECTS OF FIELD SETTINGS ON THE LEARNING AND BEHAVIOUR OF CHILDREN

by JOHN H FALK and JOHN D BALLING

Abstract by Maureen Ng

PURPOSE OF THE STUDY

A field trip to a given location may have varying effects on children of different ages. Falk and Balling believe that the novelty of the field setting influences learning and behaviour in children during field trips. (Field setting refers to the environmental context of the field location.) This study examined how the novelty of the field location affected learning in children of different ages.

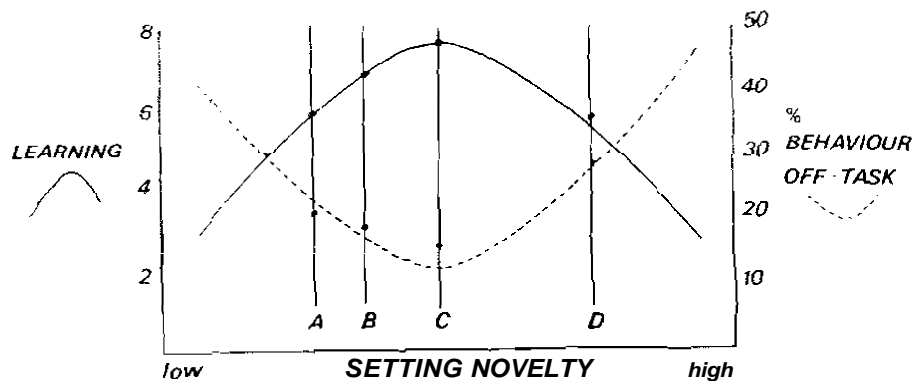
HOW THE STUDY WAS DONE

196 third and fifth (primary two and five) grade children were randomly assigned to two treatments. Half of the group went on an all-day field trip to a nature reserve for a lesson on trees; the other half were taught the same lesson outside their school classroom. A pre-test and a post-test were administered to assess learning and the students' attitudes towards the field trip. The students' behaviour during the activities was also observed.

THE FINDINGS

- Cognitive Learning - The third grade children who had the lesson in the school setting performed better than their counterparts who went on the field trip. In contrast, the fifth grade children who went on the field trip showed superior performance. Location effects thus varied with the developmental level of the children.
- Behavioural Effects - The third grade children in the school location exhibited significantly more task-related behaviour than their counterparts at the nature reserve. Among the fifth grade children, the reverse was observed. On-task behaviour was positively related to learning.
- Affective Effects - All the children liked having field trips. When asked to choose between a field trip or an activity in the school for the lesson on trees, 82% of the children expressed a preference for a field trip.

A Model of Learning & Off-Task Behaviour and Setting Novelty



(Source: Falk and Balling)

The model shows the children's learning and off-task behaviour as inverse functions, both of which are influenced by the setting novelty.

- Point C represents the fifth grade group who had found the field setting optimally novel. They exhibited low off-task behaviour and high learning.
- Point A represents the fifth grade group in the school location. They showed relatively more off-task behaviour and lower learning than the previous group.
- Point B represents the third grade group in the school location. They were more on-task and showed higher learning than their counterparts in the novel setting.
- Point D represents the third grade group in the novel setting who exhibited a 'novel field trip effect'. Higher levels of off-task behaviour and lower learning were observed in this group.

IMPLICATIONS FOR TEACHERS

- Teachers should select field locations with care. Novel settings may be conducive for older students. For younger students, shorter trips to locations that are not highly novel may be more conducive to learning.
- As off-task behaviour affects learning negatively, teachers should discourage such behaviour during field trips. Students should not engage in field exploration that is unrelated to the learning activity planned by the teacher.

This abstract is based on the article by John H. Falk and John O. Balling "The Field Trip Milieu: Learning and Behavior as a Function of Contextual Events", in the Journal of Educational Research, 1982, 76(1): 22-28. This journal is available in the IE Library.

TEACHER EFFECT ON ACHIEVEMENT IN READING COMPREHENSION

by GERALD OUFFY and LAURA R ROEHLER

Abstract by Goh Soo Tian

WHY WAS THE STUDY DONE?

The traditional approach to reading skills instruction is familiar to most teachers. The reading skills (**e.g.** reading for the **main** idea, reading for details, **etc**) are usually taught separately and students learn each **skill** as a set of rules to be followed and then do exercises on each skill based on short passages. Research in cognitive science, however, has shown that when learners are aware of what they are doing in a particular skill or task and know why and when they apply which skill, their learning will be more effective. The difference between the two approaches, when applied to reading comprehension instruction, lies in presenting the reading skills not as a 'bag of tricks' to be used mechanically but a strategy or plan which the student is to apply consciously and adaptively to overcome meaning blockages and other difficulties they encounter in their reading.

HOW WAS THE STUDY DONE?

Sample : Twenty-two 5th-grade reading teachers of an urban district in the American mid-West were selected. The students they taught were in the low reading group, that is, they were reading 1 - 3 grades below their grade level.

The Experiment: The 22 classes were divided equally into treatment and control groups. The 11 teachers taking the treatment groups were given ten hours of training on how to incorporate explicit explanation of how reading skills can be used as strategies. Specifically, they were taught how to organize their instructional talk into a 5-step lesson format: introduction, **modelling**, guided interaction, practice and application. Each teacher was observed five times, at roughly one-month intervals. The degree of explicitness of the teacher's explanation of reading skills was obtained by a trained observer using a rating scale. To assess students' awareness of the reading skill taught, a sample of students was interviewed by the observer after each observation.

To measure the students' reading gain, standardised reading comprehension pre-test and post-test were administered at the beginning and the end of the six months taken to carry out the experiment.

WHAT WERE THE MAIN FINDINGS?

1. Teachers of the treatment group were rated higher in their explicit explanation of the reading strategies than their control group counterparts.
2. Students in the treatment group showed greater awareness of the reading strategies than their counterparts in the control group.
3. There was no significant difference between the reading achievement of the treatment and control groups on the post-test.

WHAT ARE SOME OF THE IMPLICATIONS FOR TEACHERS?

- Training does make a difference in the explicitness of a reading teacher's explanation of the skills to be applied as strategies.
- More explicit explanation by the teacher does result in greater awareness of the reading strategies on the part of the students.
- Teachers should encourage students to apply the skills strategically to overcome reading problems and not just perform each skill mechanically.
- Reading gain in terms of higher scores should not be taken as the only measure of teacher effectiveness. Students' gains in awareness of reading strategies or confidence, for example, are also valid indicators of improvement.

This is an abstract of "The relationship between explicit verbal explanations during reading skill instruction and student awareness and achievement: A study of reading teacher effects" by Gerald G Duffy and Laura R Roehler in Reading Research Quarterly, 1986, 31(3): 237-252. The journal is available in the IE Library.

COMPARISON OF TWO TEACHING METHODS FOR READING COMPREHENSION

by SUSAN A SHELDON

Abstract by R B Somerville-Ryan

WHY WAS THE STUDY DONE?

This study compares two methods of teaching reading comprehension. The first, or 'control', was a more traditional approach where pupils were given a reading passage followed by a set of multiple-choice comprehension questions. The second approach, the 'experimental' approach in this study, used visuals instead of questions to consolidate and focus attention on the ideas in the reading material. The experimental approach was based on the notion of 'modelling' which suggests that whenever we read we translate and organize the information into forms which suit our own interests or purposes. The research wanted to discover **whether** giving pupils experience of 'restructuring' a text using diagrams would be more effective as a teaching technique than a multiple-choice question worksheet approach.

