

POTENTIAL OF USING TUTORED VIDEOTAPE INSTRUCTION MODE FOR HIGHER EDUCATION IN INDIA : AN EXPERIMENT

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Ever since the advent of the electronic era, constant efforts have been made to harness the power of media in the service of education. Every now and again, media is put on trial. There seems to be no doubt that media has a definite role in education at all levels and the search for an effective tool or methodology is forever on, particularly in countries in development like India. At the present moment, when the audio medium has somewhat faded into the background and the computer is yet to stand on its own, hopes are pinned on the video medium and a great many government, semi-government and private institutions and agencies are involved in developing educational video material (1).

But, in spite of the rising popularity of the medium, instructional video is yet to make a dent in the conventional, mainstream education in India. Indeed, the contribution of video to promote general education through programmes such as "Countrywide Classroom" can not be under-estimated, but its potential as a powerful instructional resource (as opposed to educational resource) is yet to be channelised.

What then are the legitimate expectations from the video medium particularly in higher education in India ?

Instructional video has two important roles to fulfill : first, the SUPPORTIVE role through which it can facilitate and vitalise the process of giving and receiving instruction, and second MULTIPLICATIVE

role through which it can enhance the educational productivity making high quality instruction available to a much larger number of learners. Looking at the magnitude of student population and the paucity of resources-institutional, material and human, it is obvious that it is in this latter, the multiplicative role, that the instructional video can emerge as a potential benefactor. It is also obvious that accomplishing this would call for well-worked out strategies and sustained R & D efforts in this direction.

But, first it is essential to review some of the research findings related to general learning outcome through the video medium which are particularly relevant to the present study. This will also give an insight into the factors which have stunted the impact of educational video and television.

According to Cullinford (2), little "deep" learning takes place through this medium. The teachers naively place too much faith in media-based programmes for providing powerful stimulus for learning, while the learner approaches it more for the immediate pleasure of viewing with little effort to seriously process the given information. N.Durbridge's (3) work with the open University students showed that as compared to learning from print medium, students have nothing to 'save' and have little assurance of "work done". According to him the most constructive thinking"... took place in a combination of video input and group action".A.W.Bates (4) on the other hand,

emphasises the importance of instructional design and claims that the documentary style *is perhaps* not the best format because it inhibits student's active participation. According to him the material should be designed in short segments on video cassettes in order to improve student control. Choat et al (5) point out that generally teachers are dominated by the programme style as well as time and viewing constraints and they are generally overwhelmed with the delivery and presentation of information rather than with how students 'internalise' the given information.

In India, instructional video has bigger odds. In addition to non-availability of funds and a dearth of well-researched and well-designed instructional material, it has also to cope with the indifference and sceptical attitude of the teachers and authorities. To many amongst us, teaching with video demands too much expense, effort and drastic changes in teaching style.

It is obvious that if video has to become an integral part of education, there is need for INNOVATION IN THE DESIGN AND APPLICATION WITH IN-BUILT SCOPE FOR LEARNER BASED ACTIVITIES SUCH AS IDENTIFICATION, DESCRIPTION, PROBLEM-SOLVING, NOTES-TAKING, DISCUSSION ETC. AND THAT THE PROGRAMMES SHOULD HAVE SUFFICIENT FLEXIBILITY OF USE WITHOUT PLACING ADDITIONAL BURDEN EITHER ON THE TEACHER OR THE INSTITUTION.

WHAT IS TUTORED VIDEOTAPE INSTRUCTION ?

The experiment was initiated by Prof. Gibbons from the Electrical Engineering Department at Stanford University, at the request of a leading computer company to provide instruction to its engineers. Earlier professionals of this company followed the courses through satellite facility of the

university (Instructional Television Fixed Services) operating within a radius of 50 miles. The Tutored Videotape Instruction (TVI) experiment used this facility as a base. The course which were being relayed were videotaped without any post-production refinement and were used for a new group of learners who were in-service professionals, using a fresh approach. Commenced in 1973-74, the experiment has evolved into a well-organised system catering to a very large number of in-service professionals who work towards the graduate programme of the university and who are awarded the same degree as the regular students.

