

Educational Technology

A TREND REPORT

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Thirty-eight theses and research reports are abstracted in the present survey in the area of educational technology. The first survey had included eighteen studies under programmed learning and the second survey twenty-one abstracts on educational technology. Although slow and steady in progress, this number is small considering the stride of development in this field in recent years.

Educational technology has a brief but active history in India. In fact, the first organised effort to promote and disseminate the message, first through programmed learning and later through other applications, began in 1965 when a group of faculty members of the Department of Psychological Foundations, NCERT, joined together for a nation-wide campaign of organizing training courses and seminars in programmed learning. The first national conference of the Indian Association for Programmed Learning was held in 1968, on the theme of Toward an Educational Technology. A number of educationists had patronized the movement in various capacities, including among others, V.S. Jha, I.J. Patel, Shib K. Mitra, Malcolm Adishesiah, Raja Roy Singh, Madhuri R. Shah, M.B. Buch and J.P. Naik. Every year, a sequential course was organized under the NCERT auspices in two phases. During 1969, senior faculty members of the universities of the Western and the Northern Regions met at Poona and those of the Southern and the Eastern Regions met at Bhubaneswar to discuss ways and means of applying the principles of programmed learning for higher education. Among other organizations which evinced active interest and sent people to be trained in the sequential courses were the

Army, the Navy, the Air Force, The State Bank of India and the Lal Bahadur Shastri Academy of Administration, Mussoorie. Shorter courses were soon organised in various institutions like the Lal Bahadur Shastri Academy of Administration, Mussoorie, the Central Hindi Institute, Agra, the Army Cadet College, Poona, The Indian Military Academy, Dehradun, and The State Bank Staff College, Hyderabad. The State Institutes of Education which took active interest in programmed learning were those of Rajasthan, Gujarat and Maharashtra. They later conducted their own training workshops.

A few large budget research programmes were also taken up by the NCERT, among which the most challenging was the one for language learning. This project was unique in its organization and innovative character. Envisaging wide-ranging application of programmed learning for language teaching and possible procedural hurdles, a Steering Committee was formed with Dr. V.S. Jha as its Chairman, and several eminent linguists and psychologists as its members. The project had three active centres undertaking six research projects coordinated by the Steering Committee. The centre at Annamalai University was developing programmes for teaching Tamil to Hindi speakers and yet another to teach Hindi to Tamil speakers. Another centre at the Central Institute of English and Foreign Languages, Hyderabad, was engaged in developing English teaching programmes for Hindi and Tamil speakers, respectively. The third centre at the Deccan College, Poona, was producing Hindi programmes for Marathi and for Gujarati speakers. By 1970, a hundred hours' self-instructional

text (not fully programmed but self-instructional, keeping the basic principles of programming intact) for each of the target languages was ready. The Marathi-Hindi programme has since been printed. In 1972, the Steering Committee was wound up and the project was handed over to the Central Institute of Indian Languages, Mysore. A few prototypes of programmed learning materials were developed and printed for demonstration purposes at the NCERT. Programmed texts on statistics, set theory, slide rules, parts of flowers, etc., were printed at this time.

After the first phase of the 10th course in programmed learning in 1974, the sequential courses were stopped by the NCERT. However, the activities in the area were shifted to the Centre for Educational Technology. The country seemed to be taking notice of programmed learning. The Indian Science Congress of the year 1970 had a special symposium on programmed learning addressed by two American experts, Gabriel Dellapiana and Howard Sloan from the University of Utah. Soon afterwards, the UNESCO sponsored a project for introducing programmed instruction in Asia, and India was given a prominent role in the project.

The Indian Association for Programmed Learning, first housed within the NCERT and later shifted to the CASE, Baroda, and recently to the South Gujarat University, Surat, became very active and influential as a professional body. It came out with a Handbook of Programmed Learning (Patel *et al.*, 1970) which became popular in all universities and institutions. Its annual conferences drew hundreds of delegates from education, industries, defence, agriculture and other sectors. In 1973, the Association changed its name to Indian Association for Programmed Learning and Educational Innovations, ostensibly to accommodate research and development in other innovative areas. In 1982, it changed its name again to Indian Association for Educational Technology. These changes in the name are also indicative of the trend of thinking by the professionals in the field, and for an outsider the research studies done during a particular phase would perhaps fall into a certain pattern.

The first university to offer a special course on Educational Technology and Programmed Learning was the M.S. University of Baroda (1966). Following this forward-looking step were the universities of Meerut, Himachal Pradesh, Aligarh, Banaras and some others.

The Centre for Educational Technology (CET), NCERT, was established in 1974. It organized several training programmes, developed different kinds of instructional sequences and conducted some research pro-

jects on different aspects of mass media. Similarly, the Department of Teaching Aids, NCERT, adapted its programmes so as to meet the challenges of educational technology, while keeping its objectives of generating and promoting audio-visual skills intact. Educational Technology Cells came up in the States under the guidance of the CET. A ripple of activities, including software strategy, script-writing and programme production, occurred under the SITE programme and again when the INSAT-1A was launched. This activity level is still maintained for INSAT-1B, and prototype programmes are being produced along with film production. Films which are at various stages of production are: Presentation Techniques, Use of TV in the Classrooms, Resources for TV, Innovations in Education, and so on. Equipment, building, staff, etc., for the CET and production centres being set up in six State Institutes of Educational Technology have been finalised with a view to utilising INSAT programmes for transmitting educational programmes.

Among other institutions actively utilizing educational technology are the Central Institute of Indian Languages, Mysore, the Technical Teachers' Training Institutes at Madras, Bhopal, Calcutta and Chandigarh, the National Institute of Bank Management, Bombay, the State Bank Staff College, Hyderabad, the Central Institute of English and Foreign Languages, Hyderabad, and the Central Institute of Hindi, Agra. There are quite a few institutions including universities where language laboratories, CCTV and computers are beginning to be used for instructional purposes. With the popularity of micro-teaching, VTR studios have come up in the universities of Madras and South Gujarat and the Indian Institute of Technology, Madras, in addition to the earlier CCTV studio in the Technical Teachers' Training Institute, Madras. The Centre for Educational Technology has also the facility of video recording. The same facility is also available at the Central Institute of Indian Languages, Mysore. Many universities and institutes make use of portable TV cameras and monitors now available in the country. Computer-assisted instruction with its latest development, viz., computer-managed learning and computer-aided learning, etc., has not taken firm roots yet in this country, barring a few experiments in the use of micro-processors and computers notably at the Tata Institute of Fundamental Research, Bombay, and the Indian Institute of Technology, Madras. The use of computers indigenously manufactured and made available to the universities and educational institutes, has increased during the last decade. It is hoped that some active centres for

the study of computer for education would be established in the near future.

Distance teaching and correspondence education have had a rapid progress, perhaps because of their feasibility and cost benefits. Many universities have started correspondence courses through separate directorates. The Central Board of Secondary Education has established the Open School with headquarters at Delhi, offering education up to the secondary level. The lessons prepared by the Open School adopt a modular and semi-programmed approach. The registration figures have increased by leaps and bounds. This organization has also conducted a few surveys and researches on its own target population. Similarly, due to the active encouragement, notably by the Department of Teacher Education, NCERT, and continuous utilization by the Technical Teachers' Training Institutes as also the University of Indore and the CASE, Baroda, micro-teaching has become very popular. The NCERT has produced a series of films on micro-teaching, and a book on teaching skills has also been brought out by the Department of Teacher Education, NCERT, besides a number of training workshops conducted on micro-teaching.

The picture of enthusiasm and optimism on the utilization of educational technology by the above institutions is not, however, reflected in the research studies conducted at the university level. While the former remain at an exploratory and promotional level, perhaps eager to transfer sophisticated technologies, the latter still confine themselves to fundamental issues like utility, feasibility and optimization of available resources. Of the studies under review, allowing for overlaps, the maximum number (eighteen) adhere around the area of programmed learning. School broadcasts and telecasts have attracted seven studies. Instructional strategy and distance teaching have three studies each and the use of toys and micro-teaching¹ have one study each. Two studies are on cross comparison of methods.

It may be recalled here that the first two surveys were almost entirely devoted to programmed learning. The term 'educational technology' was mentioned only twice in the trend report of the first survey and at five places in the second survey. The second survey also discussed educational technology briefly. As far as implementation is concerned, there seems to be a greater thrust on school education than on higher education, admittedly not only because the priority of school education is higher in a developing country, but also because educa-

tional technology itself is generally considered more applicable to children, although little empirical evidence could be found for such a tacit assumption. Again, within school education, there seems to be an accumulation of enquiries at the middle and the secondary levels in comparison to the primary and the higher levels. If an explanation for such a phenomenon is sought, perhaps it would not be strictly academic. Similarly, although the problems of rural and tribal schools are obviously more significant than those of urban and semi-urban areas, most of the studies have confined themselves to the latter areas, perhaps within a manageable distance from the universities. Also, English-medium schools have featured prominently in the studies although they are among the more privileged ones. One would be inclined to explain that the choice solved the language problem for the investigator. In a multilingual country, this really is a problem. However, one tends to be rather sceptical about the conclusions from such studies being equally valid for those schools where Hindi or the regional languages are the media of instruction. If, however, the main probe is on optimizing a method-media mix, one supposes that the investigators have a justification.

Judging from the abstracts alone, it becomes clear that fairly sophisticated research methodology has been used in most of the studies. The most popular designs are pre-posttest designs, matched group and simple factorial designs. Also, one comes across a few long-term studies using an entire sessions' data and a few complex survey designs. Some investigators have followed up their target groups well after the final criterion tests were given in search for measures of retention. At any rate, these are way ahead of the simplistic studies one came across earlier, many culminating only after the production of a programmed material of a single segment of a particular subject-matter for a particular class level. The idea of substituting an entire school system by educational technology is still forbiddingly far-fetched; it would perhaps be enough to have a few portions of the system converted into programmed materials and leave the rest untouched; thus retaining the essentials of the existing system, posing absolutely no threat to anyone, least of all to the teacher who would see these as supplementary aids only, where some other people had already done the thinking for him. Meanwhile the 'perennial experiment' (Barry, 1967) on programmed instruction and related issues could continue. "As long as it pertains to other countries, other students and other subjects, it seems quite feasible." This type of initial resistance has not yet been overcome, in spite of countless little evidences produced by research studies to the con-

¹ Researches in micro-teaching and skill development have been treated at length in Chapters 15 and 16 — *Editor*.

trary. Other rationalizations, e.g., "nothing really works in education", "India is too vast and poor and educational technology is awfully expensive", and so on, are also to be countered if the message of educational technology is to be at all taken seriously. The pessimistic undertone of the picture given here sounds like the one given by Schopenhauer and Nietzsche, but it is not meant as discouragement but as a cautionary note to the committed research workers of the future, as well as to administrators and decision-makers. The latter groups tend to underestimate the importance of readiness and rigour in software planning and, understandably, to rely more on known and safe procedures, thus at times being forced into 'crisis management'. The handicaps are also clear. Lack of trained manpower, of base line research data and scant organizational infrastructure strike one as the principal ones. Taking advantage of the situation and seeing immediate gains on the horizon, some ambitious persons might have hurriedly staked their claims on the field of educational technology and for responsible positions causing further confusion, as in the case of all the pioneering efforts, particularly in developing countries.

The exercise of redefinition of educational technology in terms of the mass media technology, on the one hand, and inputs and sequences of software material, on the other, has to take place rather rigorously. As it stands, the former aspect seems to have attracted the administration whereas the latter has appealed to the academic bodies. Another side of redefinition pertains to the particular kind of technology more applicable to a poorer nation, a technology which would perhaps solve the real educational problems of the millions of underprivileged students mostly from backward areas, belonging to the scheduled castes and the scheduled tribes and women population. Over by simplified models of the present technology, reflecting the existing formal system in bits, would perhaps fail and the novelty of educational radio and television would perhaps wear out too soon. The entire concept of educational technology will perhaps have to be reviewed in this context, with cost effectiveness and feasibility in view. How should accessibility be increased, how should the time and space requirements be met, how could special attention be provided for, how could an educational input be adapted for various groups of students — hundreds of similar factors may have to be considered before a model of workable educational technology could be arrived at. And yet, such questions have very little place in the existing research studies, both at the individual level and the institutional level.

The prediction that gradually the impact of educational technology would be felt and the traditional methods of teaching would change, and that more dynamic methods of teaching were going to be evolved day by day (Roy, 1977) has not yet come out impressively in our formal educational system. The utilization of school broadcasts and telecasts has been, at the most, at a marginal level and the learning gains through them not yet fully convincing. Coordination between their production units and trained educational technologists has been dismally low. From the research angle, the experiences of African and Asian countries must be closely examined and, where possible, adopted. Similarly, the experiences of other sectors, e.g., industries and defence, should be taken into account even within the country.

Suffice it to say that educational technology in India has not grown beyond the formative stage and is in a state of flux as it was in the beginning, although attempts to scale the wall have been quite noteworthy and significant. It is in this context that the review of the studies abstracted in this survey is being made.

Studies on Mass Media

Previous studies of instructional media were mixed in their findings. While Dewan (1966) had found televised instructional material effective, and Roy (1974) had found no significant effect on cognitive clarity of students through the television lessons of Delhi and that assimilation and utilization bases were the most affected, the present survey contains some frank evaluations of school broadcasts and school telecasts.

Passi and others (1980) conducted a preliminary survey in five districts of Madhya Pradesh for starting school broadcasts for primary and middle school teachers. They found that 95 per cent of the teachers who had the facilities did listen to different kinds of radio programmes. They listed languages, civics, mathematics and geography as the most difficult subjects to teach. More than half of the 524 teachers were willing to write the scripts. They expected instruction on the radio on motivating and managing the classroom as well as on the newer methods of teaching. Goel (1982) studied the school broadcast in the country covering all the thirty-five AIR stations engaged in producing school broadcast programmes, eight of which were chosen for indepth analysis. He contacted a sample of script-writers, school authorities, teachers and students. It was revealed that there was no coordination between the broadcast divisions and state departments of education, the objectives

were vague and the coverage low. The script-writers were mostly without any training, the schools had no provision for listening time. It is not known whether the respondents were concerned about the students' listening to the broadcasts. Lack of preparedness and coordination and a tendency of continuing the ritual of broadcasting with or without utilization are evident from the study. Srivastava (1974) found more or less the same tendency in his study covering the Western region, i.e., Maharashtra, Gujarat and Madhya Pradesh. He interviewed the producers, scriptwriters, station directors and the authorities in the Education Department. He also collected some evaluation sheets from the schools. Coordination between the AIR and the schools, governed by two separate Ministries, was less than ideal. Many schools had radio, but no listening facilities for the students. Most of the schools did not even receive the programme booklet for broadcasts on time. There was no uniformity of standards in the programmes in certain subjects. Some schools had tape recorders but never recorded any broadcast. Students had never been consulted for the programmes.

