

"Some implications of learning theory for the training of agriculturalists in E. Africa Case"

MAKELI INSTITUTE OF SOCIAL RESEARCH DEVELOPMENT

INSTITUTE OF DEVELOPMENT STUDIES LIBRARY

John Moris
R.D.R. 7

Some General Principles of Learning Theory

1. Definition: We may define learning most simply as the acquisition of meaning. It takes place in the course of a learner's behaviour, and causes him to impute to parts of his environment a meaning which can be later reactivated by cues relating to the original situation. Learning is the residue left by experience in an individual's potential for responding to future experiences.

Learning is variably affected by other factors. The rate of learning is, of course, closely tied to meaningfulness. The individual's attention and interest predispose him towards learning, while frustration, stress, boredom, fatigue, and conflict all inhibit learning. What precedes and what follows learning affect its retention.

What is learned is highly dependent upon past experience. For the learner, his past experience constitutes the reality from which he draws his interests and his conceptions of what is worth paying attention to--the meanings he draws from a learning situation are his interpretations of the relevance of that situation to himself.

2. Control: Whatever controls the individual's environment, therefore, to a considerable extent controls his learning. An institution delimits the areas of learning for those within through its authority to schedule their activities, to provide for their experiences, to define their social groups, to guide their exposure to ideas, and to reward and punish their behaviour.

The techniques used to present experience affect the learner's acquisition of meaning from his experience. Different techniques are more or less efficient; the same individual learns the same materials at different rates, depending upon the techniques employed in the instruction. Thus an institution can control the speed of progress in instruction as well as the content of instruction.

An instructional group is only one of many ways of structuring experience in order to facilitate the learning of set materials. From the institution's standpoint, it is the easiest alternative to organize; from the individual's standpoint, it is one of the less efficient techniques for programming learning. Because in the classroom one finds a mixture of learning, performance, and evaluation, we must guard against equating the process of learning with the measurement of learning.

3. Types of Learning: Whereas learning appears to be a unitary attribute of experiencing, the rate of retention appears to be influenced by different factors, depending upon the content of what is learned. Ideational learning, affective learning, motivational learning, attitudinal learning, motor learning--these may be all occurring in a single situation in response to different cues.

Insight is an extremely efficient type of learning, because it contains large components of previous learning transferred into new contexts and combinations. It occurs where the situation is already meaningful to the learner, where the individual has already mastered the preliminary repertoire of skills and concepts upon which it draws. It is more readily transferred to other situations, is better retained, and is more effectively recalled.

The association of things learned with rewards may become patterned into secondary drives which are self-rewarding, and which may become the basis of new and undesirable learning in conflict with the primary content of instruction. An unpleasant learning situation (because of embarrassment, unreasonable demands, discomfort, etc.) becomes transformed through association into a negative response to the content of what is being taught.

Most behaviours receive constant reinforcement in daily life. Consequently, behavioural change is much more difficult to teach than is information or ideas: it involves creating and rewarding new habits, providing new models, etc. It is strongly facilitated or strongly inhibited by conformity to the individual's peer group, and group decision-making is an effective way of inducing such change. Learning to extinguish responses which were previously rewarding is very difficult, and constitutes a special type of learning problem.

The learning of motor skills does not correlate with general ability. Such skills are independently developed, and prowess is very much dependent upon prior experience. With increasing age persons become less able to learn jobs which involve "time pressure" in the performance of new skills.

4. Efficiency of Learning: Attentive interest is a prerequisite to new learning. Varied presentations sustain this interest, especially where learning occurs in a group situation, and thereby increase learning efficiency. "It is the novelty of experience which provides for learning, not repetition. Hence, the remedy for poor progress is not more of the same experience, but experiences better designed to provide the desired learning."¹ Each student has a unique response pattern, based upon his personality and his past experience, which selectively determines the effectiveness of different teaching methods, to a considerable extent independent of his intelligence. The only way to accommodate for these individual disparities within a classroom setting is to employ a wide variety of teaching methods to insure uniform progress.