The CONCEPT of TVI explores the idea that students can learn better from a lecture when they have the possibility of stopping and discussing at places where clarification or discussion is required. Thus, the videotape, produced at a very low cost, is used for instructing a small group of students working with the help of a paratutor. The concept which is student based, responds to an important educational need by combining the positive aspects of the lecture method - experienced professor teaching in an organized fashion - and of the discussion method - promoting discovery and catering to individual needs and differences.

The educational productivity is remarkable because in its present form the video recording of normal classroom lectures simultaneously serves different sets of learners : (a) regular university students attending normal classes, (b) students following the lectures through microwave/satellite facilities, (c) a small group of professionals in the industry studying in TVI mode with a paratutor and (d) self learners for whom the complete course is available on video cassettes along with required support material.

No doubt infrastructural facilities for audio/video recording are required and only

well established Universities / institutions can take the lead. But considering the ultimate benefit in terms of number of beneficiaries, the additional effort and expense seems to be more than justified. The main INFRASTRUCTURAL REQUIREMENT is a renovated classroom which houses the audio and video recording facilities (6). The modifications required for equipping a classroom have been detailed out by Pettit and Grace (7).

The METHODOLOGY involves the video recording of the normal on-campus classroom lectures. The recorded lecture including the audience questions are made available along with the handouts and homework assignments to the para-tutor. The students watch the videotape with the paratutor who is instructed to stop the tape as often as required and initiate discussion. For example every time a question appears, the videotape is stopped and the TVI class is encouraged to generate the answer before the professor's solution is viewed. The videotapes and assignments are returned as per schedule. In case of difficulties or queries the tutor has access to the professor for clarification. The students do the same exercises as the on-campus students and take the same examinations.

Different studies were also carried out to define the profile of the para-tutors and the most amazing finding in this regard was that the less qualified a person was as a tutor in the subject matter, the better was the performance of the students.

The RESULTS OBTAINED from a number of experiments conducted and validated (8) are indeed interesting and at times spectacular. Most noteworthy amongst them which are of direct interest to this study are :

a) The TVI group performed better than their on-campus counterparts i.e. on the average the 'grade point average'

obtained by the TVI students was higher than that of the on-campus students. This is interesting in view of the fact that the average of admission qualification scores for TVI students were substantially lower.

- b) The performance of the TVI students was studied in two groups (i) those who could have got admission to the same course in the university on the basis of their academic scores and (ii) those who could not have got admission on the basis of their academic scores. The results showed that students from group (i) did better than their on-campus counterparts and students from group (ii) did acceptably well with at least a 'B'.
- c) The results were not as good when the students worked with the video-tapes without the tutor.
- d) When tested for on-campus students only, the results showed that the TVI students performed as well if not better. In any case, the students responded positively and were enthusiastic about the course.
- e) One of the most interesting results for us in India is that TVI mode proved to be more effective for students who did not have English as their mother tongue. This was tested with a TVI course taught at the Hitachi Central Research Laboratories with very positive results. The Tutor, an ex-student of Stanford did not translate or use any dubbing or subtitling support.
- f) The TVI mode was found to be successful when used by the students of another university. The first experiment was conducted at University of Florida (1983). A course in "Analysis and Design of Analog Integrated Circuits" was taught using the video recorded lectures of a Professor from

University of Arizona. The course was coordinated by another Professor at Florida who interacted with the Tutors and Teaching assistants. Student feedback was extremely positive indicating demand for more courses to be taught in the same mode. This fact is also very important for us and reinforces the possibility of sharing of valuable educational resources.

- g) The ideal group size was found to be between 6 to 8.
- h) The TVI mode was also tested for teaching of Humanities through a course in "Twentieth Century British and American Poetry" and the results were equally encouraging showing that it was possible to adapt this mode for the teaching of courses in Humanities and Social Sciences.
- i) Experiments were also conducted to study the use of TVI mode for teaching Physiology at Harvard Medical School.
- j) The method has also been tested for use in prisons and correctional institutions.

POSSIBILITY OF USING TUTORED VIDEOTAPE INSTRUCTION PROGRAMME IN INDIA

It is obvious that a programme promising such flexibility and such a substantial economy of material and human resources would be welcome in a developing country with the size and population of India, particularly in specialised areas such as higher engineering education.

Although the Stanford experiment of TVI is limited to in-service professionals pursuing the graduate programme more as a continuing education programme, in India it could have a much wider application. One can immediately see its applicability in Contact Programmes of Correspondence courses and "Study Centres" of the Open Universities.

