DOCUMENT RESUME

ED 119 663 IR 003 126

AUTHOR Gallagher, Margaret; Marshall, J.
TITLE Broadcasting and the Need for Replay Facilities at the Open University.
INSTITUTION Open Univ., Walton, Bletchley, Bucks (England). Inst. of Educational Technology.
PUB DATE Feb 75
NOTE 18p.; Open University, IET-41

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage
DESCRIPTORS College Students; *Delivery Systems; *Educational Television; External Degree Programs; Facility Planning; *Facility Utilization Research; Higher Education; *Multimedia Instruction; Pilot Projects; *Video Cassette Systems; Video Equipment; Video Tape Recordings
IDENTIFIERS *Open University

ABSTRACT

The Open University of Great Britain relies heavily on broadcasting as a mode of instruction, but increased course offerings are making it impossible to broadcast each lesson more than once. To reach students unable to view the original broadcast, video cassette reorder systems were tested in six community study centers as part of a 1974 pilot study. Student use patterns, equipment reliability, and variations among the centers were monitored. By the end of the year, 258 playbacks had been attended by 496 students. It was concluded that, if small technical difficulties could be overcome and initial capital expenditures reduced, a central library of video cassettes could become part of the Open University of the future. (EMH)

BROADCASTING AND THE NEED FOR REPLAY FACILITIES AT THE OPEN UNIVERSITY

Since its inception, the Open University has recognised the importance of broadcasting as a component of its teaching system. But the University has also been aware of the very special problems created by this integration of live broadcasting with other elements of its degree courses. Each Open University course is based upon "units" of work, comprising specially written printed material, self assessment exercises, set book reading, assignments - some of which are marked by a tutor, and some by computer - and radio and television programmes. These programmes, broadcast as they are at fixed times and dates, as well as offering the student valuable study material which it is often difficult or impossible to convey through the print medium, act as important landmarks or points of reference for the student. They, together with the regular assignments, are the principle "pacing" elements in the Open University student's year.

The advantages of this fixed transmission pattern in terms of immediacy and pacing, are, however, offset by the problems created for those students who, for a wide variety of reasons, regularly or even occasionally find it impossible to watch programmes for their courses at the scheduled times. This, warned the University's original Planning Committee "will remain inherent in the integrated course structure, until such times as recording machines for the television broadcasts become readily available and reasonably inexpensive".[1]

The University's original response to the Committee's recommendation that "equipment for replaying recordings of previous television programmes"[2] should be housed in local study centres, was to supply a library of Super 8mm film cassettes of every programme to its, then, 12 regional offices. From here they were distributed on request, to a student's nearest study centre where they could be played back on specially designed replay machines. The scheme, which was curtailed at the end of 1972, and the reasons for its limited success are described elsewhere [3] and need not be dwelt on here. It can be mentioned,

Since its inception, the Open University has recognised the importance of broadcasting as a component of its teaching system. But the University has also been aware of the very special problems created by this integration of live broadcasting with other elements of its degree courses. Each Open University course is based upon "units" of work, comprising specially written printed material, self assessment exercises, set book reading, assignments - some of which are marked by a tutor, and some by computer - and radio and television programmes. These programmes, broadcast as they are at fixed times and dates, as well as offering the student valuable study material which it is often difficult or impossible to convey through the print medium, act as important landmarks or points of reference for the student. They, together with the regular assignments, are the principle "pacing" elements in the Open University student's year.

The advantages of this fixed transmission pattern in terms of immediacy and pacing, are, however, offset by the problems created for those students who, for a wide variety of reasons, regularly or even occasionally find it impossible to watch programmes for their courses at the scheduled times. This, warned the University's original Planning Committee "will remain inherent in the integrated course structure, until such times as recording machines for the television broadcasts become readily available and reasonably inexpensive".[1]

The University's original response to the Committee's recommendation that "equipment for replaying recordings of previous television programmes"[2] should be housed in local study centres, was to supply a library of Super 8mm film cassettes of every programme to its, then, 12 regional offices. From here they were distributed on request, to a student's nearest study centre where they could be played back on specially designed replay machines. The scheme, which was curtailed at the end of 1972, and the reasons for its limited success are described elsewhere [3] and need not be dwelt on here. It can be mentioned,

however, that although the film cassette system was under-used and expensive, the decision to drop it was based on short-term economic reasoning rather than on long-term educational consideration.