Biswal (1980) searched for a strategy for effective utilization of school broadcast programmes in his study conducted in Orissa. The objectives of the broadcast lessons were vague, the coverage rather erratic and the scripts written by untrained writers unsatisfactory. Most of the programmes were monotonous, most schools were non-users and others had neither any arrangement nor guidance for the students. Singh and Shukla (1980) investigated the extent of radio utilization in the schools of Delhi and found that there was no attempt from the broadcasting division to train script-writers. Of the schools having radio sets, only 14 per cent made any use of such programmes. An alarming 40 per cent of the programmes had no relation with the syllabus. A 17 per cent learning gain was recorded, mostly on factual information and not in terms of vocabulary and concept formation.

Of the two studies on educational television in the present survey, one was concerned with the extent of utilization and the other with the potential of radio and TV for second language teaching. Phutela (1982) found that many teachers of Delhi did not find the TV lessons useful and in any way different from ordinary classroom teaching. The lessons were partial in coverage and unable to sustain the motivation of students. The comprehension tests revealed some real differences in terms of learning gains in students but only 38 per cent of the schools having TV even utilised school TV programmes. Paigaonkar (1978) studied the use of radio and television

for second language teaching. The knowledge and skills for utilizing linguistic, psychological and pedagogical methods for second language instruction were lacking in the makers of the programme although theoretical awareness existed. This may be fairly general among language teachers. It is, however, interesting to note that the rural teacher was more aware of the potential of the radio than the urban teacher. Paucity of TV sets did not allow a similar comparison for STV, but if the same trend exists here also, the investment on SB and STV could be justified.

Studies on Programmed Learning

Programmed learning, an educational development initiated by B.F. Skinner, has many roots. One leads out to the tutorial system with one-teacher-one-student situation, where teaching is conducted by questioning, listening, explaining and correcting in such a way as to match the pressure of teaching demand as precisely as possible to the learning capacities and knowledge of the student as evident from his responses. Another root is traced out to the work of psychologists like E.L. Thorndike at the beginning of the present century where attempt to understand the process of learning led to formulation of many postulates for facilitating it. The names of Pressey, Crowder, Lumsdain, Tyler and Gagne are also intimately associated with programmed learning. Thorndike envisaged a book which by a miracle of mechanical ingenuity, would be so arranged that only after the student had completed what was directed on page one could see page two and so on. Pressey's first teaching machine allowed the student to proceed to the next step only when he had answered the first set of multiple-choice questions correctly. Skinner gave a more concrete shape to the idea by a step-by-step programme through his teaching machine and later in a neatly designed book, and developed what is now known as the linear programme. It consisted of dividing the instructional material to small, easily manageable steps and allowing the student to learn with active participation and little or no error which would be verified immediately afterwards. Crowder offered another system through his branching programme where the student after a bit of information had to select his answer from a set of multiple choices and each time he is directed to a different set of instructions, some reinforcing his answer and going further to a fresh set of materials and multiple choices and some others analysing his mistakes and then redirecting him to start all over again. This may be presented either through a press-button system with a viewer or

through a 'scrambled book' where the pages are marked according to the direction of learning against one or the other alternative. Another approach to programming was Gilbert's 'mathetics' which after analysing the stimulus and response systems of a particular learning programme directs the student through a process of 'backward chaining', giving the final, finished task first and gradually allowing the student to fill up chunks of details. Another alternative approach is an adjunctive programme. The adjunctive programme looks rather like the short chapters of a book, each containing coherent inter-connected and inter-dependent set of facts and concepts. From carefully selected components of knowledge the chapters are broken down to short paragraphs. After reading through these the learner answers a set of objective questions (the adjunctive section). If correct, he goes on to the next chapter. If not, he is referred back to that particular paragraph which corresponds to his mistakes. The algorithmic programme is based on charting out the information inputs of a subject-matter into a series of flow diagrams. The 'information mapping' system tries to organize a page through break-up of paragraphs, print, make-up, colour and other devices into central and secondary concepts placed in terms of their interrelationship. However, the principle that is basic to all forms of programming is to create a coherent body of knowledge based on careful analysis of the objectives, custom-built for a particular set of students and give the student a chance to actively participate in the process of learning, allowing him to test himself without any aid from anyone and to know where he stands. experiments throughout the world have shown the advantage of the programmed approach in that it can save half the time and teach better than any other method known so far.

Researches in India on programmed learning have so far been confined to (i) programmed approach *vis-a-vis* traditional approach to teaching, (ii) different forms of programmed learning material, (iii) different uses of such materials, (iv) programmed learning for different subjects, (v) programmed learning and instructional media, and (vi) programmed learning and individual differences. Using the intergroup comparison method, the experimental group entirely exposed through programmed materials and the control group through traditional methods, the studies of Shah (1964), Sharma, R.A. (1966), Sharma, M.M. (1966), Desai (1966), Shah (1969) and SIE, Ahmedabad (1970) had revealed a higher achievement of the group exposed through the programmed approach. These findings cut across different subject-matter and class levels. From the studies of

Sharma, M.M. (1966), Kulkarni (1969) and SIE (1970) it was confirmed that not only immediate learning gains as measured by the posttests were higher for students working through programmed materials, but also their retention scores were better. In another variation of her study, Shah (1964) had three treatment groups, one with programmed material to study independently, a second getting help from the teacher to work through the programmed material and the third taught along traditional lines. The second group was not better than the first in attainment. Desai (1966) had found that students preferred programmed approach. The superiority of programmed materials in terms of achievement in physics (Pandaya, 1974) and languages (Reddy, 1975 and Mehta, 1973) was empirically established. As to different modes of presentation, Shah (1971) had examined four different modes in a programmed material on directed numbers and had found that the 'response prompt mode' where pupils had to read the answers provided in the blank, was the most effective in terms of immediate posttest score. This was also the least time-consuming. To Shah's (1971) list of modes, Krishnamurthy (1972) added three more response modes including branching style as well as two styles devised by himself — skip programmes and hybrid (combining linear and branching styles) — for his programme on 'thermometer'. Like Shah (1971) he concluded that the covert answer prompt form was the most effective, for students' immediate achievement. On the other hand, Kulkarni and Yadav (1966) found no difference among linear, branching and a programme without immediate knowledge of results. Gupta (1973) studying the interaction between step size and response mode found that the small step was more effective with overt response and showed the least retention, while the large step was good for correct response and showed high retention. Singh (1973) found that thematic prompts were more effective than formal prompts for a geography programme. Gupta (1965) had shown that an adapted programme on force was as good as the original and was better for students of lower ability.

Programmed materials could be useful in revision (Kulkarni, 1969 and SIE, 1970), for remedial teaching (Joshi, 1972; Shah and Kapadia, 1972) and as correspondence lessons (Mullick, 1964). Programmed materials had been developed in various subjects, e.g., mathematics (Shah, 1964; Shah, 1969; Kulkarni, 1969), English (Shah, 1964; Deval, 1974; Gupta, 1973), biology (Kapadia, 1972), geography (Sharma, R.A., 1966), physics (Hussain, 1971) and educational psychology (Chauhan, 1973). Many more programmed units were

developed in the sequential courses on programmed learning by the NCERT and the SIE, Udaipur, and under other courses. The National Institute of Bank Management, Bombay and the State Bank Staff College, Hyderabad, had printed many programmed units on various banking topics. The P&T Department had printed over 20 programmes for use in the postal training institutes. The products of sequential courses in programmed learning included programmed material developed by officers for the defence services and the State Bank, etc. Under the guidance of NIBM, Bombay, the Life Insurance Corporation of India had also developed programmed materials for their training purposes. Even though no doctoral research has been conducted on the basis of these materials, a lot of research has gone into the very development of such materials while validating them.

Eighteen studies have been reported in the present volume either partially or fully related to programmed learning. Of these, five are concerned with the comparative effectiveness of programmed learning in comparison with either conventional teaching or more innovative methods, ten with the development of programmed materials in various subjects, two with the relationship of personality characteristics and two with different modes of presentation of programmed materials. Two of the studies were concerned with an optimal strategy for multimedia programmes. The systems approach has also attracted one research. That is a good sign for many reasons. The prohibitive idea of converting an entire school programme into programmed lessons was never accepted anywhere. In a sense, the best means of survival for programmed learning is in relation to other methods and media, which is contained in the systems approach.

Mullick (1979) compared a multimedia programme with a book format programme for the same content. His study covered 204 students of Class V and 240 students of Class VI. He had six matched groups on the basis of intelligence. Besides posttest, he administered a retention test. Either format was viable for teaching science. The multimedia programmes were quicker for recall of terms, comprehension, application, drawing and teacher-made tests, but the book format was better for spelling and for lower-level students in English and general science. The sample drawn from English-medium schools might be a little biased towards the upper socio-economic status. Perhaps the study should be fruitfully verified in samples drawn from schools with other languages as media of instruction.

Kumar (1981) conducted an experimental study hav-

ing three methods and two levels of intelligence in a 3×2 factorial design. He had two groups of 90 students each, of Classes IX and X, and exposed one group to the programmed learning method and the other to the multimedia method. The latter tended to be more effective than the programmed learning method.

Shah (1980) developed a system of four components for the course on educational evaluation at the B.Ed. level. The study was conducted for two consecutive years and the strategy was found to be effective for three components, programmed learning material, discussion and practical work, whereas 'library work' was not effective. Programmed approach being mainly self-instructional, one wonders whether a rejection of library work is compatible with the basic values of this method.

Bhusan and Goswami (1978) conducted their investigation on 50 Class VIII students drawn from English-medium public schools having three groups of students at three levels of intelligence with a view to comparing linear programme and a structural communication strategy. Having a $2 \times 3 \times 3$ factorial design they concluded that structural communication worked well and, as might be expected, the high and the middle intelligence groups performed uniformly higher at knowledge and the higher objectives. The structural communication strategy proved steadily superior for the higher categories in the Bloom's hierarchy.

Seshadri (1980) developed a linear programme of 2074 frames for mathematics for Class IX. The entire syllabus as also a whole academic year was covered. She found that the strategy having PLM as its major component worked better.

These comparisons are no longer confined to exploring the effectiveness of the programmed approach. They tend to analyse it along with other alternative forms and sometimes even hit upon better alternatives.

The studies pertaining to subject-matter areas have a great concentration in science and mathematics. These have been popular with the programming probably because they are not descriptive (Shah and Kulkarni, 1979) and also because they pose some unique problems for teaching. The approaches for teaching these subjects have had some quick changes recently which partly justify the explorations of alternative teaching strategies.

Six of the studies are concerned with mathematics at various levels and one with physics. Inamdar (1981) developed a programme on simple interest for Class VII. Conducting his investigation on 108 boys and 100 girls in twelve class periods, he found that the programmes fared better than the conventional method.

Shah (1981) found that the programmed materials for

Class V on integral numbers, factors, HCF, LCM, fractions, addition and subtractions of factors, decimal fraction, ratio and proportion, profit and loss, average, line segment, ray, angles, angle types, area, square, rectangle and parallel lines were effective and acceptable. They were covered in a total of 24 hours and 40 minutes.

Pandey (1980) covered a sample of 60 students of Class IV of the Central School, Samchi (Bhutan). He found that the programmed text was superior to other methods and that the high and the low income group students following the programmed text were distinctively superior to those who had traditional teaching with home assignment and grading.

Trivedi (1980) developed branching style programmed material in mathematics for Classes V, VI and VII. For Class VI the programmed learning material was more effective than the corrective teaching and for Classes V and VII both the methods were equally effective. The Class VI girls learnt better than the boys whereas in the other two classes there was no difference between the sexes.

Suthar (1981) developed algebra programme for Class VIII covering set theory, rational numbers, real numbers, powers and indices, equations and problems, and graphs. Study habits, attitude towards mathematics, learning abilities, motivation towards school, learning and entering behaviour were also analysed. The programmed learning material emerged superior irrespective of different variables.

Man (1981) studied the effect of unit test scores and retention following the programmed material in a segment of physics. He had a sample of 762 male students. One group had unit tests, the other did not. He found that the immediate retention of students going through PLM with tests was better. As might be expected, the immediate retention was higher than the retention after a gap of one week and six weeks and those who had taken unit tests after PLM fared uniformly better.

Parlikar (1979) studied the suitability of programmed learning in home science with 135 students of Class IX, preparing PLM for self-studies and PLM as an aid to lecture method. It was more suitable, both as self-study and supplement to lecture. The high achievers found PLM for self-study more suitable. Other auxiliary variables, e.g., intelligence, socio-economic status, etc., were also analysed.

Mavi (1981) developed a programmed text in physical geography for high school students and covered 124 students of Class IX. Ninety-five per cent of the learners answered correctly 95 per cent of the 1,391 frames, and in the unit tests scored between 85 per cent and 91 per

cent.

Jeyachandran (1980) studied the efficacy of programmed filmstrips for teaching history to secondary school children. The sample had 450 boys and 315 girls from Madras city divided into three groups, one having the teacher and the programmed filmstrips, the other with only the programmed filmstrips and the third a control group with the conventional method. It was found, among other things, that the programmed materials were more effective and that higher cognitive abilities could be developed through the PLM. However, the retention was more when the teacher was also present, in which case knowledge, understanding, application and skill were distinctly better. The study also used 'group pacing' and had revealed its feasibility. This should be encouraging from the economic point of view. Group programmes had been employed earlier by G.B. Krishnamurti for health education and this in itself could be worthwhile for other researchers to investigate in depth.

Two studies by Sharma and Ahiya (1978) and Ahuja (1978) explored the interaction of personality characteristics of anxiety over and above the effectiveness of programmed approach. Ahuja did not find a significant effect of anxiety on the performance of 95 students of English-medium girls higher secondary schools. He also compared the effect of immediate and delayed feedback where no difference was detected. The performance at the knowledge level was maximum and less at the comprehension and application level. The categories of objectives had no interaction with anxiety of feedback tactics. Taken together, however, anxiety, feedback and categories of objectives had an effect on performance independent from each other. Sharma and Ahiya (1978) analysing the performance of 64 girl students of science drawn from English-medium higher secondary schools working through a linear programme in chemistry found that the performance of the low anxiety group was the best followed by that of average anxiety group. These two findings raised doubt on the very validity of the question of the effect of non-intellectual personality variables on performance in the programmed material. The issue is open for further probing. Anxiety scales have been developed and standardized in India. These may perhaps be used profitably to explore different categories of anxiety. A free floating anxiety may have a different kind of effect compared to other forms of anxiety. Other personality characteristics, e.g., security-insecurity, depression, dependency, extraversion, introversion, etc., have not been adequately enquired into so far. Some of these have established relationship with

academic achievement by different researchers already, thus providing a criterion on the basis of which one would choose personality factors for studying the effects on the performance of people through programmed material.