But, if managed properly this mode can prove to be very useful for on-campus instruction.

In the present culture and financial scenario of Indian industry, continuing education (as opposed to training) of the employees is of little interest to the employers. For off-campus study programmes, it is essential that the effort leads to a definite upgradation of academic qualifications and tangible rewards. That implies that the programme should lead to or be a part of a certificate/diploma/degree programme of a recognised if not reputed university and that the employer must share the objective of the student and participate in both the financial and academic aspects.

If a new mode of instruction has to be introduced for on-campus students, it is essential that the programme is more attractive and at least as efficient as the classroom teaching. It should be well designed providing full flexibility for individual differences in academic competency and pace and it must be a well integrated part of a whole. A student of formal education has little use of knowledge in isolation.

From the institutions' point of view (whether it is the producer cum user or simply user), it is necessary that the programme involves minimal additional infrastructural, personnel and financial burden. The cost of production of the course material is shared or recovered. The programme should provide adequate facility and flexibility for running new courses and tutorials at little additional cost.

THE IIT DELHI EXPERIMENT

The GENESIS

The IIT academic system by virtue of its singularity and flexibility has its own peculiar

constraints and needs. For a long time now constraints in opting courses have been felt and registered :-

- i) Although there is a vast choice of electives offered, students are unable to avail of the facility because of time-table clashes.
- ii) Large no. of students wanting to take the same course taught by a specific teacher.
- iii) Highly specialised courses where the number is very limited and one teacher is blocked.
- iv) Inter-disciplinary courses which are open to students from different disciplines and there is need for certain foundation courses to be taken as pre-requisite.

SCOPE OF THE EXPERIMENT

Although the efficacy of the TVI mode has been proven beyond doubt for continuing Education, our interest at IITD was to see if this mode could be used for on-campus instruction to solve one or several of the above-mentioned difficulties.

The primary objectives of the experiment were to evaluate

- a) the comparative effectiveness and efficiency of the TVI mode as against normal teacher based classroom mode,
- b) the impact of group size in TVI mode, and
- c) the psychological acceptability of the TVI mode by the learners and the concerned teacher.

Right from the beginning it was apparent that being the first of its kind and involving students whose grades were at risk (a highly sensitive issue), this experiment demanded certain flexibility of design and compromise of variables.

The experiment could only be conducted with student volunteers given the option of dropping out if they so desired. The objective was rather modest - to simply verify whether this mode could be at all considered for use and whether the students would accept it as a desirable mode of receiving formal instruction. This was not a research experiment per se, in the conventional sense of the term but an important experiment all the same, because if it succeeds, it would bring in not only solutions to urgent needs but would also open the possibility of sharing valuable human and material resources.

THE INFRASTRUCTURE

The Indian Institute of Technology Delhi, with the support of Ministry of Human Resource Development has established a modern Learning Resource Development Centre with the principal objective of producing high quality video programmes for higher engineering education. A studio class room has been set-up with three camera facility and it is possible to simultaneously cover the lecturer, the students and the visuals/writing of the teacher. A special technique employing an overhead camera is used to obtain maximum clarity of text, equations and figures drawn by the teacher on a note-pad rather than the blackboard. A high sound quality is obtained by using a clip-on microphone for the lecturer further supplemented by overhead microphones to pick up questions and observations from the students. The experiment would draw upon this facility.

THE ARRANGEMENTS

After the decision to TEST THE POTENTIAL OF TVI MODE FOR ON CAMPUS INSTRUCTION was taken, a course in "Computer Architecture" (CS

210) which is a compulsory course for CSE and EE and is also taken by PG students from Maths Dept. was chosen for the purpose. A plan to test this course in TVI mode was worked out in consultation with the Head, CET, the Teacher, and the Head, CSE. For convenience the course was designed in modular form and it was decided that for a start module I of the course would be prepared and tested so that the feedback obtained could be incorporated in the preparation and use of other modules.

The preparations for conducting the experiment which was to begin on 31.12.92 were completed well ahead of time. These included the following :

1. The necessary permissions were taken from the Head, CSE and the Dean, UG, for conducting the experiment.
2. The course material was recorded and reviewed by the Computer Science Department.
3. Two peer tutors were selected for the experiment and trained. The tutors were both final year B.Tech students, Gaurav Suri (CSE) and J.Vikram (EE). Both had taken the course in IInd year and had a CGPA above 8.5.
4. The details regarding the experiment such as the parameters to be tested, the methodology to be adopted time-table details and procedure for collection and analysis of data etc. were worked out.
5. After working out the detailed design of the experiment, the delegation of responsibilities was carried out among the people involved.