The rate of learning is very clearly responsive to the type and frequency of reinforcement given. Awards which speed correct learning may be of many types: knowledge of good performance, approval, social prestige, freedom, access to a desired situation, etc. It is important to try to find out what reinforces a given act, and to present that reinforcer if we want the act to occur or remove it if we want to extinguish the act."²

Pleasant memories tend to persist more than unpleasant ones, and positive rewards to be more effective than negative sanctions. Knowledge of one's progress--i.e., "feedback"--powerfully affects learning rates, particularly where the individual himself desires to learn. The optimal learning situation is where tasks are broken into small, logically related units which can be successfully mastered upon first presentation most of the time, and where the individual is given immediate knowledge of his success. In converse, learning situations which involve frustration, stress, unrealistic demands, or threats to an individual's self esteem slow the rate of learning new materials. (But at the same time a certain degree of arousal and stress facilitates performance.)

Through its control of rewards, an institution continuously affects the rate and direction of learning which occurs. If most rewards are not a part of the formal system of instruction, or are randomly given irrespective of actual achievement, it is likely that the learning of formal materials is inefficient while the learning of secondary drives (such as conformity to peer group pressure or enjoyment of leisure) is enhanced.

Students do better when materials they are learning fit their long term goals. The individual's concept of "what learning is for" comes from his social environment, and molds the "set" of his approach to a learning experience. His expectations, and his conception of the instrumentality of the situation, may seriously affect the rate of his learning.

Learning is most effective where particular responses are learned under the particular conditions in which they are to be used. Practice in "real life" situations insures that a transfer of learning will take place, and that the individual's learned responses will be appropriate to the situation for which training is provided. Similarly, active responses are more effective than mere passive recognition. Recognition should not be used as a criterion of learning.³

In learning motor skills, specific guidance and instantaneous "feedback" increase the speed with which the skill is acquired. Again, it is best to practice under conditions as similar as possible to those in which dependable performance is required. The response should be "overlearned" through practicing under varied conditions until the learner generalizes his response to different cues. Because of muscle fatigue, motor learning is more efficient when practice trials are short and well-spaced. Having brief rest periods within the practice period is one solution to overcoming fatigue, but the best procedure is to break down complex skills into smaller, easily mastered components.

5. Retention of Learning: What follows a learning period importantly affects what is retained. Learning closely similar materials creates the maximum amount of interference with the retention of previously learned materials, while complete rest (preferably sleep) seems to aid retention.

¹Tilton, 1951, p.239.

²Hill, 1963, p.212.

³Carr, 1962, p. 59.

It has been long known that forgetting does not proceed at a steady rate: that the most rapid forgetting occurs immediately after a practice period. Review soon after the original learning takes place helps to prevent this rapid forgetting; by properly spaced reviews retention can be kept at a high level. The spacing of repetitions and practice periods affects learning retention even more than does the spacing of the original learning.

Most of the benefits of repetition derive from the exposure it affords to other factors in the situation: multiple rewards, opportunity to learn complex cues, knowledge of progress, etc. If these are absent repetition does not of itself bring about either learning or retention.

For complex tasks, better retention occurs if they are learned in "massed trials" --i.e., longer practice periods which allow the learner to go over items several times, especially where a large degree of discovery is required.

Attempting to learn verbatim recall of items both slows the rate of learning and hinders retention: concentration upon mastering the essential meaning improves retention, as does the ordering of items learned into larger, logically related hierarchical steps. Meaningful organization lessens forgetting.

Attempted recall is superior to repetition in learning informational materials. This superiority is further strengthened if recall includes a verbal reconstruction. Active recall is superior to passive. If possible the individual should initiate active recall soon after the initial learning, and continue his review at decreasing intervals thereafter. Mastery of learning becomes increasingly stable the longer it is maintained.

Finally, as much or more time should be devoted to active recall and consolidation, perhaps verbally or in group discussion, as is devoted to the first learning. Most students give too much of their time to attempting to learn new materials, and not enough to consolidation immediately after first learning.¹

Implications of Learning Theory Concerning Students' Preparation

These principles, if taken seriously, would seem to suggest that the optimal preparation for learning agricultural professions is very different from the preparation which East African students receive. Specifically, one should anticipate the following difficulties:²