The difficulties foreseen by the Planning Committee have since been magnified by the growth of the University itself. The agreement with the BBC provides for a total of thirty hours a week of television broadcasting time. However, only a portion of this time is available at what has been defined as "prime student viewing-time" - week-day early evenings and weekend mornings. The remaining transmission "slots" are relegated to less convenient times, such as before 8 a.m. So far, policy has been to give each 25 minute programme two transmissions. Inevitably, as the number of courses offered by the University has increased, so has the number of programmes transmitted for those courses: in 1975 over 1,100 Open University programmes will be broadcast (making a total of more than 2,200 "transmissions") over the BBC 2 network. Consequently, it has become impossible to give every programme at least one of its transmissions "prime" viewing time. In 1974, programmes for twenty-four courses were transmitted on week-days before 8 a.m.; in 1975 thirty-six courses are affected in this way. Moreover, from 1976 onwards, it will no longer be possible to give every programme a repeat transmission, and by 1984, if existing conditions persist, virtually no programmes could be transmitted twice.

Clearly, students are finding it increasingly difficult, and often impossible, to view programmes at the time of their transmission. For instance, research [4] has shown us that about 25% of students taking courses in Technology at the Open University have left home by 7.30 a.m. on weekdays and that only about 40% have returned home by 5.50 p.m. Yet in 1975, all programmes for a third-level Technology course are being transmitted at these times: the 'first' transmission begins at 5.50 p.m. and the 'repeat' at 7.30 a.m. on separate weekdays.

It was with this sort of eventual situation in mind that

the University allocated £10,000 to be spent during 1974 on a project to test a video cassette recorder (VCR) system in study centres. This, it was hoped, might be an improvement, in terms of cost, quality and usage, on the old film cassette system abandoned a year earlier. Extensive evaluation was considered necessary because of the very large capital and recurrent expenditure which it was envisaged any video record/replay system would entail.

Aims and Organization

For practical reasons, the project was concentrated in just one of the University's thirteen regions - the South. Here six study centres were selected to reflect the types of community found in the region - large/small, urban/rural - and to represent varying levels of student activity as measured by factors such as number of, and attendance at, study groups, level of attendance at meetings and social functions. These six centres, at Aylesbury, Bournemouth, Bracknell, Portsmouth, Reading and Witney, have a combined student population of over 1,000, representing 27% of students in South Region, or about 2.5% of all students registered with the University in 1974.

The project had four principal aims:

(a) to test the practicability of the use of video cassette recorders by students in study centres

(b) to establish the most effective organization for any video cassette replay system

(c) to establish which of the available models of video cassette recorder is best suited to the needs of the Open University

(d) to test the current level of student demand for a system to replay television programmes.

Discussion leading up to the allocation of funds for the 1974 project had centred on the issue of a student-operated VCR system - one in which a machine and supply of blank cassettes would be provided in the study centre and recording and playback

would be organised by students themselves.[5] So a major commitment of this study was to investigate the feasibility of such a system. Accordingly, in four of our six study centres, students were responsible for the "off-air" recording and playback of programmes.

It was felt that organising recordings (which have to be made at specific times) might prove difficult, so in the other two study centres it was arranged that technical staff of the host institution made the "off-air" recordings at the request of the students, who then used the VCR solely for playback.

Neither of these two schemes could help the student who unexpectedly missed a television broadcast, so in two of the four "student-operated" centres a cassette library service was offered in addition. At the request of students, cassettes were sent from the audio visual department of the University at Walton Hall, where they had been copied from master video tapes. Since this copying process is not linked to live programme transmissions, such cassettes were available at any time of the year.

Models of VCR available in late 1973, the Sony U-Matic and the Philips N1500, were used in the project and were compared for quality of picture and sound, ease of use, reliability, robustness and so on. Given the limited hours when study centres are open and the several possible demands on the system, it was thought that two VCRs might offer a more flexible arrangement, so three of the six centres were supplied with two machines, and the rest with only one. Eighty 30 minute and ten 60 minute cassettes (fifty hours' playing time) were issued to each of the six study centres. The control clock built into the Philips VCR for automatic recording can only be set to operate up to a maximum of 24 hours ahead. So that, for example, the recording of a Sunday broadcast could be set up on a Friday evening, a second independent clock - the Sangamo-Weston - was provided. Since the Sony U-Matic has no built-in clock, so the independent clock was needed for all automatic recording with this machine.