HOW WAS THE STUDY DONE?

Sample : Two classes of eight and nine-year old pupils from two schools (about 130 pupils) were selected. The pupils were matched for reading ability, non-verbal ability, and by a **non-verbal** intelligence task. An experimental and a control group were formed within each school.

The experiment : The researcher used a reading comprehension laboratory kit, and specially prepared supplementary low-level materials for slower pupils. These provided a range of content and readability levels and the set of multiple-choice questions for the control groups. The experimental groups used the same reading passages, but the researcher designed diagram worksheets to replace the multiple-choice question exercises. Both control and experimental materials were presented in folders, and were used by pupils during two half-hour "Extra Reading" sessions per week over an eight-week period.

At the end of that time the researcher gave a series of tests. They included a test compiled from four standardised reading tests, and one unmodified standardised test. The compiled test used three different types of techniques, so that pupils had one 'type' which matched the teaching programme they had followed in the experiment:

a) passages with multiple-choice questions;

3. Compared to children in non-REAP classes, children in REAP classes appeared to be showing greater growth in language development. They were better able to self-correct, and they performed better at comprehension and at re-telling a story.
4. In writing, REAP children produced more ideas and sentences, more correct words and sentences, and used a wider range of syntactic structures.

WHAT ARE THE IMPLICATIONS FOR TEACHERS?

1. Teachers using REAP in lower primary can look forward to language teaching that is much more communicative in nature, and therefore more meaningful for both teachers and pupils.
2. REAP children are being exposed to language activities and the richness of language in books that will teach them more language in a shorter time.
3. Children who enjoy learning language and reading will develop positive attitudes to such activities.
4. Positive teacher feedback on the efficacy of the REAP method of teacher-training may have important implications for future in-service teacher-training programmes.

PRE-REAP



REAP : CLOSE-BASED MONITORING



This is an abstract of "Implementation of an English Language Programme for Young Singapore Children" by Ng Seok Moi and Olivia Soh in Future Directions in English Language Teacher Education, Hong Kong, 1986, pp 148-160. A copy of the paper is in the IFL Library,

A BOOK FLOOD FOR LANGUAGE LEARNING

"Surround children with mountains of interesting books and they'll learn quickly"

by WAKMCK B ELLEY and FRANCIS MANGUBHAI

Abstract by Pauline Steele



WHY WAS THE STUDY DONE?

How does extensive reading of high interest books compare with a structured English language programme which puts little emphasis on reading? This well-known study carried out in Fiji in 1980-1982 still merits study by Singapore teachers as more and more schools are involved in REAP, ACT, and Extensive reading programmes.

Elley and Mangubhai in their introduction to the study highlight critical differences between L1 and L2 learning in contexts where the language of the school is not the language of the home, and suggest that book-flood methods significantly reduce the differences between L1 and L2 learning, by offering stronger motivation, more exposure to excellent language models, and contextualisation through the use of illustrations.

HOW WAS THE PROJECT CARRIED OUT?

The study involved six Fijian and six Indian rural primary schools situated in areas where English is the language of the school after Class 3 (8-year-olds). Pupils in Classes 4 and 5 after sitting pre-tests, were randomly assigned to one of three groups, each of which was taught by a different method:

- Shared Book Experience - which involves the teacher reading a picture book aloud to her pupils, asking them questions involving prediction and discussion of the illustrations, along with follow-up activities such as individual reading of the text, role-play, word study, art work, and writing.

ALL STUDENTS HAD ACCESS TO THE BOOK FLOOD - A COLLECTION OF HIGH-INTEREST BOOKS IN THE CLASSROOM FROM WHICH THE SHARED BOOKS WERE CHOSEN.

- Sustained Silent Reading - teachers of these groups were advised to display the BOOK FLOOD COLLECTION attractively, read them aloud regularly, and to allow their pupils to read them silently for 20-30 minutes each day.
- Control groups followed their normal programme using the traditional Tate Oral English Syllabus. NO BOOK FLOOD COLLECTION WAS AVAILABLE TO THESE GROUPS.

WHAT WERE THE RESULTS?

1. Post-tests showed marked gains in Reading Comprehension scores by the first two experimental groups which were using Book Flood methods as compared to the Control groups which were using the normal structurally-based **programme**.
2. A follow-up study in 1981 showed that these pupils maintained their gains, and scored well above the typical performance of rural schools in their Fijian Intermediate Examinations.

WHAT ARE THE IMPLICATIONS FOR SINGAPORE TEACHERS?

- Reading high interest books is very beneficial educationally.
- Language activities based on shared reading of high interest picture books increase the language gains.
- Individually chosen books can be used as the basis for teaching language skills.
- **SSR** (Sustained Silent Reading) should be part of the daily routine in the language classroom.

Singapore students certainly deserve a richer diet of reading in their language programmes, and as REAP, ACT, and the Extensive Reading **programme** gain momentum, the situation is showing rapid improvement.

The main question remaining is whether SSR should move into the language teaching classroom **as** an integral part of the programme. The evidence presented in this paper suggests that **it** should.

USING MULTISENSORY TEACHING METHODS FOR GREATER SUCCESS IN LEARNING

by EMMETT WRIGHT

Abstract by Mrs Ruth Chellappah

INTROOUCTION

Psychologists advocate that hands-on experiences using the various senses form the basis of effective learning. This is especially so for primary school children who are at the concrete operational stage of development.

PURPOSE OF STUDY

This study set out to examine the belief that the greater the sensory involvement with hands-on experiences, the greater the success in learning and applying those concepts. The effect of learning through multisensory hands-on experiences at a Health Museum was compared with a classroom revision of the same information on human biology.

HOW THIS STUDY WAS CARRIED OUT

Six classes of sixth graders were chosen and its pupils randomly assigned to a control group (C) and an experimental group (E). Both groups were pretested for their mental ability and science knowledge. Analysis of the pretest scores showed that both groups were comparable in intelligence and achievement. They were also given a pretest based on the content of the unit of human biology that was to be taught in the study.

The teachers were randomly assigned to each class, and were not allowed to discuss the tests nor test scores with their pupils. Both groups received 15 hours of instruction in school for 5 weeks. The teachers used conventional chalkboard and two-dimensional visual aids such as charts.

In the 6th week, the C group teachers spent 3 extra hours reviewing the lessons in the classrooms. The E group, on the other hand, visited the Health Museum for 3 hours of instruction. Here, museum instructors reviewed those aspects of human biology that they had learnt, using mechanised life size human models, permanent museum exhibits and films. The students were given time to browse around by themselves.

Thus both groups had a total of 18 hours of instruction, of which only the last 3 hours of revision differed in method of presentation. Both groups were then given the posttest.