Modes of presentation had attracted two studies, of which Sharma (1982) compared linear branching programme on pollination in angiosperms with and without prior knowledge of objectives, and Davies (1982) studied the effects of different modes of pairing in programmed learning of mathematics on the performance of underachievers.

Sharma (1982) had 100 boys and 100 girls of Class X for his study and divided them into four groups of 50 each. Using 2×2 simple factorial design he found that the branching programme with prior knowledge of behavioural objectives was the most effective and the linear programme without knowledge of behavioural objectives was the least effective. Davies (1982) had 1,092 students for Class IX drawn from nine urban and one semi-urban schools. The underachievers in mathematics were identified using two scores in an achievement test as well as the predicted scores in an achievement test from an intelligence test. The underachievers, 105 in number, were grouped with abler students in three ways — mixed ability, teachers' choice and students' choice and learnt the programmed materials in dyads thus fixed. Posttests and retention tests were administered later. The most effective were the mixed ability pairing and teachers' choice pairing. It may be interesting to note that where intelligence and school background were controlled, the different modes of pairing by themselves were effective in improving underachievers' performance. Other variables like locality, sex, etc., were also analysed. This study also revealed an eagerness for economising as also a step forward towards group programmes. It is also a healthy trend to build in more and more humanistic approach for using programmed learning, thus far accused of a rather mechanistic and dehumanizing approach.

In comparison with other methods, the programmed learning may be found effective (Kumar, 1981) and also less effective for some students. It has its own strengths and weaknesses like every other method. However, one often wonders whether such a lot of scrutiny has been exercised on any other method or approach to teaching. It may ultimately be good for the programmed approach to have had as many examinations from so many angles. What is more important to bear in mind is that there might be good programmes and bad ones, and from such a situation a singular conclusion, either way, about the

method itself may be unwarranted. If, however, a number of studies are combined, a broad-based generalization points out the efficacy of the approach of programming.

Micro-teaching

Micro-teaching has emerged as a very powerful movement for teacher education in India. Beginning from the work of Dwight Allen of Stanford University, it had attracted quite a bit of research attention both in the U.S.A. and the U.K. In India, micro-teaching came in a big way to technical education. The Technical Teachers' Training Institutes of Madras and Chandigarh came forward to practise it for teacher training almost on a daily basis. Soon afterwards, attempts to delink micro-teaching from the expensive equipment like VTR was made at Chandigarh, Baroda, Indore and at the Department of Teacher Education and the Centre for Educational Technology, NCERT. Low-cost equipment was successfully tried out for an Indian model of micro-teaching.

Micro-teaching tries to divide teaching in smaller and manageable chunks and allows opportunity for the teacher to plan, teach, reteach and replan teaching and develop teaching skills like questioning, communication, management, etc. There are a number of studies in this innovative training method discussed elsewhere in this volume.

Toys and Models

Sastry (1982) used toys, models and figures based on the concepts in the primary science curriculum for teaching science to children. He exposed his experimental group only to these for a whole academic year, orienting teachers for the purpose. He allowed children to play with the toys, which was followed by discussions initiated by the teacher. He found that the experimental group fared better than the control group in a posttest, although an equal number of students passed from the latter group. For the former too, the time required initially was reduced, a better rapport developed and attitude and interest towards science was better.

Since children will have to be motivated for learning and toys provide this eminently, perhaps a lot more attention should be given to utilization of toys for the entire primary class teaching. The NCERT has financed two projects in the areas of low-cost teaching aids and teaching aids from waste materials. Such explorations may be far more rewarding if done for many subjects together and in different modes of presentation. One

could, for example, think of a paired teaching strategy with a senior batch of students teaching the juniors with the help of toys, when both would be enjoying their bit of roles. Also, the same set of toys may be creatively used for science, literature, mathematics and other subjects.

Distance Teaching

Many universities and the Regional Colleges of Education, NCERT, are now offering correspondence-cum-contact programmes for teacher training. These are other correspondence courses for science, arts and commerce too. Other institutions like the Patrachar Vidyalaya, Delhi and the Open School (CBSE) are engaged in providing school education to those who have been deprived of such opportunities.

Biswal (1980) surveyed the institutes of correspondence courses in the Indian universities with respect to enrolment, staffing, courses offered, orientation, assignments, operational problems, costs, motivation, socio-economic status of students, etc. He compared the achievements of these students *vis-a-vis* those of the conventional formal education system. Enrolment was greater in arts, commerce and B.Ed. courses. He found no significant difference in the academic achievement between correspondence and conventional system, although the motivation level of the former was below normal. In a study of the correspondence education programme of the Patrachar Vidyalaya, Delhi, it was found that most of its students were of a lower socio-economic status and joined it due to non-availability of admission or failure in regular schools or guardian's preference, etc. Some found printing errors in the lessons, some were not aware of the requirement of sending response sheets and some never sent any; some did not get back any corrected answer sheets, some did not get any comments, and some did not know of the contact programme. These were indicative of the lack of proper planning and execution and the same adhocism as was found in the case of school broadcast programme. Although correspondence education is a powerful tool and could solve some educational problems, its misuse or abuse is also likely to result in a terrible lot of waste.

Saini (1979) studied distance teaching for a specific target group for a specific purpose and found that minimal technological information could be comprehended by farmers with middle and secondary level of education, who also could use improved field practices as a result.

Research Needs, Problems and Issues

So far, the use of educational technology has been of a

short-term experimental character. In the absence of rigorous training programme in the area, research guides are also few and far between. The time is ripe for a full-fledged postgraduate course in educational technology, provided it remains reasonably free from the diploma disease and concentrates on the signal service that educational technology can give to education. This can be possible only if a business-like approach could be taken.

There are many areas where almost no attempt has been made of even exploratory research. Among them the first instance is of the use of computer-assisted or computer-managed instruction or the latest form computer-assisted learning (CAL). Computers are no longer just dreams. The country is already flooded with computers. The possible use of microprocessors for instruction is a reality now since India has already about 6,000 microprocessor systems in operation and has authorities established for facilitating the manufacture of microprocessors. It might have great potential for literacy programmes. India has a good number of highly trained people in the area, but so far, beyond a bit of data processing the computer has not been used for instructional purposes. There have been some interesting developments with regard to the use of microprocessors for formation of the scripts of a few Indian languages like Tamil and attempts at machine translations, etc. in institutions like the Tata Institute of Fundamental Research and the Indian Institute of Technology, Madras. Educational technologists should not shy away from computers any more because at the turn of the century it is estimated that there might be as many chips as people.

There are quite a few missing pieces in the jigsaw puzzle of educational television in India. The experiences of the Satellite Instructional Television for Education (SITE) during 1973-74 has not been fully examined. The programmes made out for the INSAT 1A and 1B, respectively, could also use some review and analysis from the educational technology point of view. The school broadcast and the television programme available should be treated with the same rigorous evaluation without wasting further time on polite exchange of praises. Ways of coordinating audience profile research, educational schedules in schools and product of school television programmes would require nothing less than the systems approach. An attempt should be made to optimize the utilization of such expensive programmes. In order to meet the time-lag, a 'learning centre approach' where students could come and have the video lessons could also be tried out. Video libraries are cropping up in every market place and this approach could

even be commercially profitable.

Scripts and rendering of school broadcast need a research base. Also since cassette recorders are cheap, these programmes could easily be accumulated in the form of audio libraries in the schools where students could even borrow cassettes for their use. Research could reveal the effect of such libraries on general achievement as well as on various categories of cognitive objectives. Both ETV and school broadcast should be used for teacher training at all levels.

A large gap exists in the researches on language laboratory. Very high claims were available from its users for some time, without much empirical foundation. It will be advisable to enquire into its effectiveness for language teaching with due regard to quality. Many language laboratories set up with great expense have been found to be lying unused or underutilized. On the other hand, they are put to great deal of use by a few institutes here and in countries like Japan. Language learning is crucial for a multi-lingual country and teachers for second language need as much fluency as the native speakers — a feat almost impossible without proper and judicious use of the language laboratory.

Simulation techniques are also neither seriously taken up nor enquired into whereas their potential for technical and vocational education cannot be over-emphasized.

In programmed learning, more emphasis should be given on a systems model and the materials should be more and more cognitive in nature. The experiences of England, Australia, Canada, Japan and a few Afro-Asian countries should be relevant in this context over and above the American findings. One feels that a broad-based perspective should be first created in every university department under which individual researchers should work on one segment each. The product could thereafter be combined for later use and the coverage could be large enough for generalisation. Also a centralized repertoire of programmed materials already developed and validated must start on a campaign basis, if possible by professional bodies. Many accepted programmed materials need to be adapted. Such adaptation would naturally require skilled translation as well as validation.

Educational technology should play a role in non-formal education, vocationalization of education, education for disadvantaged persons and the disabled. The last mentioned area remains largely untrodden by educational technologists, whereas as a great deal of challenge awaits them there (Pandit 1981, Siddiqui 1981, Chakrabarti 1981, and Krishnamurthi 1981). Recently, the

Department of Education in Science and Mathematics, NCERT, has undertaken a project for making teaching of science practicals feasible for blind students. Many more attempts of this nature would be necessary in all categories of disabilities, including mental retardation.

'The modular approach' has been much talked about than investigated. It has its own strengths for teaching. Some attempts are available in technical teachers training and management institutes but very little has been done in this regard for school subjects. The Department of Education in Science and Mathematics, NCERT, has a project where material for biology has been developed under this approach, but it would take time for the final report of this project to be available.

'Mastery learning' is another neglected area. If a nation is keen on the pursuit of excellence and qualitative improvement of education, mastery at every level must be the objective. This is particularly true for science and technology. An attempt in this direction has been initiated by the Department of Science and Mathematics, NCERT, for teaching physics under an individually guided system of teaching, where twenty-three units of physics for Class XI have been carefully prepared along with tests, gradually building up the concepts, application and skills in solving problems with high accuracy. A similar project has been taken up for mathematics also. Although these materials are highly structured and meticulously devised for self-instruction, they are by no means similar to programmed material. The initial experience of tryouts has been satisfactory and demands for more copies of the programme are pouring in.

The personalized system of instruction (Keller Plan approach) has remained quite untouched by educational technologists in India. It has great potential and many educational uses, and is worth investigating along with other components.

What form of educational technology could be used for practical work or other psychomotor educational activities? How should it be used for attitude change; for instance for the purpose of national integration, value-orientation, character-building, moral education and so forth? Time has come to step into the affective domain in a big way. Educational technology should not fight shy of such a challenge. To the extent possible, special packages in these and other important areas should be developed, validated and disseminated. If there is a strong research base, there will also be great force in such packages. Story-telling, sculpturing, creative-writing and all sorts of apparently impossible attempts have succeeded earlier. Thus this challenge also ought to be met.

Educational technology has so far been confined to

schools and, rarely, to colleges. Training for higher forms of intellectual activities, e.g., executive development programmes, decision-making processes, etc., have remained only in the background. The possibility should be explored. It may, however, require a different kind of educational technology, with components like experiential sessions, team building and structured group experiences, etc., borrowed from other sectors of education and training.

It is also time to get into the so-called 'metacognitive' areas where mental habits like learning to learn, ways of

systematic thinking and other higher functions are included. It would require a little more understanding of these phenomena, the nature of intellectual functions and so on. Creativity and problem-solving are also strong challenges for educational technology where some work is already in hand with evidence of feasibility (Misra 1975). Rather than action by fits and starts, all these will have to be probed deeper by a number of educational technologists drawn from all over the country. An active dialogue in these respects should be initiated, resulting in a clear perspective plan, which should then be followed by individual and institutional research.

ABSTRACTS : 912 — 949

- 912. BISWAL, B.,** *Developing Strategies for Effective Utilization of School Broadcast Programme in Orissa State*, Ph.D. Edu., MSU, 1980

The main objectives of the investigation were: (i) to study the school broadcast programme (SBP) in terms of instructional objectives, number of programmes broadcast, content coverage, script-writing and quality of the programmes, (ii) to study the facilities provided by the high schools of Orissa for the use of school broadcast, (iii) to develop and try out instructional strategies for the effective utilization of school broadcast programmes, (iv) to compare the effectiveness of the developed instructional strategies with the radio broadcast alone, and (v) to study the reactions of students and teachers towards the strategy.

The study was conducted in two phases. In the first phase, the survey of the status of the school broadcast programmes, the development, tryout and modification of the instructional materials were done whereas in the second phase, the effectiveness of the strategies was studied. The All India Radio, Cuttack, and the schools listening to the broadcast programmes were the samples of the study. In order to study the facilities and reactions, questionnaires were developed and used by the investigator. Criterion tests were developed to measure the achievement of the students. In addition to this, a proforma and unstructured interviews were also used to collect data. The data collected were analysed qualitatively and by employing certain statistical techniques like analysis of variance.

The major findings of the investigation were: (i) The objectives of different subjects of the school broadcast programmes had remained the same throughout the academic years 1975-76 to 1979-80 and the objectives for most of the subjects were not in specific terms. (ii) The number of broadcasts for particular grades was less and for Grade X there was no programme. Also, several subjects were neglected. (iii) Experts were not given training in writing scripts for radio lessons and they felt that teachers in the schools did not know how to make use of SBP. In most of the programmes clarity of speech was there but due to the lack of novelty the programmes were not interesting. (iv) Among the respondents, 62 per cent of the schools had been found not using SBP. (v) Wherever the programmes were used, there was no systematic arrangement to sit, and no guidance was

given to students about the use of SBP. Even teachers were not trained to make use of SBP. (vi) Teachers also expressed that there was need for special radio work-books. (vii) Teachers felt that English lessons were difficult for students to understand. Students had interest in listening to radio lessons and half of the students expressed the desire to have radio lessons daily. (viii) Students' achievement was found to be above 56 per cent in two programmes, above 60 per cent in ten programmes and above 70 per cent in four programmes which were selected for this purpose. (ix) The strategies developed for effective utilization of SBP were significantly effective when compared to the radio broadcast alone. Students and teachers favoured the strategies. (x) The strategies were feasible in terms of time, schedule and cost involved.

- 913. BISWAL, B.N.,** *A Study of Correspondence Education in India*, Ph.D. Edu., MSU, 1979

The objectives of the investigation were: (i) to survey the institutes of correspondence courses in Indian universities, with respect to enrolment, staff pattern, courses offered, orientation programme, assignment, etc., (ii) to make a comparative study of academic achievement of the students of correspondence education with that of the students having formal education, (iii) to study the reactions of the students of correspondence education on different aspects of the system, (iv) to study the unit cost of correspondence education and formal education, (v) to study the academic motivation and socio-economic status of the students of correspondence education, and (vi) to study the operational problems faced by the heads of departments, the teachers and the students of correspondence education.