Details of the different arrangements in each study centre are given in Table I.

Table I Details of Study Centres and type of VCR Experiment.

Study Centre & Type of Host Institution	No. of OU Students (Feb. 1974)	Type of VCR Experiment	Level of Student Activity at Study Centre	Type & No. of VCR's
Aylesbury. College of Further Education	153	Student organised record/playback. Library service.	Moderate	Philips 2
Bournmouth. College of Technology	162	Host Institution record. Student organised playback.	Moderate	Philips 1
Bracknell. S.E. Berks College of Further Education	184	Student organised record/playback.	High	Philips 2
Portsmouth. Highbury Technical College	282	Host Institution record. Student organised playback.	Moderate	Sony 2
Reading. Berks College of Education	307	Student organised record/playback.	Moderate	Sony 1
Witney. West Oxon Technical College	60	Student organised record/playback. Library service.	Fairly high	Philips 1

Preparations for the introduction of the VCR facilities had been completed by the beginning of the 1974 academic year in February. Much consideration was given to maintaining a balance

between the security demanded by the high value of the VCR equipment and the need for relatively easy access to it by bona fide users. Each study centre was furnished with a strong lockable cupboard in which all the VCR equipment - recorder, cassettes, automatic timer and so on - was stored. The recorders - which were permanently coupled to a television monitor/receiver, aerial and mains supply - were positioned and operated at a convenient height on one of the cupboard shelves. At most study centres, users had to sign for the cupboard key and were sometimes asked to show a student card or other evidence of identification. A member of the host institution staff - the Open University Liaison Officer - usually acted as a local supervisor: he carried out regular checks, and any damage or faults were reported to him.

Previous experience of other, similar, schemes [6] had shown us that underuse of technical equipment was often attributable to a lack of information available to potential users. Consequently, in this project particular attention was paid to informing both students and staff of the existence of the new facilities in their study centre and of the uses to which they could be put. This was done both by letter and in person at the meeting for continuing students held in each study centre at the start of the year. At these meetings a short demonstration of the equipment was given and, where possible, students and staff were invited to have a go at operating the video cassette recorder for themselves. An important aim of these brief demonstrations was to convince those who might be inhibited by the apparent complexity of the equipment that in fact its operation was extremely simple. In addition, written instructions - clearly set out in a numbered sequence - were pinned to the cupboard housing each video cassette recorder.

Evaluation

In order to evaluate the relative success or failure of the scheme, and of particular elements within it, a continual monitoring process was built into the project. This focused on a number of key factors, including:

usage - numbers of programmes recorded; numbers played back; numbers of students involved; range of courses covered

equipment - reliability, ease of operation (for playback and both manual and automatic recording)

individual differences - each study centre was considered individually to discover any possible relationship between usage of, and attitude to, video cassette recorders and, for example, the provision or absence of a recording service, the student/course distribution, the degree of organization of the study centre community and ease of access to the study centre.

The monitoring was carried out using several different methods, some of which were continuous, some periodic and some irregular.

A questionnaire was sent at four points during the year, to a different quarter of the relevant student population on each occasion, so that all students received one questionnaire during the year. The questionnaire investigated not only the actual usage, but also attitudes to the usefulness of video cassette recorders in study centres, estimates of potential future use and suggestions for improvement in the existing organization of the system. Information was also gathered on background variables which, it was thought, might have some bearing on usage of the VCR facilities, such as pattern of study centre attendance and extent of usage of the television component of courses.

Telephone interviews were carried out as a follow-up with a sample of students who, in response to one of the first two postal questionnaires, had declared themselves either potential users or non-users of the system. The aim was to discover to what extent attitudes had changed over time, and what factors had encouraged or discouraged use of the equipment.

Loosely structured face-to-face interviews were conducted with students and staff to obtain their qualitative comments on the scheme. The interviews aimed to obtain more detailed information than could be provided by the questionnaire on attitudes to study centre facilities, to television programmes and to the

video cassette recorder, and on possible circumstances in which the equipment might be used or useful.

Occasional visits were made to each of the study centres in order to observe and test the system in operation.

A log book, in which users were asked to enter name, date, details of use (for example, whether playback or record), course code and programme nunber, was attached to each video cassette recorder. Careful records were kept of the number of times any machine broke down and the time taken to repair it; and of the number of library service requests and the length of time taken to meet each one.