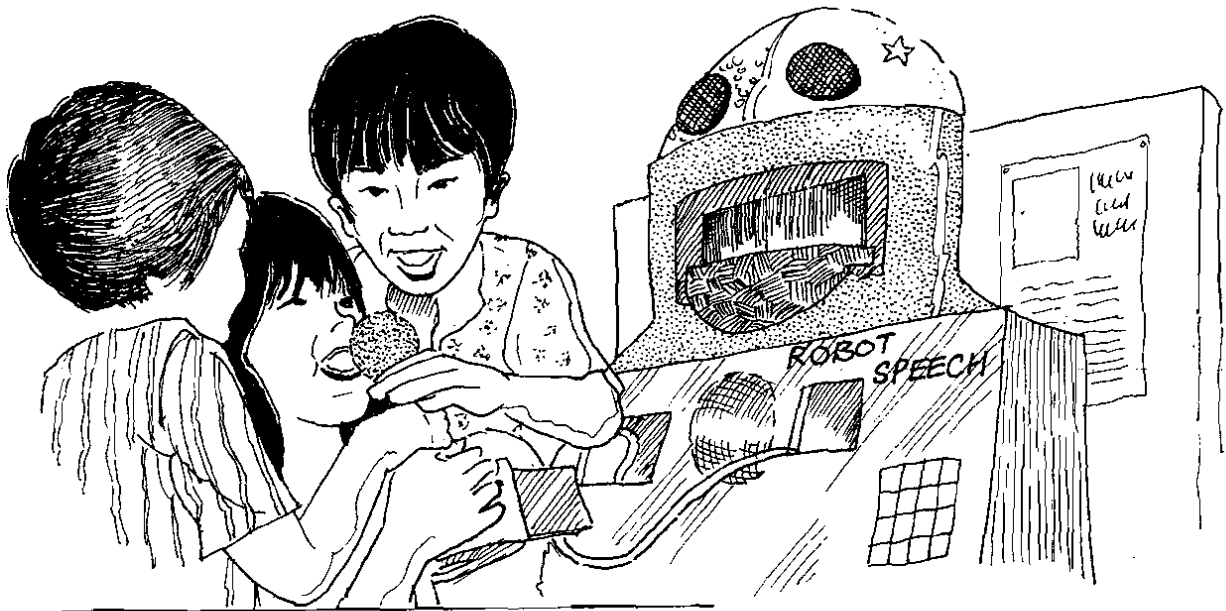
WHAT THE RESULTS SHOWED

The results of the posttest showed that with this sample of 12-year-olds from Kansas State, USA (who were of comparable mental ability and had similar past achievement scores), the multisensory hands-on experiences provided by the museum to review the lessons taught in school contributed to a much better comprehension and application of knowledge and concepts learnt.

IMPLICATIONS FOR TEACHERS

This study validates the learning theories of Piaget and others. Thus teachers should provide their pupils, especially in primary schools, with as much hands-on experience as possible. Enrichment activities should include practical laboratory activities both indoors and outdoors, with the use of a variety of AVA-like three-dimensional models and films.

These results have been generalised from a study of a sample from one school system visiting a particular museum in the USA. It would be interesting to replicate the study in Singapore. Other factors that need to be taken into consideration are the ability of the school teachers to stimulate interest and achievement, as well as the possible differential effect of museum instructors on the C group.



This abstract is based on an article entitled "Analysis of the Effect of a Museum Experience on the Biology Achievement of Sixth-Graders" in the Journal of Research in Science Teaching, 1980, 17(2): 99-104. This journal is available in the IE Library.

ENRICHMENT ACTIVITIES ENHANCE SCIENCE INTEREST AND SCIENCE ACHIEVEMENT

by LAM-KAN KIM SMEE

Abstract by Wan Yoke Kum

WHY WAS THE STUDY DONE?

In Singapore the recent curricular changes in science emphasize the importance of making science learning meaningful and relevant in our technological society. Such an objective would be difficult to achieve from lessons taught in school alone. Hence, it has been advocated that teachers should conduct science enrichment activities to complement formal lessons. This study was designed to investigate whether science enrichment activities could enhance interest and improve achievement in science.

HOW WAS THE STUDY DONE?

- Five secondary two classes (Express stream) of comparable academic science ability from one school were identified for the study. Each of these classes was randomly assigned to two experimental and two control groups and one Hawthorne control group.
- Before the study began, one experimental, one control and the Hawthorne control group were pre-tested to ascertain their comparability in science interest and acquisition of science concepts.
- " The five groups had the same science teacher and received the same instruction for their science lessons in school during the study which lasted for five weeks.
- Enrichment activities complementing the science topics taught during the study period were given to the two experimental and the Hawthorne control groups at the Singapore Science Centre. For the control groups, the activities were totally unrelated to their science lessons.
- After the completion of the treatment, all groups were given:
 - * Post-tests to assess their interest in science and acquisition of science concepts.
 - * An examination to assess achievement in science.
 - * Opinionnaires to collect students' views (excluding those of the two control groups) on the enrichment activities and their science lessons.

WHAT WERE THE MAIN FINDINGS?

The two experimental groups showed significantly ($p < 0.01$) more interest in science and made significantly ($p < 0.01$) greater improvement in their science concept attainment and science achievement as compared to the control groups.

- Over 90% of the students in the experimental groups found the activities helpful in promoting their science interest whereas over 80% in the control groups indicated that their science interest had not changed over the period of the study.
- Correlations between the scores of science interest, concept attainment and achievement were high.

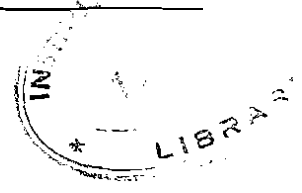
SOME IMPLICATIONS FOR TEACHERS

- The provision of enrichment activities meaningfully related to science instruction can improve students' interest in science, their acquisition of science concepts and achievement.
- The effectiveness of enrichment activities in providing worthwhile learning experiences largely depends on teachers' effort in careful and intentional planning, setting specific objectives and adequate supervision.
- Students' interest in science is strongly related to concept attainment and science achievement. "Interest-building" should be incorporated into science instruction to nurture and sustain students' interest in learning.
- Teachers should make use of out-of-school resources such as the Singapore Science Centre and the Singapore Zoological Gardens, which support and extend school science learning to complement the school curriculum.

This is an abstract of Ms Lam-Kan Kim Swee's M.Ed. dissertation [National University of Singapore) entitled "The Contributions of Enrichment Activities Towards Science Interest and Science Achievement" (1985). A copy of the dissertation is in the IE Library.

COMPARING AN OUTDOOR COURSE WITH AN INDOOR LABORATORY COURSE FOR PRIMARY TEACHERS

by WILLIAM H CHKOUSER



Abstract by Mrs Ruth Chellappah

INTRODUCTION

William Chrouser felt that the survival of the individual and society depended on man's complete observation, understanding and awareness of how he would 'FIT' intellectually, emotionally, physically and spiritually into his environment. Therefore, outdoor studies which highlighted the interrelationships among organisms and their environment are important in problem solving for effective human survival.

PURPOSE OF THE STUDY

Most studies on outdoor education have been descriptive surveys on one aspect of outdoor teaching, or historical case studies which claim increased student interest, retention, appreciation and attitudinal change. But there are few empirical studies to justify these claims. This study was conducted to justify the value of outdoor education in the curriculum.

HOW WAS THE STUDY CARRIED OUT?

The subjects of this study were two groups of primary school trainee teachers who had enrolled in a biology course at the University of Northern Colorado. Two approaches to the teaching of biological practical work were used:

- (i) outdoor classes
- (ii) indoor laboratory classes

All students received the same type of instruction through lectures, laboratory sessions, discussions and group-tutorial experiences. Each class was divided into an outdoor group which performed its laboratory activities outdoors and the indoor group which carried out all practical work in indoor laboratories. Gains in the teachers' understanding of social aspects of science, biological principles, science as a process, and their ability to think critically were measured.

WHAT DID THE RESULTS SHOW?

Chrouser's study showed that a biology course for primary school trainee teachers which emphasized outdoor experiences was more effec-

tive than a course conducted with indoor laboratory sessions in helping its students achieve understanding of science as a process, the social aspects of science and some selected biological principles (such as ecology, plant and animal geography and classification).