All the directorates of correspondence education constituted the sample for the survey whereas the Punjabi University and the Madurai Kamaraj University were selected for studying the academic achievement. To study students' reactions, 500 students from H.P. University and 40 students from Kashmir University were selected. In order to study the unit cost, 10 universities were selected. For studying academic motivation and socio-economic status (SES), a sample of 500 students was selected. To study the problems of the system all the heads of departments, 250 teachers and 500 students were selected as sample. The data were collected with the help of two questionnaires, two proformas, a rating scale developed by the investigator and two standardized tools, namely, Junior Index of Motivation and

SES scale by B. Kuppaswami. Data were collected by meeting the directors, the heads, the teachers and the students, by mailing the tools to the students and by looking into the various office records. The data so collected were analysed qualitatively, employing the statistical techniques like t-test, chi-square, etc.

The major findings of the investigation were: (i) The establishment of correspondence education in India had been a gradual process. (ii) The objectives of correspondence education had remained more or less the same as specified by the Expert Committee on Correspondence Education (1961) and the Education Commission (1964-66). (iii) It offered courses in arts, commerce and social sciences, both at undergraduate and postgraduate levels. (iv) On the academic side, staff pattern was similar whereas on the administrative side, it differed. (v) Enrolment was greater in arts, commerce and B.Ed. courses than in social science courses. (vi) Admission procedure for correspondence education had been liberal. (vii) Except the Punjabi University and the Regional Colleges of Education, no other institution arranged orientation programme for its students. (viii) All the directorates provided essay-type written material to students and gave importance to the assignments. (ix) Almost all the directorates conducted personal contact programmes. (x) In addition to the staff of the directorate, teachers from outside were also involved in conducting the various academic activities. (xi) Each directorate charged fees from its clientele. (xii) The Kashmir University was the solitary exception to have given scholarships to its students and four other directorates offered freeships to the students. (xiii) About 40 per cent of the directorates received the UGC grants and only 28 per cent of the directorates received the State Government grants. (xiv) About 68 per cent of the directorates had adequate accommodation. (xv) There was no significant difference in the academic achievement of the students of formal and correspondence systems. (xvi) The unit cost in formal education was much more than that of correspondence education. (xvii) The academic motivation of the students of correspondence education was found to be below normal. (xviii) Most students of correspondence education hailed from the second category of SES. (xix) The heads of departments in the directorates of correspondence education felt that suitable teachers were not available to them for the development of instructional material. (xx) The teachers of correspondence education felt that the workload was more due to which justice to the work was not possible.

914. DAVIES, J.L.E., *Effects of Different Modes of*

Pairing in Programmed Learning of Mathematics on the Performance of Underachievers, Ph.D. Edu., Madras U., 1982

The main aim of the study was to test the differential effects of the three pairing modes in programmed learning, namely, mixed ability pairing, pairing based on teacher choice and pairing based on student choice, on the achievement of underachievers in mathematics.

The sample consisted of 1,092 students of Standard IX drawn from ten randomly selected schools, nine in the city of Madras (urban) and one in Arkonam town (semi-urban). An achievement test in mathematics, questionnaires on interest in mathematics, participation in extra-curricular activities and academic self-concept (developed by the investigator) and a general intelligence test, study habits inventory, personality test, socio-economic status scale and adjustment inventory (adaptations of standardized tools) were used to collect data. A programmed learning booklet in the linear style on the unit 'statistics' in Tamil was prepared and validated. Apart from descriptive statistics, t-ratio, F-ratio, chi-square, analysis of covariance, multiple regression and factor analysis were used for data analysis.

The underachievers in mathematics were identified by using the predicted scores in mathematics based on the intelligence test scores and the actual scores on the achievement test in mathematics. The students whose actual achievement in mathematics fell short of their predicted scores by at least two stanines were designated as underachievers in mathematics and 242 underachievers were thus identified from the 1,092 students. Of these, 105 underachievers were involved in the experiment. The underachievers were grouped with able achievers in three ways, 'mixed ability', 'teacher choice' and 'student choice' pairings. The underachievers and their partners learnt the programmed unit in the 'dyads' formed. The underachievers were helped by the able peers whenever necessary. The experiment went on for two weeks in each school. A posttest was administered after the paired programmed learning of the unit was over and again after a lapse of three weeks without prior intimation, to test their retention.

The main findings of the study were: (i) Underachievers had 78 per cent individual gains. (ii) Underachievers in 'teacher choice' and 'mixed ability' pairs gained significantly in the posttest and had significant residual gains (favourable shift) over the predicted level of performance in mathematics. (iii) Underachievers in the 'student choice' pairs had a mean gain ratio 0.49 and they missed the significance level by a very narrow mar-

gin. (iv) In the semi-urban school, underachievers in all the three pairing modes gained significantly. (v) Among the urban school groups, only those underachievers who were in 'teacher choice' and 'mixed ability' pairs gained significantly. (vi) When intelligence and school background were controlled, the different pairing modes were by themselves effective in improving the performance of underachievers in the posttest, with the teacher choice and the mixed ability modes being significantly more effective than the student choice mode. (vii) The two-way analysis of variance of mean gain ratios of the underachievers in the urban and the semi-urban schools indicated that there were significant differences between the gains due to (a) the pairing modes, in favour of the semi-urban school group, and (b) the interaction effects, in favour of the 'teacher choice' pairing in the semi-urban group. (viii) A similar analysis of the effects of the pairing modes and sex indicated that there were significant differences in the gain ratios of the underachieving boys and girls in 'mixed ability' and 'student choice' pairing in the urban schools in favour of girls. (ix) The able partners in the dyads had not only maintained their original attainment levels in mathematics but had also significantly gained over these in 'mixed ability' and 'teacher choice' groups. (x) Underachievers and their able partners had developed positive attitudes towards the dyadic approach to programmed learning.

915. GOEL, D.R., *A Study of School Broadcasts in India*, Ph.D. Edu., MSU, 1982

The objectives of the investigation were: (i) to study the functioning of school broadcast units with respect to different aspects of the programme such as transmission, script preparation, etc., (ii) to find out the extent of utilization of school broadcasts in schools, and (iii) to explore the possible role of colleges of education in the scheme of school broadcast programmes.

For studying the functioning of school broadcast units, all the 35 stations of AIR producing school broadcast programmes were included in the study. Out of these, eight stations were visited personally for in-depth study. Five script-writers from each radio station were contacted. The extent of utilization was studied by contacting schools in the State of Haryana. Data were collected by using different questionnaires for producers of school broadcasts, script-writers, students, teachers, headmasters and principals of colleges of education. A school broadcast observation schedule was developed

by the investigator for recording observations with respect to school broadcasts. Unstructured interviews were conducted with producers, students, teachers and headmasters. The data were analysed by using frequency distribution, percentages, etc.

The major findings of the investigation were: (i) Coordination between school broadcast units and state departments of education in different states in organizing school broadcasts was not adequate. (ii) The objectives of particular programmes were not enunciated at most of the school broadcast units. (iii) A very limited portion of the syllabus was covered through these programmes. (iv) The majority of the scrip-writers (78 per cent) received no training in preparing scripts. (v) In none of the schools was there provision for school broadcast period in the time-table. (vi) The majority of the principals of colleges of education thought it advisable for the pupil-teachers to listen to the school broadcast programmes and offer suggestions to the AIR for improving these programmes.

***916. GOLANI, T.P.,** *The Use of Audio-visual Aids in the Secondary Schools of District Thane*, Ph.D. Edu., Poona U., 1982

The objectives of the study were: (i) to create awareness among teachers and headmasters of secondary schools about the importance of audio-visual aids, (ii) to help in raising the academic standard in secondary schools of Thane district, (iii) to know the existing situation regarding audio-visual materials in the secondary schools of Thane district, (iv) to elicit the opinions of headmasters and concerned teachers about the measures for providing better and improvised materials on audio-visual education, and (v) to present these measures in the form of concrete proposals and their implications for secondary schools as well as for the professional courses in training teachers and preparing materials for audio-visual aids in education.

The methodology consisted of library study, empirical survey through questionnaire, interview, visits and observation and field experiment. A survey was conducted in 217 secondary schools in Thane district. Experiments were conducted in 20 schools to demonstrate the advantage of using audio-visual aids in teaching subjects like social studies, mathematics, sciences and languages.

The findings of the study were: (i) According to the opinions of the secondary schools under survey, the teaching aids were essential and useful in developing clear concepts and in stimulating learning. (ii) The

audio-visual aids being expensive, the schools could not afford to purchase them. Sophisticated aids, like tape recorder, radio, television set and projectors, were out of the question in many of the schools as they were exorbitantly costly. (iii) Audio-visual aids were not easily made available whenever required. (iv) Due to difficulty of transport facilities in rural areas, the audio-visual aids were not available even on loan. (v) The use of audio-visual materials could be increased if teachers were allowed some free time for the location and preparation of requisite materials; because they had to perform many other duties in addition to teaching, they did not usually find time. (vi) Because of non-availability of trained personnel in audio-visual education, there was lack of guidance and assistance to the teachers; not a single school had employed a specially trained teacher for this purpose. (vii) Some schools had projectors, but few films and due to non-availability of technicians, the projectors were lying unused. (viii) Accommodation was a problem of every school in the district; laboratory and teachers' common rooms were used for storing the materials. (ix) For want of accommodation, some schools used laboratory and classrooms for showing films and filmstrips on the projector. (x) Very few schools were having an auditorium of their own, but it was hardly used for showing films; on the contrary, some class arrangements were made in the hall, due to shortage of classrooms. (xi) There was no incentive of any kind to the teacher for using teaching aids. (xii) Schools promised to use modern teaching aids in the near future, if they got monetary support from the Government. (xiii) The fullest value of the teaching aid could be realized only when the teacher was thoroughly trained to use it to the best possible advantage. (xiv) Better results in the field of audio-visual aids could be achieved only if the Audio-visual Education Institute took up this problem with the Government, through the State Institute of Education, Pune, and provided a good service to the secondary schools as early as possible. (xv) The students learned better when audio-visual aids were used and they also sustained more interest in the learning activity with audio-visual aids than without them.

917. INAMDAR, J. A., *A Study of the Effectiveness of the Programmed Learning Strategy in the Subject of Mathematics for Standard VII in relation to Some Psychological Correlates*, Ph.D. Edu., SPU, 1981

The thesis aimed at studying the effectiveness of the programmed learning strategy in the subject of

mathematics in Standard VII.

The topic for study was the unit on Simple Interest. The material was developed and validated. The candidate selected seven students from three schools, of whom three were bright, three average and one dull, according to their achievement in the previous examination. The material was tried on thirty students of Standard VII. An entering behaviour test was given to the students. The experimental and control groups were formed on the basis of this test. The sample consisted of 108 boys and 100 girls in the experimental group and the same number of boys and girls in the control group. The experiment was conducted in twelve periods. The performance of the group was studied in relation to some psychological correlates such as general ability, reasoning ability and motivation towards school. Analysis and interpretation of the data were done to find out the relation between general ability and performance in achievement in the PLM, the relation between reasoning ability and performance in achievement in PLM and the relation between motivation towards school and performance in achievement in PLM.

It was found that the programmed learning technique was superior to the conventional technique.

918. JAGDISH SINGH, *A Study of Correspondence Education Programme of the Patrachar Vidyalyaya, Centre for Educational Technology, NCERT, New Delhi, 1981*

The objectives of the investigation were: (i) to study the characteristics of students of the correspondence course, (ii) to find out the reasons for students preferring correspondence education to regular school education, (iii) to study the process of planning, preparation and dispatch of lesson units to students, (iv) to study the requirement of response sheet assignments and the process of providing feedback to students, (v) to study the organization of personal contact programmes, (vi) to study students' attitude towards three aspects, namely, lesson materials, response sheet assignments and personal contact programme of correspondence education, and (vii) to make suggestions for better functioning of the programme.

The sample consisted of 265 students residing in Delhi of whom fifty-seven were from Standard IX, sixty-five from Standard X, sixty from Standard XI and eighty-three from Standard XII. Data were collected by personally interviewing each student through a structured questionnaire.

The study yielded the following findings: (i) Students in the two correspondence courses were spread over a wide range of age levels—15 years to 37 years. (ii) About 11 per cent and 19 per cent of the boys and the girls, respectively, were married. (iii) Quite a few students belonged to rather low socio-economic status. (iv) In the case of 42 per cent students, there was a time-lag between their leaving a regular school and joining the correspondence institution. In 67 per cent cases, the time-lag was up to four years but in a few cases it was as long as ten years. (v) Students joined correspondence courses due to various reasons, prominent among them were: they were employed or likely to be employed or were required to attend to household chores (48 per cent), non-availability of admission in regular schools (23 per cent), dropouts (12 per cent), guardians not in favour of their attending a regular school (6 per cent) and failure to pass out from the regular school (3 per cent). About 8 per cent respondents gave various reasons like sickness/marriage/pregnancy/lack of time to study, etc. (vi) By and large, the students found the lesson materials interesting and easy to understand. (vii) About 11 to 18 per cent of the students felt that there were printing errors in the lesson materials. (viii) About 30 per cent and 36 per cent of the students of Classes IX and XI, respectively, were not aware of the minimum requirement of submission of response sheets while about 2 per cent students of each class thought they were not required to respond. (ix) The evaluated/corrected response sheets were not received by 23 per cent and 22 per cent students of Classes IX and XI, respectively. (x) About 33 per cent students who received back the response sheets did not find comments of evaluators. About 55 per cent found comments in some cases and only about 12 per cent found comments in all cases. (xi) About 76 per cent students of various classes who were aware of the contact programme attended it at one time or other.

919. JAGDISH SINGH and SHUKLA, S., *A Case Study of School Broadcasts in Delhi*, Centre for Educational Technology, NCERT, New Delhi, 1980

The objectives of the investigation were: (i) to examine the extent of radio utilization in Delhi schools, (ii) to understand the conditions that encouraged or impeded radio utilization, (iii) to study teachers' attitude towards school broadcasts, (iv) to study the process of programme planning and production and liaison between the Directorate of Education and Akashvani in various

stages of programme planning and production, and (v) to study the comprehensibility of radio lessons on the part of students.

A structured schedule was prepared containing a few open-ended questions in order to elicit teachers' comments and suggestions. The field investigators visited every third school out of 532 schools having listening facility of the broadcast. The investigators collected information from the records as maintained by the schools in respect of school broadcasts. The information was also obtained through observation, informal discussions, interviews, etc. Comprehension of programmes was studied by a pre-and posttest design. These tests were administered by the investigators. The data were analysed by using percentages and other descriptive statistics.

Some of the major findings of the investigation were: (i) The Directorate of Education and the Akashvani did little in training script-writers for school radio. (ii) Of the schools having radio sets 14 per cent did not utilize the radio programmes. (iii) Only in 32 per cent cases, there was some proximity in time between radio programme and the teaching of those lessons in the class. (iv) Forty per cent of the radio programmes were not related to the syllabus. (v) Non-availability of programme chart and lack of awareness of radio programmes were some of the difficulties in the utilization of school programmes. (vi) After listening to the programmes, the experimental group gained on all programmes to the extent of 7 to 17 per cent. Item analysis of the tests showed that the students gained very little on word knowledge and concept formation. Most gain was on acquisition of factual information.