Results : Success and Failure

By the end of the 1974 academic year, at least 131 students (13%) had actually made use of the video cassette recorder facilities and at least a further 27(4%) had made preparations or unsuccessful attempts to do so. This is the number of students documented - by either log book entries or questionnaire data - as having used the system. However, we know that uses were logged by only about half the students who in fact made use of the VCR, and since the questionnaire data is not cumulative (respondents to early questionnaires who had not used the facility at the time of questionnaire completion may subsequently have done so) we can only estimate the 'real' number of users. We put this at between 17% and 20% of students.

We know that during the year 325 programmes were recorded over the six study centres, and that 258 playbacks were attended by a total of 496 students: so each 'viewing' was attended by an average of about 2 students. Demand was heaviest from students following Technology and the Science courses:of the programmes recorded, half were from the Science and Technology areas. Programmes from Arts, Social Sciences, Educational Studies and Mathematics courses made up the other half. This can be explained partly in terms of the differing emphases which individual Faculties and course teams place on television - for instance, several Arts and Social Science courses which rely heavily on

television appear as frequently in the log books as the Science and Technology courses - and partly, perhaps, in terms of the personal characteristics of students taking courses in different Faculties. It is interesting, for example, that no Arts or Educational Studies programmes were recorded by students themselves. All of the Arts programmes recorded during 1974 were made at Bournemouth and Portsmouth where recordings were carried out by staff of the host institution. Similarly, recordings of Educational Studies programmes were either made at these two centres, or requested through the library service by students at Witney and Aylesbury.

Over 50 unsuccessful attempts to use the facilities are known to have been made. Very few of these difficulties were related to the operation of the equipment: most were caused early in the year by organizational deficiencies such as confusion over the procedure for obtaining keys.

The principal operational difficulty was caused by the automatic timer: at the four "student-operated" centres a total of 34 recordings was attempted automatically. Of these, 7 were unsuccessful: in three cases this was because the mains plug was disconnected after the machine had been pre-set, and four times the timer either was set for, or began recording at the wrong time. At Reading, the only "student-operated" centre at which all automatic recordings had to be made with the ancillary Sangamo timer, only one student actually used the timer successfully.

The level of demand varied considerably between the six study centres: it was heaviest at Witney and Bournemouth, where respectively 24% and 23% are known to have used the system and lowest at Aylesbury and Reading, with 12% and 11% of students using the equipment. In the middle, at Bracknell and Portsmouth respectively 18% and 15% of current students are known to have used the service in 1974. Questionnaire and interview data revealed a clear interaction between the nature of arrangements for recording and playback - student-operated, staff-operated, library service - and the general sociability and level of activity of the student community, in producing the actual degree

of usage made. Overall, student reaction - even among those who did not actually make use of it - was enthusiastic towards the scheme: the vast majority of students were impressed by the possibilities offered, felt that they were needed, and hoped for their continued availability.

Given optimum arrangements for recording and playback, student use of video cassette recorders is certainly practicable, both in terms of demand and of operability. In 1974, no major problems arose in terms of student breakage, of damage to or loss of equipment or cassettes. Clearly, it is a practical proposition to expect students to operate such equipment with a minimum of trouble. However, we found that overall reliability of the machines was a major factor affecting the viability of any such scheme. Problems were caused not only by machine breakdown, but by slight technical mishaps, such as picture instability due to tracking and tuning controls slipping or being moved inadvertently.

Video equipment has until very recently been almost exclusively handled by a few technical operators who have been able to carry out adjustments and minor maintenance, such as cleaning tape heads, for themselves. In most colleges and universities where this sort of equipment is in use, technical assistance is usually immediately available: at Brunel University, for example, maintenance of the student-operated replay machines is carried out by staff of the University's Television Service on a weekly basis.[7] However, if machines are to be used by students and others with little or no technical knowledge, for example, in schools or in Open University study centres where in general no qualified technical staff are available, it is essential that regular checking and preventive maintenance is carried out so that unnecessary wear and damage to machine heads and tapes is avoided. At the present time, none of the manufacturing companies offers a really efficient and comprehensive maintenance service.

Other important factors affecting the ultimate success of any scheme are planning and briefing. Initially, at least, considerable organizational effort is needed in order to plan the location and installation of equipment. Time and effort are also needed in order to arrange written briefings and demonstrations of

equipment to both staff and students, who will need to be helped over any initial unease they may feel about using expensive technical equipment.