The outdoor group did not show significant gains compared to the indoor group in their understanding of biological principles in general. Critical thinking ability was not influenced in any way by outdoor activities.

WHAT ARE THE IMPLICATIONS FOR TEACHERS AND TEACHER TRAINERS?

This study has shown that if outdoor activities are utilised properly as an educational tool in a biology course for primary teachers, a better understanding of the social aspects of science is achieved by the student-teachers, together with a greater interest in the process of problem solving related to everyday life. Learning in an outdoor situation seemed to aid in teacher trainees' understanding of, and interest for, the subject. Thus they would be able to transfer this interest and curiosity about outdoor science to their own pupils. They would transmit this enjoyment of the outdoors, their deeper understanding of the individual's role in his environment, together with the scientific processes for problem solving to their pupils.



This abstract was based on an article entitled "Outdoor vs Indoor Laboratory Techniques in Teaching Biology to Prospective Elementary Teachers," in Journal of Research in Science Teaching, 1975, 12(1): 41-48. This journal is available in the IE Library.

FILLING A GAP IN SCHOOL SCIENCE EDUCATION

by BAT-SHEVA EYLON and AVI HOFSTEIN

Abstract by Maureen Ng

INTRODUCTION

The decline in enrolment in science courses and attitude towards science among high school and university students in some countries has led to the call for a change in the goals and philosophy of school science. In recent years, there has been increased awareness of the need for science curricula to better meet man's future needs and interests.

PURPOSE OF THE STUDY

The study looked at an Israeli extracurricular science education course. The course, which was conducted by the Weizmann Institute of Science, Israel, offers school students an opportunity to engage in science as it is conducted by scientists. Weekly sessions or vacation courses involve the students in inquiry-type experiments, science workshops, projects and discussions. In addition, the students are introduced to topics in physics, chemistry, biology, electronics, astronomy, mathematics and computers that are not taught in school. The content of the courses is flexible. Its instructors are scientists and graduate students of the university.

PROCEDURE FOR THE STUDY

The subjects of the study were 147 high school (equivalent to Singapore secondary three and four) students who had enrolled voluntarily in the extracurricular science course at the Weizmann Institute. 637 students who did not participate in the course formed the control group.

Data were gathered through four questionnaires measuring the students' scientific ability; their attitudes towards science; their reasons for enrolling in the extracurricular science course and their perceptions of the potential contribution of the course.

THE FINDINGS

- The students who participated in the extracurricular science course outperformed the control group in the tests of scientific skills. In terms of scientific ability, these students were significantly better than their counterparts.

- b) passages with tables and diagrams;
- c) two types of cloze test (open and multiple-choice).

WHAT WERE THE MAIN FINDINGS?

1. The experiment showed some clear group differences in favour of the experimental technique. The experimental groups performed better in the post-test which tested the particular approach they had been using, which was expected, but they also performed better on a broad range of comprehension tests. In contrast the control groups, those using the 'traditional approach', showed little improvement in ability to do multiple-choice question tests in spite of their practice at this technique.
2. The experimental approach also appeared to have a positive effect on the degree of improvement shown by the learners. It seemed to have been particularly effective for very good or very poor readers. When these groups were studied separately, poor readers made greater improvement than good readers in both control and experimental conditions.

WHAT ARE SOME OF THE IMPLICATIONS FOR TEACHERS?

- Teachers can confidently use a wider range of teaching approaches for teaching reading comprehension, especially techniques which use visual/verbal activities.
- Restructuring a text using diagrams appears to be more effective than the traditional question and answer approach to teaching reading comprehension at the primary school level.
- Reading comprehension does appear to involve readers using the entire context of the text rather than depending solely on its surface features.

This is an abstract of "Comparison of Two Teaching Methods for Reading Comprehension," by Susan A. Sheldon in Journal of Research in Reading, 1984, 7(1): 41-52. The journal is available in the IE Library.

CONTEXT CUES IN EARLY READING

by GILLIAN BEARDSLEY

Abstract by Ruth Wong

WHY WAS THIS STUDY UNDERTAKEN?

Several research studies have shown that young readers make use of certain contextual cues to find the meaning of unknown words when they read. Syntactic cues (trying to get hints from the structure of the sentence) and semantic cues (trying to get hints from the meaning of the surrounding words) are two of the most commonly used cues. This study attempts to find out which cues are likely to be most useful at different stages of reading development.

HOW WAS THIS STUDY DONE?

- Sixty-four subjects were divided into four groups of 16 "good" and "poor" readers. The ages of these subjects ranged from six to eight years.
- The different groups had experienced the same approaches in learning to read, with emphasis on reading for meaning.
- Four cue types were considered in this study:

Cue types	Examples
C1 Proactive syntactic (i.e. using syntactic cues to predict the meaning that follows.)	(1) He can _____ (2) Go to the shop for _____ cakes. (3) If you omit items or forget delivery dates we shall cancel _____ order.
C2 Retroactive syntactic (i.e. using syntactic cues to predict the meaning that precedes.)	(1) This _____ is good. (2) _____ you tell me the time please? (3) For _____ years the church had stood there.
C3 Proactive semantic (i.e. using semantic cues to predict the meaning that follows.)	(1) The dog has a _____ (2) After school the children ran all the way _____ (3) In the middle of the bay they were caught in a sudden storm that threatened to _____ them.

Cue type	Examples
C4 Retroactive semantic (i.e. using semantic cues to predict the meaning that precedes.)	(1) I _____ with my toys. (2) The _____ for tea is in the jug.

- One word was needed to fill the space. A score of one was given for each deletion if the word was acceptable in the context of the sentence.

WHAT WERE THE FINDINGS?

- Children made use of context cues according to age and ability,
- Proactive syntactic cues turned out to be the cues the subjects found the easiest.
- The 7- to 8-year-old poor readers made more miscues than other groups.
- Good readers were able to make more use of semantic cues than syntactic cues.

WHAT ARE THE IMPLICATIONS FOR TEACHERS?

- Teachers should train children to use both syntactic and semantic cues when they read.
- Teaching approaches should use reading materials with meaningful language to encourage and enable pupils to use semantic cues.

This is an abstract of Gillian Beardsley's "Context cues in early reading" in Journal of Research in Reading, 1982, 5(2): 101-112. This journal is available in the IE Library.

READERS' EXPECTATIONS FOR STORY STRUCTURES

by JILL F WHALEY

Abstract by Vanithamani Saravanan

What is a Story Grammar? It represents the parts of a narrative story and the relationship among these story parts. Researchers have identified different story grammars. These differ in their complexity. The most simplistic story grammar consists of setting, problem, and solution. A more complex model, used in this research study, is shown below (Fig. 1)

Setting	- introduces characters, time and location
Beginning	- initiating event which starts the story or new episode
Reaction	- the reaction of the main character to the initiating event and his goal
Attempt	- effort to achieve the goal
Outcome	- the success or failure of the Attempt
Ending	- the consequence of the action, or the final response of the character

Fig. 1: Story Grammar

WHY WAS THIS RESEARCH CONDUCTED?

The following research hypotheses provided guidelines:

- Children who are experienced in reading or hearing stories read aloud, regardless of age, expect certain things to happen in a story.
- Older readers would expect particular structures in the story grammar more frequently than younger readers.
- Readers from the same age group would exhibit similar responses to the story structures found in the story grammar.
- The ability to predict upcoming parts in a story structure would aid readers in comprehension and recall.

HOW WAS THE RESEARCH CONDUCTED?