920. JEYACHANDRAN, J., *An Experimental Study of the Efficacy of Programmed Filmstrips as a Method of Teaching History in the Secondary Schools*, Ph.D. Edu., MSU, 1980

The objectives of the study were: (i) to develop software materials for the media, and (ii) to validate the developed materials against the conventional teaching in terms of immediate recall and delayed retention in the case of the four objectives, viz., knowledge, understanding, application and skill.

The sample was chosen from nine schools in the city of Madras. All were Tamil-medium schools out of which five were boys' and four girls' schools. The total sample consisted of 450 boys and 315 girls. The subjects were divided into three groups which were taught through three

different methods, namely, teacher with programmed filmstrip, programmed filmstrip without teacher, and the conventional method. Four lessons were prepared on the unit 'Buddhism and Jainism'. Data were collected with the help of achievement tests prepared by the investigator. These tests were administered before the lesson, after the lesson and four weeks later to get the pretest, posttest and retention scores. The data were analysed employing the statistical techniques like Bartlett's F-test.

The major findings of the study were: (i) It was possible to develop programmed learning materials in history. (ii) Group pacing was possible in programmed learning. (iii) Programmed learning material (PLM) could be integrated with audio-visual materials. (iv) PLM could be used through media like filmstrips. (v) Teacher had an important role when self-learning techniques were employed. (vi) Higher cognitive abilities could be developed through PLM. (vii) Learning through PLM resulted in better retention. (viii) Between programmed filmstrip with teacher and programmed filmstrip alone, the former was more effective. (ix) Retention of learning was more in the case of programmed filmstrips with teacher and programmed filmstrip without teacher in comparison with the conventional method. (x) So far as the achievement of different objectives, viz., knowledge, understanding, application and skill, was concerned, it was the maximum in the case of teacher with programmed filmstrip followed by programmed filmstrip and the conventional method in that order.

***921.** JOIS, S., *A Study of the Instructional Radio Users in Karnataka (a Case Study of School Broadcast in Karnataka)*, Educational Technology Cell, Dept. of State Educational Research and Training, Bangalore, 1982

The main objectives of the investigation were: (i) to find out the strengths and weaknesses of the instructional media, (ii) to find out the effective utilization of instructional radio from five districts of the State, (iii) to find out the subject areas that need to be chosen for instructional radio, and (iv) to study the attitude of teachers towards school broadcast.

In this survey, data were collected by administering a questionnaire in two schedules. The data were further validated by personal interviews in some selected schools. Schedule I consisted of general information about instructional radio, and Schedule II was an attitude scale comprising about twenty items. One

thousand schools, randomly selected, responded to the questionnaire. In addition, the heads of the schools were informally interviewed. Percentage analysis was used to analyse the data.

The major findings of the investigation were: (i) The questionnaire was responded to by 55.6 per cent of the institutions. (ii) In all, 65.6 per cent of the institutions possessed radio sets and were using them for instructional purposes. (iii) The percentage of the institutions which did not have radio sets at all was 16.3. (iv) About 3 per cent of the institutions were having radio sets but not in working condition. (v) Reasons for non-utilization were: (a) the headmaster was not allowing them to use, (b) there was no separate time-table for this, and (c) there was lack of accommodation. (vi) The use of this medium was helpful to a classroom teacher. Also, listening to instructional broadcast was not a waste of time. Teachers using the instructional radio programmes agreed that the knowledge of the pupils had improved as a result of their listening to the radio broadcast.

922. KAUR, R., *An Inquiry into the Effectiveness of Self-instructional Audio Cassettes in Developing Teaching Skills among Student-Teachers in a Three Phased Study*, Ph.D. Edu., Pan. U., 1981

The objectives of the study were: (i) to develop instructional materials for the skills of probing, questioning, explaining and illustrating with examples, (ii) to prepare audio cassettes of the instructional materials prepared by the investigator for the above-mentioned teaching skills, (iii) to develop the skills of probing, questioning, explaining and illustrating with examples through self-instructional audio cassettes, and (iv) to examine the effect of self-instructional audio cassettes on the general teaching competence of student teachers.

The sample consisted of thirty-two student-teachers taken from Dev Samaj College of Education for Women, Ferozepur City. The tools used were Raven's Standard Progressive Matrices, Socio-Economic Status Scale (Kuppuswamy), Junior Index of Motivation (Frymier), a questionnaire for student-teachers, self-instructional audio cassettes, Baroda General Teaching Competence Scale prepared at the CASE, and observation schedules for the skills of probing, questioning, explaining and illustrating with examples.

The important findings of the study were: (i) Teachers of both the experimental groups made continuous progress component-wise and as a whole in the skills of probing, questioning, explaining and illustrating with exam-

ples. (ii) The traditional techniques of teaching also helped continuous progress in the performance of student-teachers. (iii) Both the techniques of training — traditional and micro-teaching — were effective in improving general teaching competence of student-teachers. (iv) The experimental groups exposed to both the treatments showed better performance than the control group exposed to the traditional technique only. (v) The student-teachers could effectively integrate the teaching skills acquired in simulated conditions into their actual classroom teaching. (vi) The self-instructional audio cassettes were effective for developing different teaching skills. (vii) Immediate, pinpointed and self-feedback through audio cassettes was an effective way of improving the performance of student-teachers in the use of different teaching skills.

923. KUMAR, A., *An Experimental Study of the Relative Effectiveness of Three Methods of Instruction — Exposition Method, Programmed Learning Method, and Multi-media Method in Science Education*, Ph.D. Edu., Kur. U., 1981

The objectives of the investigation were: (i) to find out the relative effectiveness of the three methods of instruction — expository method, programmed learning method and multi-media method, (ii) to study the relative retention in learning through these three methods, (iii) to develop a programme in branching style on the selected unit of content in biology, and (iv) to develop multi-media text on the programmed content.

In order to experimentally study the relative effectiveness and the interaction between the three methods and the two levels of intelligence, a 3×2 factorial design was employed. The biology students of Classes IX and X of two inter-colleges formed the sample of the study. In all, 180 students were divided into three groups of sixty students each. One group was given instructions through the programmed learning method, the other through the expository method and the third group through the multi-media method. All the students of the three groups were administered the criterion test as pretest, then on the completion of the respective treatments these three groups were again administered the criterion test. After fifteen days, the same criterion test was re-administered.

The findings of the investigation were: (i) The multi-media method was more effective than either the programmed learning method or the expository method. (ii) The programmed learning method was more effective

than the expository method. (iii) Retention in learning by the multi-media method was higher than by the other two methods. (iv) Retention in learning by the programmed learning group and the expository group was equal. (v) There was no interaction between the three methods of instruction and the levels of intelligence.

924. MAN, B.S., *An Experimental Study of the Effect of Unit Tests on Retention following Programmed Instruction Material in a Segment of Physics*, Ph.D. Edu., HPU, 1981

The major objectives of the investigation were: (i) to study the differences in retention, measured in the form of performance on the criterion test at different intervals, of the group of students following programmed instruction material with unit tests, (ii) to study the differences in retention, measured in the form of performance on the criterion test at different intervals, of the group of students following programmed instruction material without unit tests, (iii) to study the difference in retention, measured in the form of performance on the criterion test immediately after the completion of the programme of the two groups of students following the programmed instruction material with and without unit tests, (iv) to study the difference in retention, measured in the form of performance on the criterion test one week after the completion of the programme, of the two groups of students, and (v) to study the difference in retention, measured in the form of performance on the criterion test six weeks after the completion of the programme, of the two groups of students.

The experimental method was used for the study. A sample of 762 male students was drawn from the schools of Meerut City. The subjects were matched on the scores on the criterion test (pretest), the socio-economic status scale and the achievement motivation test so as to obtain two groups each of seventy subjects, one group designated as the experimental group and the other as the control group. The experiment was carried out in four phases. In the first phase, pre-pretest and general mental ability test were administered to the two groups. The subjects who scored less than 100 per cent marks on the pre-pretest were provided remedial help through classroom instruction till they attained the level of pre-requisite behaviour necessary for taking the programme. In the second phase of the experiment the programme was administered to the two groups. The experimental group was given a unit test after the completion of each unit of the programme and the control groups

were not given any such tests. Immediately after completion of the programme the criterion test was administered to the two groups to get the measure of immediate retention. In the third and the fourth phases, the criterion test was again administered to the two groups to get the measure of immediate retention. In the third and the fourth phases, the criterion test was again administered to the two groups, one week and six weeks after the completion of the programme to obtain the measure of one week and six weeks' retention. The t-test and analysis of co-variance were applied to analyse the data obtained at different phases of the experiment. The scores on the general mental ability test of the two groups were used as a measure of pertinent control variable (co-variate) in the analysis of co-variance.

The following were the findings of the investigation: (i) The immediate retention of the group using programmed instruction material with unit tests, was significantly superior to its one-week retention. (ii) The immediate retention of the group using programmed instruction material without unit tests, was significantly superior to its one-week retention. (iii) The one-week retention of the group using programmed instruction material with unit tests was not significantly different from its six-week retention. On the other hand, the one-week retention of the group using programmed instruction material without unit tests was significantly superior to its six-week retention, implying that there was no further significant loss in the retention of the group using programmed material with unit tests whereas there was a significant loss with retention of the group using programmed material without such tests during the said interval. (iv) The immediate retention of the group using the programme with unit tests was found to be superior to that of the group using the programme without such tests. (v) The one-week retention of the group using the programme with unit tests was found to be superior to that of the group using the programme without such tests. (vi) The six-week retention of the group using the programme with unit tests was found to be superior to that of the group using the programme without such tests.

925. MAVI, N.S., *Development of a Programmed Text in Physical Geography for High School Students*, Ph.D. Edu., Kur. U., 1981

The objectives of the study were: (i) to develop programmed learning units in physical geography, and (ii) to empirically validate the programmed units.

The sample consisted of 124 students of Class IX. The entire programme consisted of eighteen units which covered geomorphology and climatology. The programmes were in the English language and had a linear format. In all, 1,391 frames were developed, out of which 1,294 frames were of constructed response type and 97 of selection response type. The programme was tried out with individual tryout, group tryout and field tryout. The final programme was evaluated in terms of error rate density on the criterion test and sequence progression. The programme was further evaluated by obtaining the reaction of the students on the reaction checklist consisting of 100 items.

The objectives of the study were: (i) Ninety-five per cent of the learners were able to respond correctly to 95 per cent of the frames. (ii) The cumulative density calculated by taking into account the number of frames and the number of responses expected did not exceed 0.50. (iii) Sequence progression for information through the frames was fairly normal. (iv) On unit tests, the success reached by learners ranged from 85 to 91 per cent. (v) The opinion expressed by the students was found to be favourable towards the programme.

926. MULLICK, S.P., *An Inquiry into the Relative Effectiveness of Linear Style Book Format and Multi-Media Programmes*, Ph.D. Edu., SGU, 1979

The hypotheses of the study were: (i) There will be ample gain in the scores of students taught by the book format programme (BF) and multi-media programme (MM) as measured from pretest and immediate posttest or retention test on the identification of terms and recall of terms. (ii) The multi-media programme and book format programme will teach differentially, with reference to the objectives measured by the comprehension and application, drawing and teacher-made tests. (iii) The multi-media programme group is expected to do better insofar as the objectives measured by oral tests are concerned. (iv) The book format programme group is expected to commit fewer spelling errors than the multi-media group. (v) The students who achieve high scores in the tests of intelligence, English and general science will score high in all criterion measures and *vice versa*. (vi) The students will show a positive attitude towards the programmes.

The sample consisted of 444 children studying in three English-medium schools of Delhi, of whom 204 children belonged to Class V and 240 to Class VI. These children were administered the pretests, viz., Coloured Progress-

sive Matrices, the identification and recall of terminology test, and the battery of posttests, viz., the test of Identification of Terms, Recall of Terms, Comprehension and Application, Drawing, teacher-made test and attitude questionnaire, after having conducted the BF and MM programmes of instruction which were randomly assigned to different sections of Classes V and VI. In order to investigate the relative effectiveness of these programmes, six pairs of matched groups with respect to intelligence were formed. Besides, a retention test with respect to all the criterion measures was administered to the children after fourteen days. An analysis of variance design of six cells (2×3) was used for analysing the gain achievement scores of the children.

The major findings of the study were: (i) The MM programme was superior to the BF programme when the gain was measured by the tests of identification and recall of terms, comprehension, application and drawing and teacher-made test and also when the time for completion was taken as a criterion. (ii) The BF programme was superior to the MM programme when the number of spelling mistakes was considered. (iii) These programmes did not differ when the number of mistakes in pronunciation in the oral tests was considered. (iv) The BF and MM programmes did not teach differentially, the different levels of students in intelligence, English and general science insofar as the learning effects as measured by the scores in the tests of comprehension, application and drawing and teacher-made test were concerned. (v) The MM programme was particularly suitable for average-level groups in intelligence and general science when the teacher-made test was used. (vi) The BF programme was particularly found suitable for low-level students in English of Class VI when the teacher-made test was used. (vii) When the criterion measures were the gain scores on the test of identification and recall of terms, the MM programme was particularly suitable for high-level groups in intelligence, English and general science, but not so suitable for low-level groups in English; the BF programme was particularly suited to high-level groups in intelligence and English; the BF was particularly not suitable for low-level students in English of Class V; the BF programme was particularly suitable for low-level students in English of Class VII and the BF programme was particularly suited to average-level groups in general science. (viii) No interaction effects between the levels in intelligence, English and general science and the treatments among Class V children were evident when the criterion measure was the number of spelling mistakes. Similarly, no interaction effects were evident in the case of Class VI children when divided

into high, average and low levels in intelligence. No trend in the interaction effects of the levels in general science was evident.

*927. NAGARAJU, C.S. and RAMKUMAR, U., *School Broadcasting Utilization by High Schools in Bangalore District*, ISEC, Bangalore, 1982

The main objectives of the study were: (i) to know the extent of utilization of the school broadcasts, and (ii) to identify the problems faced by schools in utilizing the programmes along with the opinions of teachers.

The study was conducted through mailed questionnaires to all the schools having radio sets in Bangalore district. There were eighty-five such schools. The second stage of the study was taken up after receiving the questionnaires from thirty-three schools. In this stage, 50 per cent of the schools which did not respond to the questionnaires were selected and the schools were visited to administer the questionnaire, a teacher opinionnaire and an observation checklist. The heads of these institutions and one or two teachers in each institution were asked to fill up the questionnaire and the opinionnaire respectively. The schools which had stated that they utilized school broadcasts were also visited.