The Most Efficient System

The 1974 project indicated that a centrally-based cassette library service was likely to be the cheapest and most practical way of providing students with alternative access to television programmes. The other systems we tried each had a number of disadvantages.

The student-operated system relies heavily on the use of the automatic timer. In practice this often proved inconvenient to use and insufficiently accurate. Existing copyright restrictions on Open University material also raise problems: strictly speaking, it is not permissible for one student to make off-air recordings for another. The major limitation in this system, however, is that the student must know in advance that a programme will be missed. This seriously cuts down the number of students who can benefit from the replay system, since many programmes are missed unintentionally or unexpectedly.

The same restriction applies to the system in which host institution staff carry out recordings for students. In fact, in 1974 this constraint almost certainly resulted in students requesting staff to record programmes in case they might be missed, and subsequently never needing to play them back. In other respects the "host institution" service functioned smoothly and had the major advantage that the student could book recordings by telephone. However, in terms of a national provision, this type of organization is not feasible, since very few study centres are housed in institutions which could at present offer the necessary facilities and expertise. Nevertheless, alongside any blanket scheme operated by the University, there is clearly a place for the development of links of the sort established at Bournemouth and Portsmouth and already being offered to the University by other institutions. These institutions need not necessarily be exclusively educational establishments. Public libraries provide congenial atmosphere for study, and if present copyright barriers can be overcome, there is great scope for fuller utilisation of the resources now available at many of these.

The Open University cassette library service offered to students at Witney and Aylesbury as part of the 1974 project has none of the disadvantages already mentioned. Although introduced to students very much as a "back-up" service, the idea proved popular and successful: a total of 70 programmes (about two a week, on average) had been copied by the end of 1974. The main advantages of a library service, from the student's point of view, are firstly that he has very little to do in order to obtain a programme, and secondly that he is almost 100% certain of being able to view any programme at any time.

From the University's point of view, a centrally operated library service is undoubtedly the cheapest way of ensuring that students have access to television programmes at times other than at transmission. Once the hardware is available - and depending on the type of machine chosen it would cost between £90,000 and £170,000 to equip all study centres - expenditure, in terms of software and man-hours, is entirely governed by demand. Moreover, a decision to opt for this sort of service has implications for the type of replay machine selected for installation in study centres: if students are to use the machines only, or primarily, for playing back recordings, some of the features of the more expensive machines become superfluous, for example the built-in television receiver and automatic clock. The efficiency of the library service would be optimised by allowing a proportion of demand to be met "off the shelf" using an established stock of pre-recorded copies, and supplementing this by further copying of specific programmes as dictated by demand. Clearly, the larger the stock component, the greater the investment in cassettes; conversely, the smaller the stock component, the greater the investment required in man-power and copying equipment. With an initial national demand of 700 copies per week - estimated on the basis of usage in our 1974 study - such a service (including capital expenditure written off over a four year period) would cost in the region of £100,000 annually.

The Current Situation

The University has not as yet authorised this expenditure. It has so far remained unconvinced by the answers to two major

questions. Firstly, is the amount of money involved in providing such a service justified by the known level of demand? The students who used the system in 1974 are certainly a minority of the total population, but clearly a sizeable and important one. It is important to bear in mind, moreover, that up to 20% of students used the facilities in 1974, when there was no great problem with transmission times and when the experimental conditions of the project undoubtedly deterred many potential users. Usage is likely to increase significantly as the University moves into more difficult transmission times, and as the service is organised entirely on a lending-library basis. But even at 20% of the student population, we are dealing with 10,000 actual students who could be using this service if it were available, say in 1976. The recurrent cost - less than a 3% increase in the current broadcast budget - is in fact small when gauged in terms of student demand, and when set against other possible ways of meeting this demand.

Secondly, given the current state of video technology, isn't it likely that developments in the field will soon make available replay machines which are even cheaper and which are more appropriate to the professedly home-based teaching methods of the Open University? After a thorough literature search, and consultation with, for example, educational technologists in other institutions and the services, and members of the BBC engineering staff, we are convinced that no suitable technology, other than the video cassette/cartridge recorder, will be available at a similar cost, at least within the next few years. On the basis of the evidence collected in the 1974 project, we felt that neither of the two models tested - Philips and Sony - was completely suited to the University's needs, but trials this year which will continue to monitor the Philips and Sony, as well as testing the Radio Rentals VCR, and two cartridge machines - the National Panasonic and the Hitachi - will enable us to recommend a particular model for use in study centres.