- | |
|-----|
| WHO |
|-----|

 Fifty third-graders, 51 sixth-graders and 52 eleventh graders took part in this study.

- All subjects were average or above average readers

HOW

Subjects performed two tasks on a total of six stories.

- The prediction task required readers to orally tell what would come next in the story given different combinations of sequentially ordered structures (eg. Setting only, Setting and Beginning.)
- The Macro cloze task consisted of a written passage with various story structures omitted.
- Subjects' ability to match the story structures and the complexity of the response were used in scoring the various tasks.

WHAT

- All subjects expected certain structures to be found in stories.
- There were age group differences. Third graders expected certain structures less frequently. No difference was found between sixth and eleventh graders.
- Inter-task findings supported the identified story structures found in the story grammar. Each story structure within the grammar was considered and compared statistically.
- All subjects, regardless of age, had expectations for the various story structures with the exception of the Reaction part of the Structure which was problematic.

Suggestions for the Classroom Teacher

- Provide children with opportunities to experience stories which will enhance their knowledge of story structures.
- Get children to predict what will happen next in stories.
- Discuss story parts: this will aid reading comprehension and narrative writing.
- Use the story grammar framework to evaluate stories you select for your classroom reading experience.

This is an abstract of "Readers' Expectations for Story Structures by Jill F Whaley in Reading Research Quarterly, 1981, 17(1): 90-111. This journal is available in the TE Library.

CHILDREN'S EMERGENT READING AND FAVOURITE STORYBOOKS

by ELIZABETH SULZBY

Abstract by Gayle Whitson

WHAT IS EMERGENT READING?

For all young children it would appear that the process of beginning reading starts before they enter school. Experiences which children encounter such as observing the print on a product label or road sign and hearing children's storybooks read aloud contribute to their development as beginning readers. In this particular study, the researcher documents beginning stages of reading which children may pass through before gaining independent control of the text.

Milestone Stages In Emergent Reading

Labelling pictures	Verbatim Memorizing	Over focussing on the print eg. (sounding out)	Reading with self correcting of errors	Independent Reading - using prediction
1	2	3	4	5

Guiding Principles and Understanding of Emergent Reading Research

- Reading to children contributes to their success as beginning readers.
- Children's favourite stories provide opportunities to test their awareness and hypotheses about written language and about the reading process.
- Young children, read to on a daily basis, are engaged in the process of learning to read. They are Emergent Readers!

WHY WAS THIS RESEARCH DONE?

This research alerts parents and educators to the fact that valuable literacy experiences occur during the pre-school period.

Emergent Reading Research attempts to explain the following questions:

1. How do children's interactions with storybooks change as they move from a "reading" telling approach to conventional reading?
2. What are the stages identified during this period of time known as emergent reading?

HOW WAS THE RESEARCH DONE?

WHO ◦ A sample of twenty-four kindergarten children (middle class, mixed language backgrounds). Ages ranged from 4.11 to 6.4 years.

- Subjects were given a beginning and end of year interview, which consisted of the child reading a favourite storybook on tape. These were then transcribed.

WHAT The interview transcripts provided further description of the Emergent Reading Stages.

- Comparing the beginning and end of year interview results showed that most children progressed significantly in the stages of emergent reading.

IMPLICATIONS FOR THE CLASSROOM

- Teachers and parents should read to children on a daily basis and engage children in silent reading.
- From this study, teachers and parents should recognise that even very young children are capable of engaging in silent reading!
- Encourage children to share stories or parts of stories with the class.
- Teachers of young children should broaden their definition of "reader" to include the identified stages in Emergent Reading.
- Teachers and parents should continue to provide positive reading models for their children.

This is an abstract of Elizabeth Sulzby's "Children's emergent reading of favourite storybooks : A developmental study" in Reading Research Quarterly, 1985, 20(4): 458-481. This journal is available in the IE Library.

WHAT CHILDREN THINK ABOUT READING

by RICHARD L PARKER

Abstract by Richard L Parker

WHY WAS THE STUDY DONE?

As children learn to read and become progressively more proficient, their views of the reasons for reading change. These views are very important because they help to determine how much children want to read, how much time they spend reading, the types of books they read, and whether they will become lifelong readers. Earlier studies have indicated that children identify a number of functions of reading, including:

- reading for enjoyment
- reading in order to gather information
- reading in order to perform better at school
- reading in order to become a better person, and
- reading as a means of escape.

HOW WAS THE STUDY DONE?

Children were asked to write a composition about "Why I Like to Read". The children were assured that their compositions would not be read, corrected or graded by their teachers. They were encouraged to write as much as they could and were assured that spelling and grammar were not significant in this task. The children came from a number of Singapore schools and there were three age groups: 7-year-olds (75 children), 9-year-olds (157 children), and 13-year-olds (50 children).

The compositions were then analysed according to the set of functions identified in the earlier study involving thirteen different countries. It was then possible to calculate the percentage of children in each age group who mentioned each of the functions of reading in the list. These percentages were then examined and compared with the data collected earlier.

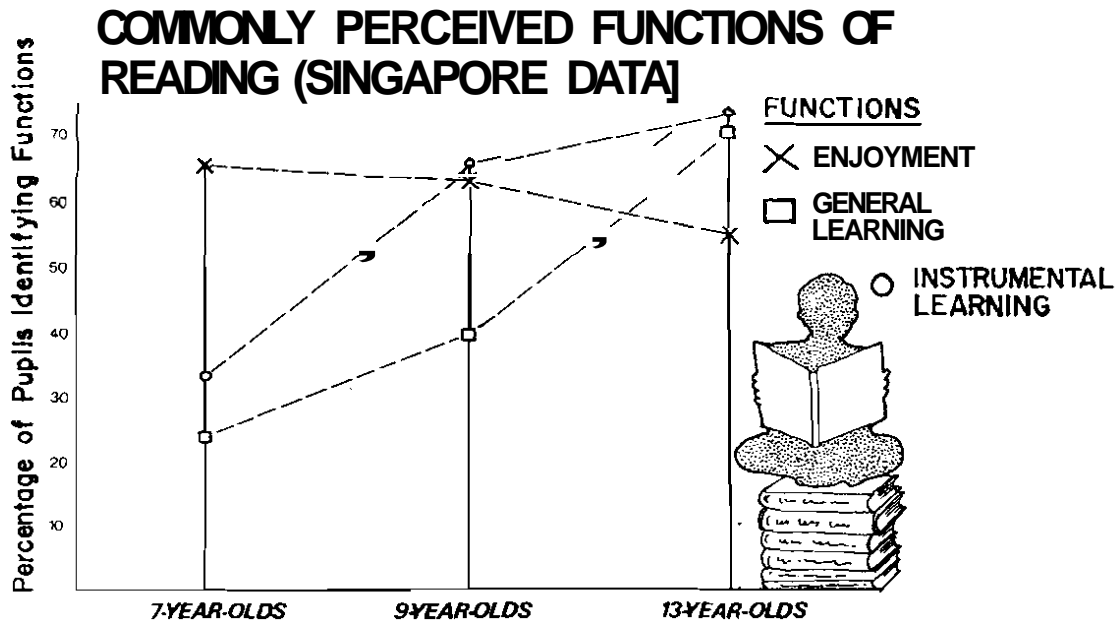
WHAT WERE SOME OF THE RESULTS?

The major results are evident in the graph below. Some of the interesting issues they raise include:

- While more than half of the children at all levels indicated that they liked to read because it was fun to do so, one should be

concerned about the remainder who do not see reading as an enjoyable activity.