The major findings of the study were: (i) The utilization of school broadcasting is very low as compared to the number of schools having radio sets. (ii) The major reasons given for the non-utilization of school broadcasts was that the radio set was out of order. However, even where the radio sets were in order, the schools were not utilizing the school broadcast. The other reasons were: difficulty in seating arrangements, non-functioning of intercoms, etc. (iii) The reasons for the non-utilization of broadcasts were: (a) problem in arranging the time table, (b) heavy workload for teachers, (c) lack of trained teachers in utilizing broadcasts, (d) lack of advance information by the AIR, and (e) non-supply of printed materials (handbooks), well in advance to help the teachers to prepare the students for radio listening. (iv) Feedback on the AIR broadcasts was normally not given by many schools. (v) A majority of the teachers did not listen to school broadcasts. The main hurdle in using the radio was the school system itself. Without qualitative contribution the radio programme had become an economic burden and the same could be diverted to more useful utilization for out of the school youth in rural areas.

*928. OBERAI, N., *Development and Evaluation of*

Radio Vision as an Instructional System, Ph.D. Edu., SGU, 1981

The major objectives of the investigation were: (i) to compare the effectiveness of the radio vision method of instruction with the traditional method of instruction in terms of academic gains on the part of the subjects, (ii) to study how far the instructional objectives set for each lesson were fulfilled by instruction through radio vision with the help of teachers' ratings, (iii) to compare the effectiveness of radio vision as a medium of instruction with certain methods of classroom instruction with or without radio vision in terms of academic gains on the part of the students, and (iv) to study how far the instructional objectives set for each lesson were achieved by instruction through radio vision with black-and-white slides and radio vision with colour slides with the help of teachers' ratings.

The pilot study was conducted on the students of Classes VIII and IX of the Government Boys' Secondary School and Girls' Secondary School in Dausa, Rajasthan. In all, 125 students were selected randomly from both the schools. The final experiment was conducted on the students of Class IX of the same school. Pretest-posttest control group design was used for the experiment. Data were collected by using Jalota's Group Test of Mental Ability, Srivastava's Socio-Economic Status Scale, criterion tests, students' interviews, a questionnaire to teachers, observers' class profile and attention measures. In order to test the significance of the difference between means, t-test and F-test (univariate analysis of variance) were used.

The major findings of the investigation were: (i) The radio vision groups obtained significantly higher mean scores on the recognition test than the group receiving instruction through the traditional method. (ii) All the radio vision groups, except the black-and-white radio vision group, obtained significantly higher mean gain scores than the group receiving instruction through the traditional method in the final experiment. (iii) With respect to the recall test, the group receiving instruction through colour radio vision plus workbook obtained significantly higher mean scores on the criterion test than the remaining six groups. (iv) The majority of the teachers opined that most of the students found the radio vision method interesting. (v) The attention profiles of different radio vision groups indicated that radio vision could attract the attention of very high percentage of students and sustain their attention throughout the length of the presentation.

929. PAIGAONKAR, A., *The Use of Mass Media for Second Language Teaching in India with special reference to Radio and Television*, Ph.D. Ling., Poona U., 1978

The objectives of the study were: (i) to take a survey of the availability of English and Hindi teaching programmes through the mass media in India, (ii) to see how far the principles of linguistics, the principles of psychology of learning and considerations about the socio-cultural conditions of the learners were used in preparing English and Hindi lessons for the mass media, (iii) to see if there was an attempt to use the potentials of each mass medium while preparing English and Hindi lessons and to what extent they were utilized, (iv) to find out facts about the conditions in which planning, preparation, and evaluation of English and Hindi lessons for the mass media took place, and (v) to see how English and Hindi programmes over the mass media were being utilized by teachers and pupils.

The programmes studied were Hindi teaching on the Pune radio through Marathi, English teaching on radio for schools in Maharashtra, English teaching on Bombay-Pune and Delhi televisions under the School Television programme and English teaching through the Marathi newspaper 'Kesari' from Pune. The design of the study was based on survey methodology, using observation, interviewing and questionnaire as tools for data collection. Content analysis of official documents was also carried out. All those connected with policy formation, programme production, programme execution and programme participation were studied using suitable methods.

The findings of the study were: (i) Script-writers and subject experts of radio and TV lessons for schools had the knowledge about the principles of linguistics and pedagogy but did not have the training needed to use the media potentials. This was reflected in the actual lessons produced. English lessons through the newspaper and Hindi on radio for general public did not reflect such knowledge and training of their producers. (ii) Teachers in the schools of Pune, Bombay and Delhi lacked awareness of the principles of linguistics and their application to second language learning. No training was available to them from any source. A few Bombay and Delhi teachers were exposed to some orientation because of user-teacher courses and on-the-spot evaluation meetings. This, however, covered very few teachers. (iii) Teachers were generally aware of the second language teaching programmes over the mass media, with the exception of linguaphone records. (iv) Rural teachers were

more aware of the radio as an available medium of teaching second languages than their urban counterparts, but the situation was reverse in the case of the rest of the mass media. (v) It was hypothesized that the use of English and Hindi lessons put across by the radio and the TV would progressively decrease as one moved from the urban upper class schools to the urban lower class schools, suburban schools and rural schools. This was not supported in the case of the radio programmes and there being very few TV sets in the rural schools, a meaningful comparison could not be made.

930. PAINTAL, I., *Evaluation of Microteaching and Other Recent Innovations in Educational Technology*, Ph.D. Edu., Del. U., 1980

The main objective of the study was to know the effect of transferring the self-instructional microteaching course on effective questioning developed for British teachers at the International Microteaching Research Unit, University of Lancaster, to pre-service and in-service teachers in Delhi and Haryana.

The sample consisted of 164 subjects (30 males and 134 females) out of whom 83 were B.Ed. students, 70 in-service teachers and 11 teacher-educators from Delhi and Haryana. The original Lancaster course consisted of five videotaped instructional sequences in which questioning skills were demonstrated and explained. It also used videotape recorders and cameras to record the microteaching lessons given by the teachers which they played back for self-evaluation. It was felt that in India microteaching experiments involving expensive videotape recorders and cameras would not be economically viable. Therefore, it was decided to rely on live demonstrations, lectures and printed instructional material which could easily be duplicated and made available to teachers to read. The attitude scale was also got filled in to know the attitude of teachers towards the programme. The data-gathering instruments used were the observation schedule for recording the use of the questioning skills in the classroom, the attitude scale towards teaching, the observation schedule for recording the use of skills during microteaching practice sessions and the post-course evaluation form. Means and significance of the difference between means were found out for statistical interpretation.

The major findings of the study were: (i) Both the groups which the investigator observed in their classrooms for differences in the teaching behaviour before the course and immediately after the course, had defi-

nitely shown improvement in the use of the questioning skills of prompting, seeking further clarification and asking questions that called for a set of related facts. (ii) The results obtained were very similar to the results obtained by Perrott with her in-service teachers but both the groups and the Perrott's group had shown no improvement in the skill of refocussing. (iii) Fifty-six per cent of the participants had reported improvement in the quality of answers given by their pupils and in the level of pupil participation. (iv) After taking the average of all the six groups, one could say that on the whole 35 per cent of the subjects were familiar with microteaching before the beginning of the courses and on an average 73 per cent of the subjects had favourable attitude towards the programme. Twenty-six per cent had a neutral attitude and only one subject (out of 164) had a negative attitude towards microteaching. On the whole, these six groups had shown a more favourable attitude towards microteaching than the Perrott's group of in-service teachers. (v) With regard to the changes in pupil behaviour due to microteaching, 62 per cent of the participants reported an improvement in attention and interest of pupils and 56 per cent in the quality of answers given by the pupils and the level of pupils' participation.

931. PANDEY, I.D., *Use of Programmed Instruction on Teaching Mathematics at Primary Level*, Ph.D. Edu., Pat. U., 1980

The aim of the study was to see the relative effectiveness of the traditional method without home assignment and grading, a programmed text and the traditional method with regular home assignment and grading in teaching mathematics at the primary level.

The sample consisted of sixty students of Class IV studying in the Central School at Samchi (Bhutan). The subjects were randomly divided into three groups to whom the three methods were randomly assigned. The three groups were tested for homogeneity with regard to prerequisites and age. The programmed text prepared for the purpose consisted of 2,557 frames divided into thirty units to be covered in thirty working periods.

The main findings of the study were: (i) The group following the programmed text differed significantly from the other two groups both in respect of immediate and delayed achievement. (ii) The group following the programmed text was significantly superior in retention to the subjects following the traditional method without home assignment and the traditional method with home assignment and grading.

932. PARLIKAR, K.R., *A Study of Suitability of Programmed Learning in Home Science Education for Adolescent Girls*, Ph.D. Edu., MSU, 1979

The main aims of the investigation were: (i) to develop and validate the linear form of programmed learning material (PLM) on 'Saving', (ii) to study the suitability of the linear form of PLM in home science as self-instructional and aided methods of study for selected adolescent girls opting for home science, (iii) to study the effectiveness of the linear form of PLM in home science as compared with the selected conventional methods of study when used as self-instructional and aided method of study, and (iv) to establish the suitability of the linear form of PLM in home science for selected adolescent girls varying on the basis of selected input variables such as intelligence, overall achievement, achievement in home science and socio-economic status.

About 135 students of Class IX studying in Maharani High School for Girls at Baroda and opting home science were selected as sample. The students were divided into three groups. The three groups were taught through three different methods, viz., the conventional method of study using lecture-cum-discussion, PLM for self-study and PLM as an aid to the lecture method. The pre- and post-achievement was measured through achievement tests. Intelligence was measured through Desai-Bhatt Intelligence Test. Achievement in the previous years was obtained from their cumulative record cards. Socio-economic status (SES) was measured through an inventory prepared by the investigator. Data were collected in terms of immediate and delayed retention tests given on the completion of each sub-unit as well as the whole unit. Data were analysed in terms of frequency and percentages, mean, median and standard deviation. Analysis of variance was also used to study the variations on immediate retention test (IRT) and delayed retention test (DRT) scores.

The major findings of the study were: (i) The PLM was suitable for promoting home science education for adolescent girls. In general, it was most suitable as a self-study method. (ii) The use of PLM was more suitable when compared to conventional method of study, viz., the lecture-cum-discussion. (iii) Its use as an aid to the conventional method was more effective than the conventional method alone as far as immediate retention was concerned. (iv) Intelligence, overall class achievement as well as achievement in home science and time taken to go through PLM were responsible for variations in IRT scores. (v) The methods of study indepen-

dently affected the DRT scores when the analysis of data was done controlling the scores according to the extent of preparation, adjustment to school and SES. (vi) Time taken to go through the PLM independently affected the variations in the DRT scores on subjective items significantly. (vii) PLM for self-study was suitable for above-average students and its use as an aid was suitable to the average students. (viii) High-achievers found the use of PLM for self-study most suitable. (ix) Students belonging to high and middle SES achieved the highest mean scores on IRT. For them, the use of PLM for self-study was more suitable than its use as an aid.

933. PASSI, B.K., KATIYAR, P.C., SANSANWAL, D.N. and SYAG, R.N., *Survey for Starting Radio Broadcasts for Primary and Middle School Teachers of M.P. State*, Dept. of Edu., Indore U., 1980

The objectives of the investigation were: (i) to study the facilities available for listening to radio broadcasts, (ii) to know the time and programmes listened to by teachers, (iii) to know the opinion and reasons for broadcasting educational programmes for teachers, (iv) to know, with reasons, duration and time of educational broadcasting for teachers, (v) to study with reasons the difficulties faced by teachers for teaching various subjects, (vi) to prepare subject-wise list of topics where teachers faced difficulty in teaching, (vii) to know the opinion and reasons of teachers regarding difficulties related to various teaching methods, (viii) to prepare a list of topics related to education in general and training in particular on which teachers would like to listen to the radio broadcasts, (ix) to study whether teachers would like to take an examination on topics broadcast through radio or like to take some other benefits, and (x) to prepare a list of topics on which teachers liked to write lessons for radio broadcasts.

The sample of the survey consisted of 524 teachers of primary and middle schools situated both in urban and rural areas of M.P. These teachers belonged to Raipur, Indore, Dhar, Gwalior and Rewa districts of M.P. Data collected through an open-ended questionnaire, were analysed by computing percentages.

The findings of the investigation were: (i) A majority of the teachers (95 per cent) had facilities for listening to radio broadcasts. (ii) A majority of the teachers (63 per cent) listened to different radio programmes during evening hours. (iii) A majority of the teachers (88 per cent) liked to have separate broadcasts for teachers. (iv)

The teachers liked to have broadcasts of thirty minutes' duration in the evening. (v) A majority of the teachers (80 per cent) were of the opinion that they had difficulties in teaching languages, science, mathematics and geography. (vi) A majority of the teachers (90 per cent) expressed the opinion that they had difficulties related to the methods of teaching. (vii) A majority of the teachers (78 per cent) expressed their willingness to take examination on the topics which were broadcast, and get certificate, promotion and increment. (viii) Sixty-five per cent of the teachers liked to write scripts for broadcasts if orientation in writing-scripts and guidance from time to time were provided to them. (ix) Subject-wise topics for broadcasts suggested by teachers were: Hindi-grammar, stories, poems, pronunciation, and Kabir ka Rahasya Vad, English-grammar, pronunciation and poems, Sanskrit-grammar and pronunciation. (x) The teachers liked to listen to broadcasts related to the ways of motivating and creating interest among students for teaching language and science, maintaining discipline in classrooms as well as in school, administering and engaging students in purposeful learning in single-teacher primary schools, psychology, specially socialization, of the child, motivation, problem-solving, etc., the new methods of teaching science such as discovery method, and methods of teaching of English through structural approach.

934. PHUTELA, R.L., *A Study into Utilization and Comprehensibility of School Television Programmes in Delhi*, Centre for Educational Technology, NCERT, New Delhi, 1980

The objectives of the investigation were: (i) to determine the extent of utilization of school television (STV) programmes by the school, (ii) to study the factors responsible for underutilization of the programmes, (iii) to study the process and liaison between the various agencies involved in the production and utilization of the programmes, (iv) to study teachers' attitudes towards the school telecasts, (v) to find out the preferences of teachers regarding the subjects for teaching through television, and (vi) to study the level of comprehension of the STV programmes on the part of the students of different classes.

A questionnaire was constructed based on content factors, motivation factors, presentation factors and viewing conditions. A 4-point attitude scale for assessing the attitudes of the teachers towards STV programmes was also included. The sample was drawn from the

higher secondary, high schools and middle schools of Delhi. Every third school was included in the sample study. The schools were visited by the investigators, without prior intimation, at the time of the telecast. Comprehension tests were administered to the students both before the telecast (pretest) and after the telecast (posttest). The data obtained were analysed using percentages and t-test.