The Open University's reluctance to commit itself to capital expenditure of up to £170,000 is understandable and, in the end involves a value judgement as to the importance of broadcasting

within the teaching system. However, whether the eventual decision is for or against the provision of replay facilities it will have far-reaching implications for the University's teaching system. The shortage of air time which already makes it difficult for many students to receive broadcasts will reach a crucial point in 1976 and will become increasingly acute with the steady phasing out of repeats. Over the next few years, the whole future of broadcasting in the University will be affected by this situation. As it becomes increasingly difficult for students to watch broadcasts at the time of transmission, course teams are likely to become increasingly reluctant to integrate broadcasts with the other course materials and may tend to use broadcasts to relay "enrichment" or "free-standing" material. It is probable that if broadcasts were to assume this role, even fewer students would watch at inconvenient times than would do so if broadcasts were an integral part of the course. On the other hand, if the broadcast element of the course is designed in the knowledge that every study centre is equipped with a replay device which allows students to review any particular programme at will, to view the television component of the course at a pace suited to each individual student, and to use broadcast material for pre-examination revision, then many existing limitations on the role of television in the teaching system will be removed: there will be major implications for the uses to which broadcasting can be put. The cheap home-based video replay device is decades rather than years away. For the foreseeable future, the cost advantages of using open-network broadcasting for the Open University's home-based students are not seriously challengeable.[8] Cassettes will not - cannot - be the primary means of distributing Open University audio visual material. They <u>are</u> needed as a secondary means of distribution to an inevitable and large percentage of the student population. Prototypes of other forms of video replay equipment, such as the video disc, do of course exist. Even when fully developed and available commercially there is no guarantee that they will be an economical proposition for the Open University.

It is in this respect that the Open University's needs differ from those of many institutions and organisations at present faced with the problem of finding a video recorder

appropriate to its needs. As long as one is talking in terms of the purchase of a few machines, then a difference of even several hundred pounds in their purchase price is unlikely to be a crucial determinant of choice. However, the Open University has 260 study centres; consequently, the cost factor impinges more heavily on selection.

However, it is important to bear in mind that it is not necessarily the machine itself which determines the cost of its use, but the total system within which it is used. For instance, if heavy expenditure on soft-ware is envisaged then this must be weighed against machine costs, since some of the more expensive video recorders use some of the cheapest tapes. In our costings for the library service, for example, a differential of up to £80,000 in capital expenditure, was reduced to one of £20,000 in total expenditure, when other costs, such as soft-ware and maintenance, were included.

Other important considerations of general application emerging from our study included the detailed pre-planning and organisation which was necessary to ensure the smooth operation of even this modest project; the large investment of time needed to brief those who were to have access to the facilities; the advantage of careful monitoring, at least in the early stages, to help smooth out teething problems and assess the overall success or failure of the scheme; the need for a reliable preventive maintenance service to avoid unnecessary wear on the machines.

Finally, it should be recognised that the question of resource provision is one which can contain far-reaching implications. For the Open University, it is not simply a question of whether we should install an extra audio-visual resource in study centres. It is a question of the future use of broadcasting in the University and therefore of the very nature of the University's teaching system.

References

1. THE OPEN UNIVERSITY (1969) Report of the Planning Committee, London, HMSO para. 66 p. 18.

2. Ibid para. 104 p. 27.

3. BATES, A. W. (1974) Video Cassettes at the Open University in Leedham, J., Romiszowski, A. J. Videocassettes in Education and Training, London, Kogan Page. pp 45-46.

4. MCINTOSH, N. E. (1972) Research for a new Institution: The Open University, in Innovation in Higher Education. Society for Research in Higher Education, London.

5. BATES, A. W. (1974) op. cit p. 48.

6. Ibid p. 48

7. NOORDHOF, G. (1974) The Development of Self Replay Facilities at Brunel University in Programmed Learning and Educational Technology, Vol. 11., No. 1. January, 1974, p. 14.

8. BATES, A. W. (1973) Educational and Cost Comparisons between Open Network, Cable and Cassette Systems of Multi-Media Teaching. 8th Mediorama, Blankenberge, Belgium, p. 16.

M. Gallagher
J. Marshall
February 1975