Large numbers of children, especially the older ones, saw reading primarily as a way of doing better at school. This is a disturbing trend, since it suggests that these children are unlikely to read once they leave school unless they are amongst those who also read for enjoyment.



WHAT SHOULD TEACHERS DO?

1. Teachers should ensure that they devote time to reading stories to children as a regular part of their language programme.
2. Classrooms should have an extensive collection of books which are available to children at various times during the school day.
3. Teachers may be advised to promote reading as an enjoyable activity rather than as a way of becoming a more proficient scholar.
4. Teachers need to be sound models for their pupils. This means that they need to be enthusiastic about reading and books. It also means that children should frequently see their teachers reading for enjoyment. This can be most easily achieved in a Sustained Silent Reading programme, where teachers as well as pupils read the book of their choice for a specified period of time.
5. Teachers should choose materials for the classroom that will be enjoyed by children, or that will provide children with information that is **needed** and interesting. There is no place in the classroom for contrived, irrelevant or poorly written texts of the type which have frequently found their way into collections of comprehension exercises.

This is an abstract of a paper of the same title presented by Richard L Parker at the 2nd International Conference on Literacy and Language, Bangkok, 1987. A copy of the paper is in the IE Library.

PUTTING REAP INTO THE SINGAPORE CLASSROOM

by NG SEOK MOI and OLIVIA SOH

Abstract by Maureen Khoo

This paper describes the early attempts of a team of Singapore teacher educators implementing, in the lower primary classroom, an English Programme that is practice-based. It explains how the recommended approaches were arrived at and how a new system of teacher-training was used and closely monitored.

The Programme that arose from systematic school-based studies recommends two approaches to language and reading - the Language Experience Approach and the Shared Book Approach. It also incorporates the Book Flood concept.

WHAT WERE SOME OF THE MAIN FEATURES OF THE IMPLEMENTATION?

Training, in the form of workshops and classroom monitoring, aimed at meeting teachers' individual needs. It was conducted in phases over the school year to allow practice intervals for each technique. Training featured school-based practice demonstrations, participant-interaction, provision of both general and lesson-specific guidelines, and on-call resource persons for participating schools. Teacher-participants were reassured that monitoring of lessons was supportive and not evaluative in nature. Efforts were made to create an administrative-level support system in participating schools.

WHY WAS IMPLEMENTATION OF THE PROGRAMME MONITORED?

Careful monitoring formed an essential part of the implementation. This was considered necessary to :

- ensure that essential principles of the recommended approaches were practised
- note the level of acceptance by teachers and to take corrective measures
- provide support and encouragement to teachers.

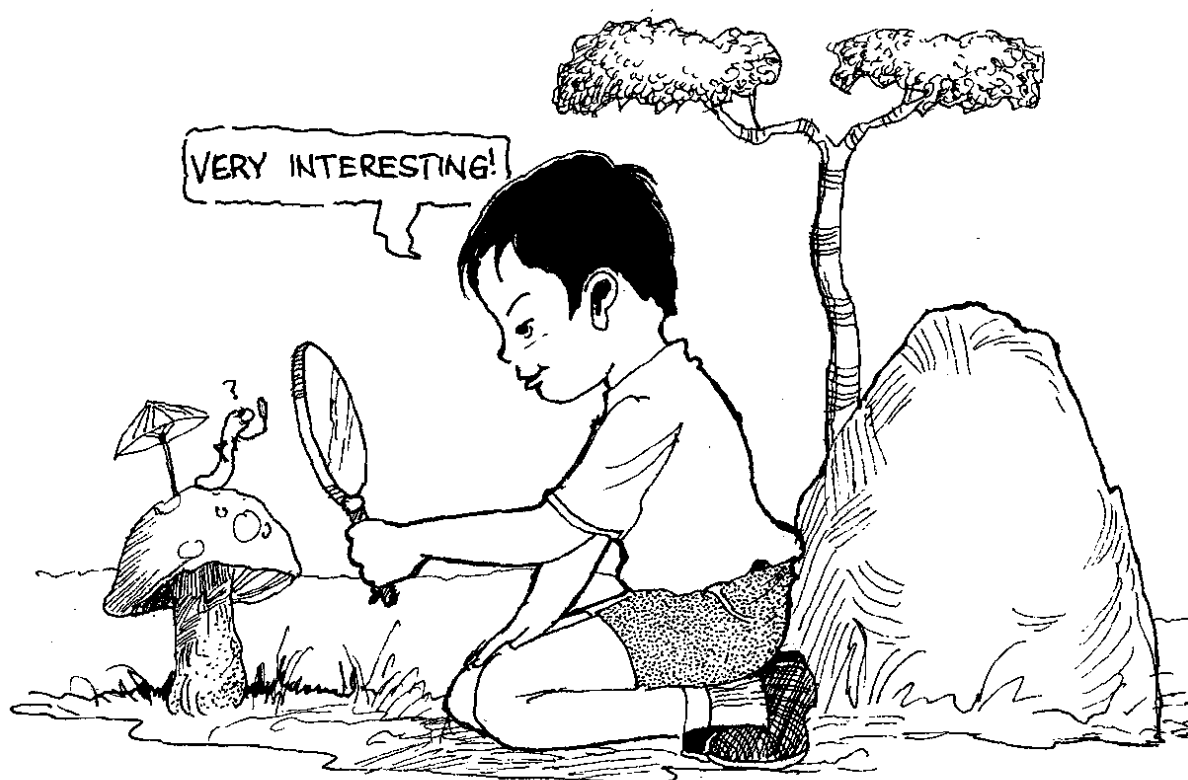
WHAT WERE SOME EFFECTS OF REAP AFTER 10 MONTHS?

1. Shared book lessons were enjoyed by both teachers and pupils.
2. Some teachers were pleasantly surprised by the amount of oral language and reading skills the children were developing.

- The primary reasons that the students cited for enrolling in the course were intrinsic. Many had taken part out of scientific curiosity.
- The students preferred student-centred to teacher-centred activities. They appreciated the laboratory work and the content that was different from what they had learnt at school.
- The students perceived science and school science differently. Their attitudes were more positive towards the extracurricular science course than towards school science.

IMPLICATIONS FOR TEACHERS

Teachers can further nurture students' intrinsic scientific curiosity through enrichment activities in science. Science clubs constitute one means by which students may expand their scientific knowledge beyond what is learnt in the school science curriculum. Schools can establish school-institutional links and seek out resource persons in the field of science who can be advisers or consultants to the teachers and students.



This abstract is based on Bat-Sheva Eylon and Avi Hofstein's article "Extra-curricular Science Courses: Filling a gap in school science education" in Research in Science and Technological Education, 1985, 3(1): 81-89. The journal is available in the IE Library.

SCHOOL HISTORY VISITS AND PIAGETIAN THEORY

by MIKE POND

Abstract by Wilson Jacob

INTRODUCTION

The teaching of history through field trips is becoming increasingly important. It has been found to be effective because it helps pupils to:

- (a) sense the atmosphere of the past and appreciate their heritage
- (b) observe and understand concrete evidence and thereby learn history meaningfully
- (c) imaginatively transport themselves into the ages and empathise with people of a different period and time.

PURPOSE OF STUDY

- (1) the extent to which field trips can help pupils perceive the roles and functions of a selected historical site (a monastery) in the past;
- (2) the degree to which pupils in the concrete operational stage of cognitive development can see the past in a building of historical interest. (According to Piaget's findings, these are children who are unable to see beyond the here and now, unable to hypothesise and draw conclusions.)