THE METHODOLOGY

The following methodology was worked out for the experiment :

1. All the students taking the Computer Architecture course registered as per routine for the regular course. In the first lecture the instructor explained the

concept and asked for volunteers for the experiment. 19 students volunteered to take the course in the TVI mode.

2. The students were given the option of discontinuing with the TVI mode and rejoining the regular class if they so desired. On the first day one student dropped out, the remaining 18 continued till the end of the experiment.
3. The volunteers were divided into two groups TVI I (5) and TVI II (13). This also suited the time-table of their tutorial cycles, so that arranging extra viewing sessions would become feasible.
4. The TVI groups needed one extra hour per week to complete the viewing which, according to the TVI concept had to be stopped every now and then for generating discussion.
5. After completing the module, they joined back the control group.
6. All students took the Minor I examination, which was divided in to two sections, Section I contained questions set on the module undertaken in TVI mode and Section II contained one question from the portion covered after the experimental group had joined the control group.
7. Throughout the period of the experiment, the students were offered the possibility to review lectures on demand.
8. The teacher gave two (instead of one) office hours per week for all students for consultation.
9. All the students, whether taking the regular course or the TVI module were given the same handouts, worksheets and assignments.

THE TIMETABLE

The TVI group followed the same time table, as the regular group except for two modifications-

- (i) The students had an additional contact hour per week with the peer-tutors to

complete viewing the video tapes on schedule.

(ii) The course co-ordinator increased his office hours for consultations from one to two per week during which he received all students.

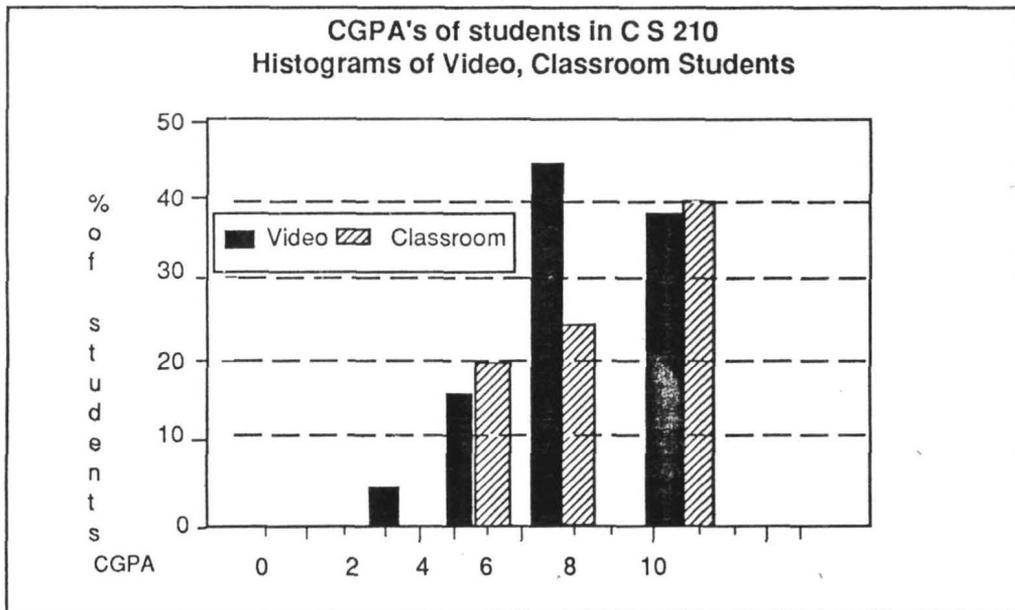
COLLECTION AND ANALYSIS OF DATA

A. ENTRY LEVEL OF TVI STUDENTS :

Due to several considerations, it was not possible to divide the TVI group into a homogenous group according to the entry level and both the groups had students with mixed CGPAs. It was noted that 18% students were from 4-6 point range, 45% from 7-8 point range, and 37% from 9-10 point range.