Some of the major findings of the investigation were: (i) Many teachers did not find STV programmes useful as they were not different from classroom teaching or were not presented in such a manner as to sustain student's motivation. The quality of the programme was not high. The number of programmes per class was not adequate. (ii) About 38 per cent schools in the sample possessing TV sets were utilizing STV programmes. The reasons for not viewing were: TV sets being out of order, functions in the schools, examinations, etc. (iii) Most of the teachers from these schools accepted TV as a welcome help and agreed to the positive statements like teachers too learn about better methods of teaching. (iv) The results of four out of the five comprehension tests showed real difference in the learning of the subject matter, indicating that these lessons were well understood.

- *935. RAMACHANDRA, K.T., *A Study on Use of Visual Aids by Teachers of University of Agricultural Sciences, Bangalore*, Ph.D. Edu. (Agr.), Agr. Sc.U., Bangalore, 1982

The major objectives of the study were: (i) evaluating the current use of visual aids by the teachers of Agricultural University, (ii) identifying the factors governing the use of visual aids, (iii) finding out the association between the visual aids use level and the factors governing their use, (iv) finding out the association between the visual aids, use level and the visual aids use determinant level, (v) identifying the relative influence of the factors associated with the visual aids use level, and (vi) identifying the over-all influence of the factors in determining visual aids use level of teachers.

All teachers, research workers and extension workers located in the four teaching campuses who had taught at least two courses to either undergraduate or post-graduate students for the last two years (1977-1978) were included as respondents in this study. Out of 279 respondents selected, only 234 responded, which formed the sample for the study. A simple and objective scale was designed to measure visual aids use level covering the visual aids such as chalk board, maps/graphs/

charts, flip charts, flannel graphs, specimens/models and slides. Another comprehensive scale was developed to measure visual aids use determinants, which included personal, situational and administrative factors. The indices of test-retest reliability for this ranged from 0.770 to 1.00. Mean, median, coefficients of correlation and multiple discriminant analysis were used for analysing the data.

The major findings of the study were: (i) The visual aids use level index values were low in basic science and humanities and were high in other agricultural colleges, veterinary colleges, and fisheries colleges. (ii) Though slight variations were seen in the mean and median values of visual aids use index among teachers of different age groups, the association between the age and the visual aids use level was not significant. (iii) The association between the visual aids use indices and teachers' qualifications, experience, training status was significant. (iv) Other factors like the number of times the course was offered, the number of students per class, undergraduate or postgraduate level of teaching, training on visual aids, attitude towards visual aids, budget allotment on visual aids, though they affected the mean values slightly, did not have significant association with the visual aids use level. (v) However, knowledge of visual aids, availability of material resources to develop and use them inside the classroom, administrative encouragement and follow-up evaluation were highly significant in their association with visual aid use. (vi) The association between the visual aids use level and the visual aid use determinant level was positive and significant. (vii) Multiple discriminant analysis indicated the relative magnitude of contribution in the descending order of the factors as (a) knowledge of visual aids, (b) availability of material resources, (c) administrator's encouragement, (d) facilities to use visual aids inside the classroom, and (e) follow-up evaluation on the use of aids.

936. RAVINDRANATH, M.J., *Development of Multi-media Instructional Strategy for Teaching Science (Biology) at Secondary School Level*, Ph.D. Edu., MSU, 1982

The main objectives of the investigation were: (i) to develop a duly validated multi-media instructional strategy for teaching the course in biology at Standard VIII, (ii) to study the relationship between students' achievement and intelligence, (iii) to study the feasibility of the strategy in terms of time and cost, and (iv) to develop alternative instructional components for teach-

ing a few concepts and study their relative effectiveness.

The strategy developed by the investigator covered the prescribed content in biology for Standard VIII through different units. The multi-media strategy arrived at comprised twelve instructional components, namely, introduction by the teacher, programmed learning material (PLM), lecture, team teaching, inquiry technique, pupil activities with teacher demonstrations, discussions, audio-visual presentation, narration of biographical sketches of scientists, summary, criterion test and feedback, and exercises and assignments. Final validation of the multi-media strategy was done through an experiment conducted on ninety students studying in Standard VIII of a school in Baroda City. The students were divided into two matched groups and a pretest-posttest design was adopted for analysing the comparative effectiveness of the multi-media strategy and the traditional method of teaching. Effectiveness was assessed in terms of achievement on unit criterion tests and a comprehensive test. Student reactions were also obtained as a measure of effectiveness. Data regarding the intelligence of students were obtained by using Madhukar Patel's Intelligence Test. Correlation between intelligence scores and achievement scores on the comprehensive test for the experimental group was computed using product moment coefficient. Achievement scores of students with respect to three levels of intelligence were analysed with the help of analysis of variance. Relative effectiveness of two types of PLM, namely, inductive PLM and deductive PLM, was studied in respect of a few selected units. The sample for this included all the forty-five students of the experimental group mentioned above, who were divided into two matched groups of twenty-two and twenty-three students.

The main findings of the investigation were: (i) The instructional strategy was effective to the extent that 70 per cent of the experimental group students obtained 60 per cent and above on all the unit tests and the comprehensive test. (ii) The experimental group students performed better than the control group on the comprehensive test and also on the annual examination conducted by the school authorities. (iii) Development of scientific attitude was significantly higher for the experimental group students. (iv) About 70 per cent students expressed favourable reactions to all the components except towards team teaching. (v) There was positive and significant correlation between intelligence and achievement through the strategy. (vi) The strategy was quite feasible in terms of time as it required only ten additional periods spread over the whole year for complet-

ing the course. (vii) Both types of PLM, namely, inductive and deductive, were equally effective as instructional material.

***937.** SABHARWAL, V.K., *A Study of the Comparative Effectiveness of Programmed Auto-learning vis-a-vis Other Methods of Teaching English as a Second Language in relation to L-1 and L-2 Achievement*, Ph.D. Edu., Raj. U., 1978

The main objectives of the study were: (i) to assess the relative efficacy of the four different treatments of TESL, viz., the bilingual method, the audio-lingual method, the grammar-translation method and programmed auto-learning, (ii) to find out whether higher or lower achievement in L-1, namely, Hindi, helped or hindered achievement in L-2, namely, English, (iii) to find out which of the experimental treatments for TESL yielded better L-2 achievement results with learner groups of differential L-1 and initial L-2 achievement, and (iv) to find out whether or not exposure to practice sessions brought about differences in L-2 learning by learner groups using programmed instruction material.

Four mother tongue medium higher secondary schools of Jaipur were selected as experimental schools. All the students of Grade VII in these schools served as experimental sample for the study: The entire sample was administered L-1 and L-2 achievement tests constructed according to the accepted principles of test construction. Two independent reference groups, each of 100 subjects, were selected through quota sampling. The entire experimental sample was divided into nine factorial groups for each experimental school. Each of the experimental schools was randomly assigned one of the four experimental treatments. Associate teachers for experimental instruction were selected on the basis of willingness to participate in the experiment, and rating in terms of competence in TESL by the principal of the concerned school. All associate teachers were oriented to the experimental treatment. At the end of the experimental teaching, all the subjects were administered a posttest.

The findings of the study were: (i) Learners' groups of differential L-1 and initial L-2 achievement learned L-2 in different measures. (ii) The bilingual method and programmed auto-learning based on the bilingual method were more effective instructional strategies for teaching English as a second language for Hindi-speaking learners studying in upper primary classes in mother tongue medium schools. (iii) Learner achievement in L-1

and L-2 language proficiency correlated with subsequent L-2 learning. (iv) Achievement in L-1 and L-2 was independently and *per se* correlated with subsequent L-2 learning. (v) Achievement in L-1 and L-2 contributed directly as well as differentially to subsequent L-2 achievement. Of the two, earlier achievement in L-2 made a relatively greater contribution to subsequent L-2 learning. (vi) Exposure or non-exposure to practice in using programmed self-instructional materials did not help or hinder second language learning through such materials. (vii) The past achievement in L-2 was the best single index of subsequent L-2 learning through the grammar translation and the audio-lingual method. There did not exist any such predictor for effective forecasting of L-2 learning through the bilingual method and the programmed auto-learning. (viii) Other things being equal, learners taught by teachers exhibited consistently better achievement than those learning on their own through programmed self-instructional materials.

938. SAINI, G.S., *Distance Teaching—Prospects and Problems*, Ph.D. Ext. Edu., PAU, 1979

The main objectives of the study were: (i) to determine the information needs related to agricultural technology, as perceived by small and marginal farmers, (ii) to ascertain the extent to which the information needs perceived by the trainees were achieved through distance teaching, (iii) to measure the comprehension level of the trainees with respect to the content of lessons, (iv) to determine the extent of application of information gained in the field situation, and (v) to suggest further improvement in correspondence courses on the basis of opinions of the trainees with regard to lesson reading behaviour, lesson schedule and personal contact programme.

Systematic sampling was done to select 188 and 253 farmers, respectively, from the first two batches of the one-year certificate correspondence course in agriculture for literate small and marginal farmers in which farmers from entire Punjab were enrolled. Questionnaires were used to measure socio-economic profile of respondents, need determination, comprehension, information application in the field situation, lesson, reading behaviour, opinion of respondents in respect of lesson schedule and opinion and reactions of respondents regarding personal contact programme. The longitudinal research technique was employed to determine the extent to which the information needs were fulfilled, with a questionnaire as well as through observation of lessons.

The comprehension test included twenty-one items. To determine the extent of adoption of information gained through distance teaching, practices regarding four crops common to entire Punjab were assessed. Opinions and reactions of the trainees to the number of contact programmes, their duration, timing, location as well as the teaching methods used, talks, visits and discussions were sought.

The main findings of the study were: (i) Young respondents with middle and secondary level education comprised potential group for correspondence course. (ii) Prior to registration, the farmers' knowledge in different aspects of agricultural technology was inadequate which was made up through distance teaching. (iii) The majority of the farmers could, reasonably, comprehend the content which they read themselves in their free time. (iv) After reading, the information was discussed and disseminated. (v) The lessons were effective in imparting information as well as in improving field practices.

939. SASTRY, S.N., *A Study of the Effectiveness of Using Educative Toys in Teaching Science for Primary Standards*, Government Teachers' Training Institute, Hassan, 1982 (NCERT-financed)

It was hypothesized that: (i) science teaching through educative toys might not be as effective as through traditional methods, and (ii) science teaching through educative toys might not increase comprehension easily.

Toys, models, and figures based on one or other concept included in primary school science syllabus were used. Two sections of standard V of a primary school in Karnataka were selected. Only one section, the experimental group, was exposed to science teaching through toys for an academic year. Some of the toys used were prepared by the teacher/investigator while others were from children's collections locally available or from toy manufacturers. The selection of toys was dependent on their relevance to the concepts in physics, chemistry and biology which could be taught through toys. The same teacher taught both the groups so as to minimize differences likely to arise because of teacher variable. The selected teacher was oriented to teaching science through toys. The experiment entailed providing some of the selected toys to individual students or groups of students to play with. This was followed by discussions initiated by the teacher on the different aspects of the toy, its functioning, its construction and the evaluation of concepts was done with the help of similar toys. Data

were gathered with the help of a questionnaire, observations and school test marks.

The findings of the study were: (i) The experimental group did considerably better on the posttest than the control group. However, the number of passes in the posttest of the two groups was the same, probably because indirectly they had become aware of the treatment. (ii) Comparison of the school marks of the two groups revealed a steep rise in the marks of the experimental group. (iii) Initially, the use of toys in the experimental group consumed more time than the traditional method but in the later stages, teaching was quicker and easier. (iv) There was a marked difference in attitude towards learning science among the experimental group pupils. (v) An attachment/rapport developed between the teacher and the subjects of the experimental group. (vi) The students of the experimental group evinced more interest in science whether it was taught in the first or the last school period.

940. SESHADRI, M., *An Experiment in the Use of Programmed Instruction in Secondary Schools*, Ph.D. Edu., MSU, 1980

The main objectives of the investigation were: (i) to identify different components of the instructional strategy, (ii) to develop software material to be utilized under different components, (iii) to study the effectiveness of each component in terms of students' and parents' reactions and teachers' observations, (iv) to study the effectiveness of the instructional strategy as a whole, and (v) to study the relationship between achievement through instructional strategy and certain selected personality variables.

The methodology included the process of identification of the components that would constitute the strategy. This process was based on the instructional objectives of mathematics, the learners' characteristics, and certain other factors like feasibility of preparing instructional materials, available time, administrative support and the number of students. The components identified were: introduction by the teacher, programmed learning materials, exercises or assignments, tutorials, summary, mathematical games or group activity, post-test and discussion of performance of posttest and feedback sessions. Software material related to each component was developed. The syllabus of mathematics for Class IX was divided into thirteen units and on each unit programmed material of the linear style was prepared. In all, there were 2,075 frames. The strategy was vali-

dated on a sample of fifty-one students of Class IX of a school in Vasco da Gama. The experiment was conducted for a complete academic year. Internal criteria for validation consisted of the performance of the students on criterion tests pertaining to each unit and two comprehensive tests at the end of each semester. For external validation, the criterion was the performance of the students on the question papers set by the Headmasters' Association of the Union Territory of Goa, Daman and Diu. The tools of data collection were the criterion tests, Headmasters' Association examinations, semester and comprehensive examinations, questionnaires to know learners', parents' and school authorities' reactions. Other tools used were the Raven's Standard Progressive Matrices, Junior Index of Motivation (JIM Scale) and Palsane's Study Habits Inventory. The statistical techniques used were t-test, product moment coefficient of correlation and partial correlation.

The main outcomes and findings of the investigation were: (i) A duly validated instructional strategy having reproducible PLM as the major component and with established long-range effectiveness and feasibility for using in classroom situations was developed. (ii) Achievement had a positive correlation with intelligence, but not so with the scores on JIM scale and Study Habits Inventory.

941. SHAH, I.K., *Developing a Teaching Strategy for the Course on Educational Evaluation at the B.Ed. Level and Studying Its Effectiveness*, Ph.D. Edu., MSU, 1980

The objectives of the investigation were: (i) to develop software materials for four components of the strategy, viz., library reading, programmed learning material (PLM), discussion and practical work, (ii) to study the effectiveness of developed strategy in terms of students' performance on criterion tests and comprehension test and also in terms of instructional objectives related to knowledge, comprehension and application, (iii) to study the effectiveness of each component and feasibility of the strategy during the regular course of instruction, and (iv) to study the relationship between achievement through the strategy and intelligence, reading comprehension ability and academic motivation.

The sample for the study consisted of all the thirty students of B.Ed. class of the college of Mahila Mahavidyalaya, Baroda, affiliated to S.N.D.T. Women's University, Bombay. The experimental validation was conducted for two succeeding years. Data

were collected with the help of Observation Schedule for discussion session, criterion tests and comprehension test, Reaction Scale, Desai-Bhatt Group Test of Intelligence, Junior Index of Motivation and Gujarati Language Reading Comprehension Test. The data obtained with the help of these tools were analysed by calculating mean, standard deviation, skewness and percentiles. In order to study the relationships, product moment and partial correlations were computed. The t-test was employed to study the difference between mean achievement at three levels of intelligence.