HOW THE STUDY WAS CONDUCTED

The study was conducted in Norwich, UK and involved 57 children between the ages of 10 and 12. Using the British Abilities Scales test of Reasoning pupils were tested for the stage of cognitive development they had reached. They were then taken on field trips to Norwich Cathedral. The use of imagination to figure out the role of the building in the past was the focus of the field **exercises/work** sheets. Finally they were tested to find out to what extent they were able to reconstruct the past and empathise with people of a bygone age.

THE FINDINGS

1. Pupils able to think in abstract terms were more likely than those in the concrete operational stage to perceive the past from the existing evidence.

2. Pupils at the formal operational level (according to Piaget, these are children who are able to relate their own knowledge to the immediate evidence, to hypothesise and make deductive conclusions) were more able to reconstruct the past imaginatively and make empathetic responses.
3. Pupils in the concrete operational stage tended to be unable to see beyond the present and the immediate.

IMPLICATIONS FOR TEACHING

The study is of special significance for history teachers at the lower secondary level mainly because of the use of field trips as a teaching method and also because the majority of pupils are in the concrete operational stage of cognitive development.

Teachers need to bear in mind that Normal Stream pupils will face serious problems trying to relate the past to the present. Therefore field exercises should be more "down to earth" and aim at getting pupils to make factual responses. Objective type and partly structured questions are likely to be more appropriate and relevant.

On the other hand, Express Stream pupils, particularly those in good schools, can be "stretched" by encouraging them to respond to questions which require the use of imagination to reconstruct the past.



This abstract is based on the article "School Visits and Piagetian Theory" by Mike Pond. It appears in Teaching History, 1983, 37: 3-6. The journal is available in the IE Library.

AN EVIDENCE-BASED APPROACH TO HISTORY TEACHING

by ROBERT R MCKINLEY

Abstract by Goh Chor Boon

WHAT IS THE STUDY ABOUT?

This study, carried out in Ulster, Northern Ireland, stresses the importance of teachers using evidence to help pupils develop rational explanations and to educate them in the procedure of historical enquiry.

HOW WAS THE STUDY CARRIED OUT?

A farm which had been removed from its original setting and housed in a museum was selected as the site for the field trip. A source book on the farm was produced to encourage pupils to enquire into the evidence provided at the site. Before the actual visit to the farm, the pupils made a visit to other sites in the museum in order to gain some experience in handling and interpreting various types of evidence. The teacher also gave brief but concise information on some aspects of farming development in the nineteenth century. Finally, the pupils were taught to identify and to know the use of various types of agricultural implements.

On the day of the visit the pupils were told to bear in mind three **tasks:**

- (1) Describe, using visual evidence only, what the site looks like now.
- (2) Describe, using visual evidence only, what **it** might have looked like in the past.
- (3) **Comment** on any changes and explain why they might have happened.

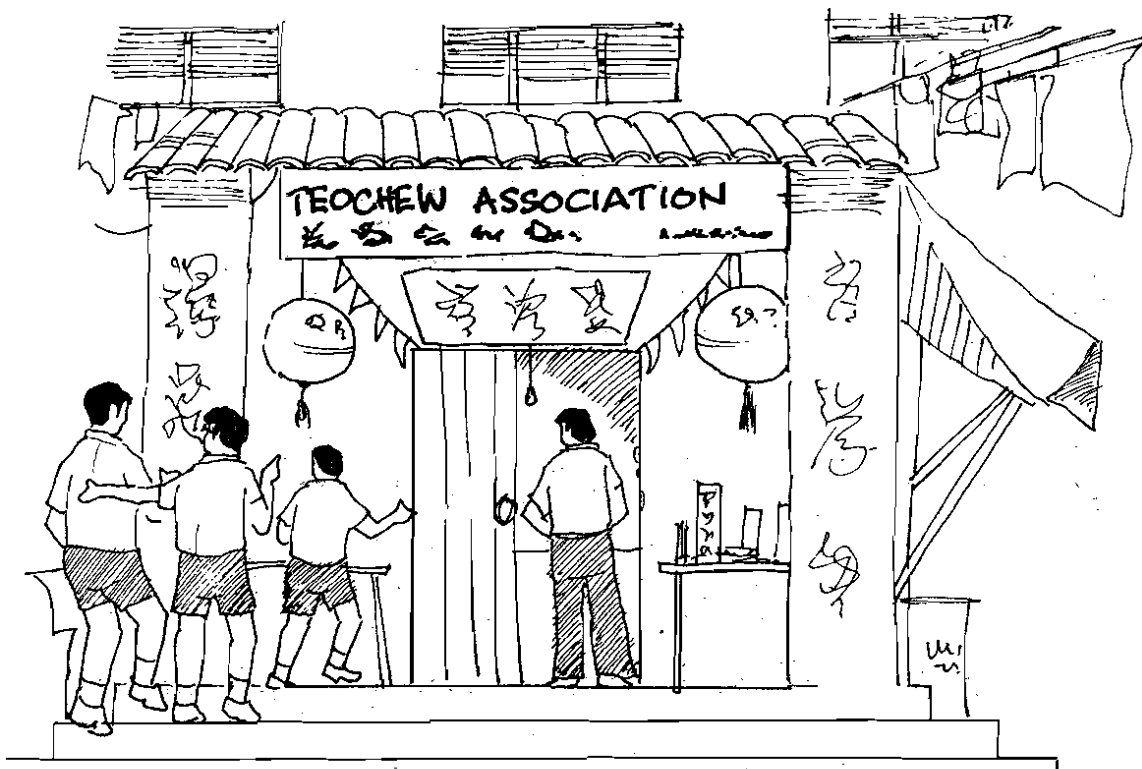
WHAT WERE THE MAIN FINDINGS?

The pupils were well motivated throughout the learning experience. Despite the limited time at the site, many were engaged diligently in close examination of the visual evidence. With the help of the background knowledge acquired prior to the trip the pupils learned to develop a range of cognitive **skills**, from classification, measurement, and dating to historical-reconstruction and **interpretation**. **Some** pupils also indicated that they were able to appreciate the values and livelihood of their predecessors more readily. Therefore, concepts such as "continuity" and "change" were made known to them in a more effective way.

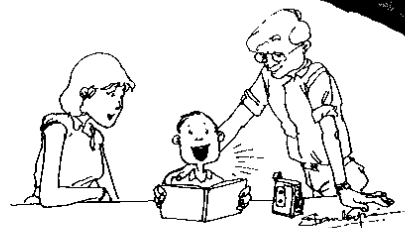
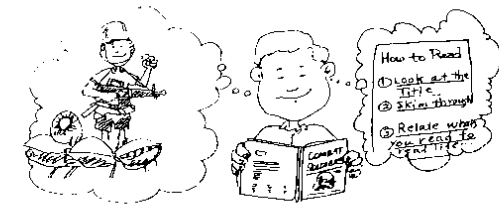
WHAT ARE THE IMPLICATIONS FOR TEACHERS?

Though there are constraints and limited opportunities, the adoption of an evidence-based approach in history learning is worth exploring. There is something vital and compelling about getting our pupils to see and touch artifacts and natural objects which are a tangible link between the present and the past.

Two examples of such studies carried out locally are the Chinatown and Fort Canning projects. When students are taken to these sites they will be able to see concrete evidence of events that took place in the past and objects such as Sultan Iskandar Shah's tomb that will remind them of the early Malay rulers of Temasek. Visits to the various clan associations and guilds in Chinatown will provide visual reminders of times that are changing.