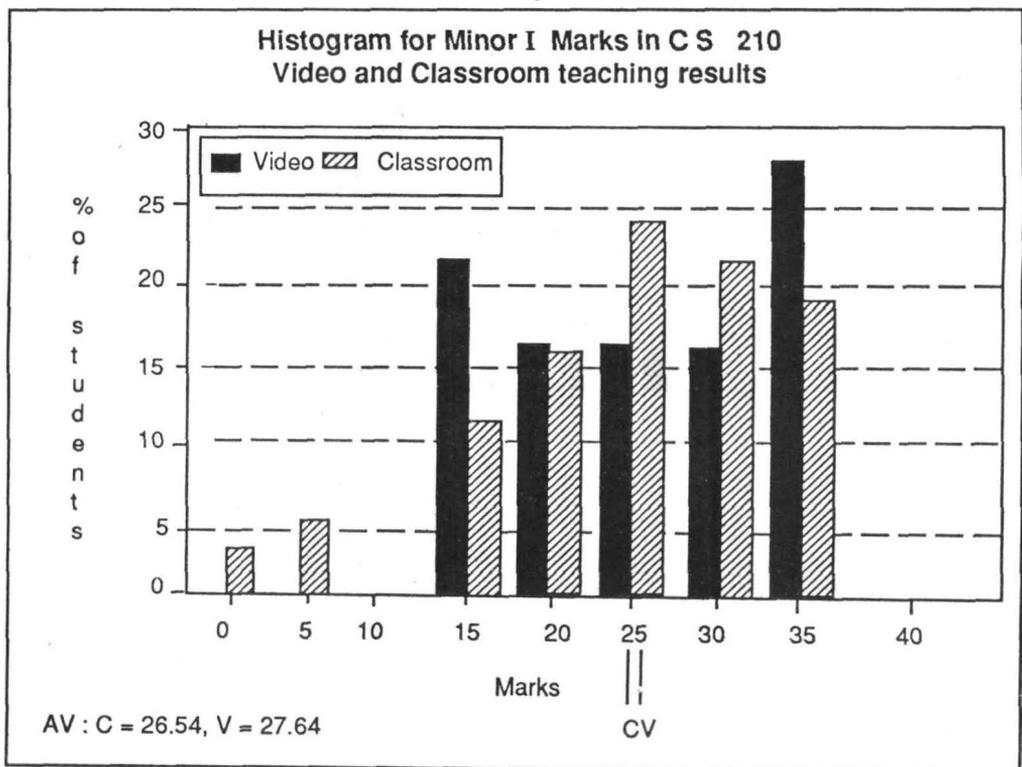
Average CGPA were as follows :

Control Group	37 students	7.11
TV Group I	05	7.05
TVI Group II	13	7.92



The performance of the TVI group was compared with the performance of the control group on the basis of Minor I. The Minor I question paper was for 40 marks and contained 5 questions. The fifth question was based on the subject matter taught after the TVI groups had joined back the control group. It carried 6 marks. The comprehensive performance data is reproduced below :

Category	No.of Students	Total Marks obtained	Avg. Marks
TVI Group	18	498	27.66
Control Group	37	982	26.54
Total	55	1480	26.9



LIMITATIONS OF THE EXPERIMENT

1. The test sample was very small, in fact it was too small for any formal statistical analysis of the data to be attempted.
2. The viewing arrangements were far from satisfactory.
3. The difficulty index of the portions covered in the module was very low, since it was the basic part of the course which dealt with elementary topics.

CONCLUSIONS

As per the objectives of the experiment two types of outcomes were being assessed - i) academic and (ii) psychological.

i) Academic Outcome -

- a. Average marks scored by the TVI groups were higher than that of the Control group, both with and without the final question. Thus, taking into account the variables such as "grouping on the basis of choice" and one extra hour per week to complete the viewing of tapes and Hawthorne Effect, one may say that learning outcome through this mode is no less than the conventional mode.
- b. The mode seemed to be less effective for average students (CGPA 6-8) but was found to be very effective for students with lower (CGPA 4-5) or higher (CGPA 9-10) abilities.

- c. Although the Stanford study specified that 5-6 was the ideal group size, in the IITD experiment, the group size did not have any effect on the performance of the students. This result was very exciting as for on-campus students a good group size would be between 12-15.