The major findings of the investigation were: (i) The developed strategy was effective in terms of students' achievement on criterion and comprehension tests. (ii) The achievement of knowledge, comprehension and application objectives was to the extent of 80 per cent. (iii) Out of the four components of the strategy, three components, namely, PLM, discussion and practical work, were effective whereas one component library work, was not satisfactory. (iv) The students' reactions were favourable for the strategy. (v) The strategy proved feasible in respect of time needed and with regard to coordination with other scheduled B.Ed. programmes. (vi) Achievement was significantly related with the intelligence of students whereas it was not significantly related with Gujarati language reading comprehension and academic motivation.

942. SHAH, J.C., *To Develop and Try Programmed Material in Mathematics for Students of Class V in Gujarat State*, Ph.D. Edu., Gujarat Vidyapeeth, Ahmedabad, 1981

The main objectives of the inquiry were: (i) to develop programmed materials on various units of the mathematics syllabus of Class V, and (ii) to try the same on children of Class V from a few selected schools.

The programmed material was prepared on (i) integral numbers, (ii) divisible and non-divisible numbers, (iii) factors, (iv) H.C.F., (v) L.C.M., (vi) fractions, (vii) addition and subtraction of fractions, (viii) decimal fractions, (ix) ratio and proportion, (x) profit and loss, (xi) average, (xii) line, segment, ray, angles, (xiii) angle types, (xiv) area, (xv) square, (xvi) rectangle, and (xvii) parallel lines. The sample included seven primary schools of Malpur, Bayad and Kapadvanj, where the programmed material was tried, and four schools of Malpur which were taken as control group schools. The programmed material was tried on 250 students whereas the control group schools had 200 children. The stan-

standard method of developing linear programmes was followed. For every unit a criterion test was also developed. The frames developed were tried out at least four times till the percentage error came down to 3.57 per cent. The other tools included questionnaires for students and teachers to know their reactions towards the programmed materials.

The outcomes of the inquiry were: (i) Programmed material on the selected units in mathematics for Class V was developed. The total time for completing the programmed material was twenty-four hours and forty minutes. (ii) The reactions of the students and the teachers were favourable.

***943.** SHAH, S.G., *Development and Tryout of Multi-media Package on Effective Questioning in the Context of Microteaching*, Ph.D. Edu., SGU, 1979

The objectives of the study were: (i) to develop self-instructional multi-media package on effective questioning which would be helpful to pre-service and in-service secondary schools teachers, and (ii) to try out the package by experimentation and to explore the feasibility of the self-instructional multi-media package.

The sample consisted of thirty-two teachers selected randomly, out of whom sixteen were in-service teachers teaching in secondary sections of Gujarati-medium schools of Surat City and sixteen were teacher-trainees from a college of education. The researcher developed the multi-media package on questioning skill. Data were collected through tools such as the background information sheet, attitude inventory scale, behaviour coding system, evaluation guide for raters, perception of the teachers about multi-media package, and interview schedule for qualitative evaluation of multi-media package. The experiment was conducted by using single group design. The data collected were analysed by using t-test and chi-square test.

The major findings of the study were: (i) The teachers who were exposed to the treatment of the self-instructional multi-media package course showed significant improvement in all the skills except one. (ii) As regards the percentage of the pupil talk, there was significant improvement. (iii) Sixteen of the seventeen measures showed significant difference at 0.01 level between the pretest scores and the retention scores. The teachers could not retain the gain after three months for the skill of refocussing. (iv) The self-rating scores of the teachers showed that they had a feeling of improvement in the use

of eleven questioning skills out of the twelve. (v) The results about the opinion of the teachers revealed that they did realize the utility of the microteaching technique for practising the skills. (vi) The results obtained on the package course evaluation questionnaire indicated that the package course was quite interesting for the participants. (vii) The qualitative evaluation of the package led to the conclusion that the teachers were quite satisfied with the package course so far as its educative importance was concerned.

***944.** SHARMA, J.N., *The Effectiveness of Density of Programme and Time in Remedial Teaching in a Segment of English Syntax at the Pre-university Level*, Ph.D. Edu., Pan. U., 1981

The objectives of the investigation were: (i) to diagnose the error patterns in the use of English prepositions, (ii) to study the performance of students taking remedial programmes of varying densities on the criterion test, (iii) to find out the effect of different time-spans of learning on the performance of students on the criterion-referenced test, (iv) to analyse sex differences in the achievement of students in the use of English prepositions, and (v) to ascertain the double ($D \times T$, $D \times S$, $T \times S$) and triple ($D \times T \times S$) interaction effects of the factors of density, time, and sex on the performance of students on the criterion-referenced test.

The sample for the study consisted of 300 pre-university students having equal number of boys and girls, from six (three boys', three girls') out of the eight colleges of Chandigarh. It was an experimental study and a factorial design of $3 \times 3 \times 2$ was followed. It tested the effect of the independent variables of density, time, and sex on the dependent variable of the performance of students on the criterion test. All the tests used in the study were developed by the investigator, which included a Diagnostic Test in English Prepositions, Criterion Test, and an Extrinsic Programmed Text on Simple Prepositions of English. The statistical techniques of analysis of variance, F-ratios and t-ratios were used.

The major findings of the investigation were: (i) Density levels of the programme did not show differentiating effect on the performance of students. (ii) The students taking more time in learning the content under study achieved less than the ones taking less time. (iii) Girls fared better than boys in learning the use of prepositions. (iv) Density and time taken together did not show significant results on pupils' performance. (v) Density did not interact with sex to yield significant results

on the pupil performance. (vi) The interaction effect of the factors of time and sex had also not accounted for significant performance. (vii) Density, time and sex, when taken together, did not interact to yield significant effects on pupil performance. It could be said, therefore, that each factor was independent of the other two factors with regard to performance.

- *945. SHARMA, K., *A Study of a Programme in Classification of Plant Kingdom for High School Students in relation to Continuous and Delayed Schedules of Reinforcement*, Ph.D. Edu., HPU, 1981

The objectives of the investigation were: (i) to study the effect of continuous and delayed schedules of reinforcement in programmed learning on the performance of students on immediate criterion test, (ii) to study the effect of continuous and delayed schedules of reinforcement in programmed learning on the performance of students on delayed criterion test, and (iii) to develop a programme and a suitable criterion test on classification of plant kingdom.

A criterion test was developed for measuring the performance of students on pretest, immediate posttest and delayed test. A programme was developed on the classification of plant kingdom and was validated against internal criteria of error rate, programme density and sequence progression. The programme was also validated against the external criterion of 90 by 90 and was found valid in terms of these criteria. The effect of different schedules of reinforcement was then studied through an experiment. The sample for the experiment was drawn from four Hindi-medium schools in Simla selected randomly. In all, 200 students of standard IX constituted the sample. They were divided into two groups at random with 100 students in each group. A pretest-posttest control group design was employed for the experiment. The schedule of reinforcement was the treatment variable and the scores of students on immediate posttest and delayed test were the dependent variables. The data obtained were analysed employing the t-test.

The findings of the investigation were: (i) There was no difference in the effects of the two schedules of reinforcement as the mean scores under the two schedules of reinforcement did not differ significantly. Thus, in terms of immediate posttest performance, the programme following continuous schedule of reinforcement and that following delayed schedule seemed to be equally effective

for Class IX students. (ii) The mean score of the group following the delayed schedule programme was significantly higher than that of the group following continuous schedule programme. Thus, the delayed schedule of reinforcement led to better retention than the continuous schedule.

- *946. SHARMA, Y.K., *A Study of the Effect of Knowledge of Behavioural Objectives on the Performance in Pollution in 'Angiosperms' in relation to Linear and Branching Programme at the Secondary Level*, Ph.D. Edu., HPU, 1982

The study was conducted in order to investigate the relationship between two styles of programming and effect of prior knowledge or otherwise of behavioural objectives.

The study covered a target population of Grade X students of high and higher secondary schools in Simla. The sample, randomly selected from high and higher secondary schools of Simla, consisted of 100 boys and 100 girls. The subjects were divided into four experiment groups of fifty each through the process of randomization. The experiment was conducted within the framework of 2×2 simple factorial design. Styles of programming and behavioural objectives were the independent variables while the amount of attainment recorded by the subject on the criterion test was the dependent variable. Each experimental group was assigned one combination.

The findings of the study were: (i) The branching programme with prior knowledge of behavioural objective was the most effective while the linear programme without knowledge of behavioural objectives the least effective. (ii) The performance of the students who had undertaken the linear programme with prior knowledge of behavioural objectives was significantly better than the performance of those without prior knowledge of behavioural objectives. (iii) The performance of the students taking the branching programme with prior knowledge of behavioural objectives was significantly better than the performance of those taking the same programme without prior knowledge of behavioural objectives. (iv) A significant difference in the means of the group taking the branching programme with prior knowledge of behavioural objectives and the group taking the linear programme with prior knowledge of behavioural objectives showed the superiority of the former combination.

947. SHRIVASTAVA, R., *A Critical and Comparative Study of the School Broadcasts in Western Region*, Ph.D. Edu., Vik. U., 1974

The objectives of the investigation were: (i) to find out the present position of school broadcasts by surveying and studying the various aspects of the system, (ii) to make an assessment of the system by obtaining the opinions of various persons involved in the process, (iii) to give practical suggestions for improvement so that it may become more scientific and effective, (iv) to review and clarify those fundamentals of psychology which have direct bearing on learning situations in the school broadcasts and to highlight the implications for good teaching practices, (v) to study the role and place of school broadcasts in school education and to analyse the significance of school broadcasts, their contributions to education of students as well as trained and untrained teachers, (vi) to find out the difficulties experienced by teachers and students while listening to these programmes in the classroom, (vii) to examine the validity of these programmes through specific evaluation and utilization schedules, and (viii) to construct utilization and evaluation schedules together with guidelines for different activities before, during and after the school broadcasts.

The sample comprised 200 schools randomly selected from Madhya Pradesh, Maharashtra and Gujarat, who listened to radio programmes. Data were collected from All India Radio stations in the western region, namely, Bhopal, Indore, Bombay, Nagpur, Poona, Ahmedabad, Baroda and Rajkot. Producers, script-writers and directors were interviewed. Educational authorities were also interviewed to collect information about the conditions in respect of the administration, organization and planning of school broadcasts. Data were also collected through the evaluation and utilization sheets, which were prepared by the researcher and circulated to schools for use during the listening of school broadcasts in the classroom. The study employed normative and historical method of research. The data were analysed by computing correlation, chi-square and percentages.

The findings of the investigation were: (i) School broadcasts were governed by the Ministry of Information and Broadcasting, Government of India. Before the commencement of each session, the producer (AIR) set up school broadcast councils which comprised principals, teachers, experts in the area and the AIR staff. (ii) The subject committees only approved the subject matter and content of the subject. The script-writers worked only with the producers. The writers made necessary

provision for music so as to make the learning process effective. (iii) The school broadcasts were related to languages, social studies, science and general knowledge. (iv) The appropriate forms for presentation, such as dramatization, plays, dialogue, conversation, discussion with students, narration and question-answer, were appreciated by teachers, educators, and students; these were useful in motivating students, creating interest in them and holding their attention. (v) There were nearly 695 listening schools in Madhya Pradesh, 1,200 in Maharashtra and 1,302 in Gujarat; there were many schools which possessed radio sets but did not provide listening facilities to students. A few listening schools made provision in the regular time-table for school broadcasts. (vi) The listening schools were located both in urban and rural areas; the teachers used various devices and sources for supplementing knowledge in different subjects. (vii) The quality of reception was fair in Madhya Pradesh while in Maharashtra and Gujarat it was good; the delivery of school broadcasts was, by and large, appropriate; fast and slow speeds were also reported. (viii) School broadcasts were useful in enriching and extending the work of teachers but could not replace the classroom teaching. (ix) Some schools had tape recorders but very few made use of them to record and replay the lesson. (x) No attempt was made to associate students with the organization of these programmes. (xi) There was no uniformity in the lessons in different subjects broadcasts. (xii) There was lack of cooperation between the listening schools and the AIR station; most of the schools did not receive the AIR programme booklets on time, especially in Madhya Pradesh. (xiii) The programmes could be improved by adjusting them to the course, better planning, cooperation of the AIR staff, provision of trained staff, regular inspection by educational authorities, etc.

948. SUTHAR, K.S., *A Study of Performance on Programmed Learning Material in relation to Some Psychological Characteristics*, Ph.D. Edu., SPU, 1981

The major objectives of the study were: (i) to develop programmed learning material (PLM) in algebra for Class VIII, (ii) to compare the achievement in algebra of students with different study habits, learning through the PLM and the traditional way of teaching, (iii) to compare the achievement in algebra of students with different reasoning abilities, (iv) to compare the achievement of students having positive and negative attitude

towards mathematics, and (v) to compare the achievement of students with high and low motivation towards school learning through PLM and the traditional way of teaching.

The sample consisted of 500 pupils of Standard VIII from representative secondary schools of Kaira District. The investigator developed and tried out PLM in algebra for Standard VIII in all the units such as set theory, rational numbers, real numbers, powers and indices, equations and problems, graphs on real numbers, etc. The investigator used the Study Habits Inventory Scale for Attitude towards Mathematics, Reasoning Ability Test, Motivation towards school and self-prepared entering behaviour test and terminal behaviour test in algebra.

The finding of the study was that the PLM was superior to the traditional way of teaching, irrespective of different variables.

949. TRIVEDI, I.U., *Use of Branching Variety of Programmed Learning Materials as Diagnostic and Remedial Tools*, Ph.D. Edu., MSU, 1980

The major objectives of the study were: (i) to develop programmed learning materials of the branching type in mathematics for Classes V, VI and VII, (ii) to compare the achievement of the students studying by the tradi-

tional methods of teaching with that of the students studying through programmed materials, (iii) to diagnose students' weakness in mathematics, and (iv) to use programmed materials as remedial measures.

It was an experiment using experimental control group design. The subjects in the two groups were selected on a random basis. For each class, there were 40 students in the experimental group (20 boys and 20 girls) and an equal number in the control group. The two treatments were the use of programmed learning materials of the branching type and the conventional method. Two-way analysis of variance was used for data analysis. In the design, pretest score and intelligence were used as the covariates. The tools of research used were programmed materials developed for the selected units of mathematics, pretest, posttest and the Bhatt Test of Intelligence. The experiment was conducted by the teachers who were trained to use the programmed materials.

The major findings of the study were: (i) For Class VI, the programmed learning material was more effective than the conventional method of teaching whereas for Classes V and VII, both the methods were equally effective in terms of pupils' achievement. (ii) In the case of Class VI, girls learnt better than boys through the use of programmed materials, whereas in the case of Classes V and VII, there was no significant difference between the mean scores of boys and girls learning through programmed materials.