This abstract is based on R.R. McKinley's article "The Adoption of an Evidence-based Approach to a Site Visit: A Case Study" which is published in Teaching History, 1984, 38: 17-21. The journal is available in the IE Library.



Comprehending the text is easier if the materials are structurally organized and the reader draws upon his life experiences and knowledge of reading strategies during the act of reading.

Judy Chandler and Marcia Baghian (1986). "Predictable Books Guarantee Success." *Reading Horizons* (26, 3: 167).

The most important factor in children's reading progress is whether or not parents take the trouble to listen to what their children read.

Keith Topping (1987). "Paired Reasoning: A Powerful Technique for Parent Use." *The Reading Teacher* (40, 7: 608-614).

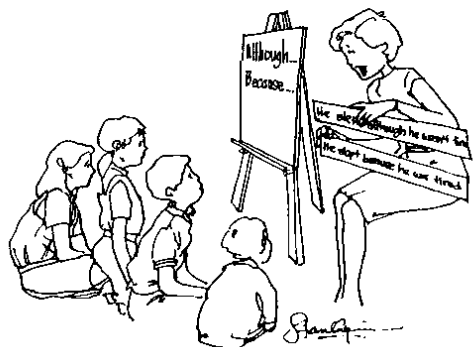
Hearing the story read aloud first will make reading easier for young children. Children will then be better able to make sense of the story, since they have a broad view of what happens and they have some familiarity with the type of language used.

Mare Clay (1985). "Beginning Literacy in Two Languages." *Singapore Journal of Education* (7, 8: 9).



A child learns to read even before going to school. We live in a print-saturated world and three-year-olds have begun to find their way around in it. They have no trouble, for example, in picking out the sign that says "McDonald's".

Hawitla Dombey (1987). "Reading for Real from the Start." *English in Education* (21, 2: 12-19).



In order to enjoy literature and to comprehend fully what they read, children need to be assisted to see things from another person's point of view.

M. K. Gardner and M. M. Smith (1987). "Does Perspective Taking Ability Contribute to Reading Comprehension?" *Journal of Reading* (30, 4: 333-336).

Most pupils in the upper primary classes (roughly ages 10-12) have rather hazy notions of conjunctions like 'because' and 'although'. Highlighting these conjunctions improved their comprehension of the text.

Esther Gera and Ellen B. Ryan (1985). "Use of Conjunctions in Expository Texts by Skilled and Less Skilled Readers." *Journal of Reading Behaviour* (XVII, 4: 331-346).



Reading tasks in school tend to stress reading to learn rather than reading to do. In real life, a person spends an average of 113 minutes performing tasks which require reading to do. It is not surprising that there is little direct transfer from classroom reading instruction to real world settings.

W. A. Hank and J. P. Helleidt (1987). "How to Develop Independence in Following Written Instructions." *Journal of Reading* (30, 7: 602-607).

Most questions asked during the reading lesson serve to test rather than teach comprehension skills.

Isabel L. Beck and Margaret G. McKeann (1981). "Developing Questions That Promote Comprehension: The Story Map." *Language Arts* (58, 8: 913).



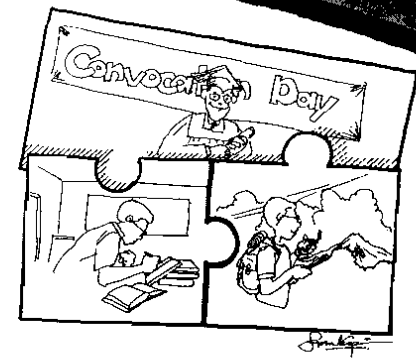
Repeated visits to a site often produce the best learning results at all ages, particularly for very young children. A first visit can emphasize activities that will familiarize students with the setting while later visits can focus on more conceptual material.

John H. Falk (1983). "Field Trips: A Look at Environmental Effects on Learning." *Journal of Biological Education* (17, 2) 137-142



Field work experience is a highly effective learning mode in scientific methodology for students who desire to participate

David M. Riban and David B. Koval (1971). "An Investigation of the Effect of Field Studies in Science on the Learning of the Methodology of Science." *Science Education* (55, 3) 291-294.



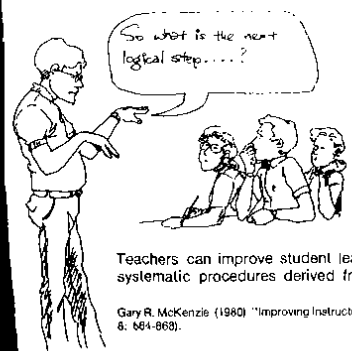
Secondary students who complement their academic studies with extra-curricular activities gain experience that contributes to their success in tertiary institutions.

W. Spady (1971). "Status Achievement and Motivation in the American High School." *School Review* (79, 3): 319-403.



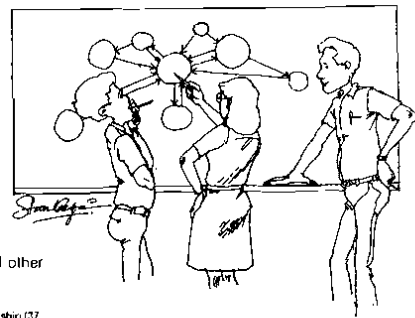
Children learn science best when they are able to do experiments so they can witness 'science in action'.

R. Gunstone and R. White (1981). "Understanding of Gravity." *Science Education* (65, 291-299)



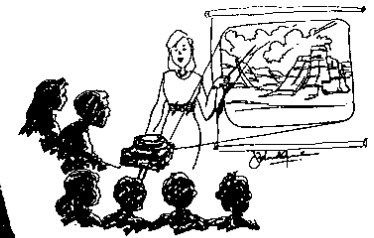
Teachers can improve student learning by using test-like questions and other systematic procedures derived from learning theory and research.

Gary R. McKenzie (1980). "Improving Instruction Through Instructional Design." *Educational Leadership* (37, 8) 684-689.



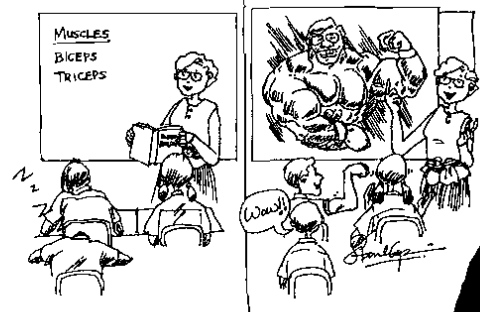
When concept mapping by students is used as an evaluation tool, misconceptions in students' thinking can be spotted as well as new objectives that emerge from their creative thinking. Research studies reveal that concept mapping can facilitate transfer learning and problem solving.

James van Patten, Chuvil and Charles M. Reigeluth (1986). "A Review of Strategies for Sequencing and Synthesizing Instruction." *Review of Educational Research* (56, 4): 437-471



Cognitive understanding and concept development in environmental education may be as effectively developed by visual aids as through field trips.

Sheila J. Backman and John L. Crompton (1984/5). "Educational Experiences Contribute to Cognitive Development." *Journal of Environmental Education* (16, 2) 4-13.



In a large number of learning tasks children seem to learn better when the materials are pictures than when the materials are words.

Joel R. Levin (1976). "What Have We Learned About Maximizing What Children Learn?" In *Cognitive Learning in Children, Theories and Strategies*, edited by Joel R. Levin and Vernon L. Allen. New York: Academic Press.