II. Psychological Outcome -

Feedback received from the TVI students showed that :

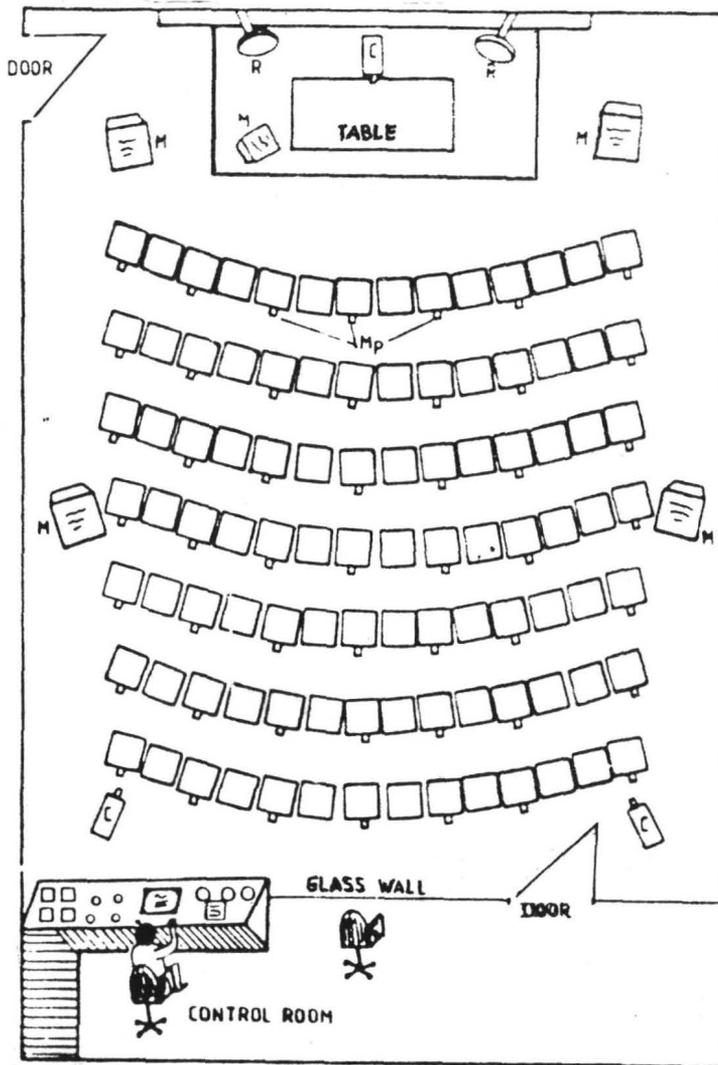
- a. This mode is highly enjoyable, most students found the experience better than that of a normal classroom. None of the 18 students registered thought of dropping out and completed the entire experiment.
- b. The students found interaction with the peer tutors very comfortable and enriching.
- c. The atmosphere was found to be conducive to learning as it's more informal.
- d. The overall response of the students was enthusiastic and very encouraging.

In the **FINAL ANALYSIS**, despite all limitations, the results of the experiment and the response of the students has been found to be positive enough to extend the experiment further to a full course in the near future. The results obtained confirmed the ones obtained by Prof. Gibbon's team (ref. Results OBTAINED (d) except for the group size.

NOTES :

1. Although a national list is yet to be compiled, in Capital alone, there are more than fifty agencies involved in this activity.
2. Cullinford, C. (1984) "Children and Television" (London, Gower)
3. Durbridge, N. (1982), "Developing the Use of Video Cassettes in the open University", Institute of Educational Technology, Paper on Broadcasting No.208 (Milton Kyees, Open University) (mimograph).
4. Bates, A.W. (1984) "Broadcasting in Education : an evaluation" (London, Constable).

5. Choat, E & Griffen, H (1986), "Young Children, Television and Learning", Part 1, Journal of Educational Technology, 12, pp 79-89.
6. Given below is the rough sketch of a typical studio-classroom used for recording lectures later used in the TVI mode.



M = MONITOR (5)
R = REFLECTOR (2)

C = CAMRA ON CEILING (3)
Mp - MICROPHONE (Behind every alternate chair)

7. J.M.Pettit and D.R.Grace, IEEE, Spectrum May, 1976.
8. For details regarding the various tests conducted and results obtained please refer to "TUTORED VIDEOTAPE INSTRUCTION" By J.F.Gibbons, W.R.Kincheloe and K.S.Down SCIENCE, 195, 139 (18 March, 1977).