- 1 Students' experience in all realms of agriculture is so limited that they cannot transfer previous learning. This limits their response to illustrative items, and slows their learning of new materials. It precludes insightful learning, so that they tend to treat principles of agriculture as statements of information--a corpus of law to be mastered and returned.
- 2 Students lack the whole cluster of latent interests in natural history, mathematics, science, mechanics, hobbies, etc. which are generally a part of a western youth's background. The lack of these interests, which we acquire in childhood, further restricts the student's attention. He is slow to respond to experience in agriculture, science, or mechanics because he does not have related, latent interests in these fields. His interest must be built up "from scratch", as it were, and until he acquires this internal drive he will be a slow and somewhat indifferent learner.
- 3 Many students have acquired a firm, if simplistic, mental picture of what agriculture is. In order to change this conception one must break down an image which is already well founded and which is constantly reinforced by the larger society. Re-learning is considerably more difficult than the first learning of an attitude, especially where there are countervailing forces at work.
- 4 Students are acutely aware of the enormous amount of information which they must learn in scientific fields. Unfortunately, they have also learned

¹Although in my own words, this statement of principles draws heavily upon several standard texts in educational psychology (Tilton, Skinner, Hill, and Sawyer and Telford). These sources contain full discussion of experimental evidence.

²For more complete discussion, see the previous chapter.

4 (Continued:)

a single technique for coping with new information. They compensate for their lack of previous experience by furiously memorizing each new piece of vital information. They are concerned with only one type of learning--recall--and this for only one type of information--what they conceive to be essential information. They accept one guide to determining what information is essential, the syllabus. Their acute awareness of the shortage of time which they have available to themselves for learning is, therefore, self defeating, for it is coupled with one of the least efficient of all methods of learning--the attempt to achieve verbatim recall.

5 Furthermore, students' previous reliance upon inefficient learning techniques has always been rewarded by the educational system. True, it has been only partially rewarded--but partial reinforcement is one of the most potent means of creating compulsive habits! The other types of learning which are so fundamental in any applied science (engineering, medicine, agriculture, etc.) such as problem solving, manual dexterity, speed of calculation, etc., have never been rewarded in the schools. Students' entire approach to education has come to be instrumental to achieving the rewards: getting a good final qualification. They must in consequence re-learn the purpose of education, before they will show the highly motivated, interested concern which makes for efficient learning.

6 Students have acquired a set of secondary drives which they themselves believe are antithetical to life as a field officer in agricultural professions. Their expected reward for scholarship is a good, highly paid job; their expected use of this reward is to lead a comfortable life as near as possible to the centers of influence (by which they are hired and promoted). They believe a post in the field involves the loss of promotion and the negation of civilized life. Their learned drives for attainment, prestige, self-respect, and comfort directly conflict with their probably future in agriculture. Their teachers as well as their peers also believe this, and encourage them to think of better alternatives.

It is amazing that students do as well as they do, considering the forementioned difficulties. The options chosen by students and their background and the social setting in which they live all interact to inhibit their progress. Yet, by means of enormous application and innate high intelligence, most manage to achieve their goal--University qualification. On the other hand, it is obvious that before these men can become good field officers their training must provide much more than would be required otherwise. In particular, it ought to:

- 1 Supply the whole gamut of out-of-doors field experiences needed to enjoy natural science.
- 2 Provide basic personal skills not provided by the home but essential on the job: neatness, organization, driving, climbing, etc.
- 3 Create new and attractive models of the field officer's life.
- 4 Foster an internal set of standards which does not depend upon rewards.
- 5 Create new habits of procedure within work: a preference for independent thought, problem-solving, and innovative solutions.
- 6 Re-awaken the motivation of curiosity as the basis of learning.
- 7 Instil the habit of active observation of the external world.
- 9 Develop a pride in being self-sufficient.

In short, to be successful a training program must recapture control over the teaching of habits, attitudes, and motivations. The existing programs are indeed teaching these components of behaviour--but what students learn about behaviour is directly antithetical ^{to} ~~from~~ what they are taught about in class!

Implications of Learning Theory for Agricultural Training
Institutions at Certificate, Diploma, and Degree Level

How do existing training programs compare with one another when examined in the light of the teaching methods they employ? And to what extent are these methods likely to be effective, given the nature of the jobs that agriculturalists are doing? The generalizations listed below explore the answers to these questions. The information is based upon personal visits to three degree training programs (Ethiopia, Nigeria, and Uganda), and nine certificate and diploma level programs (Zambia, Tanzania, Kenya, and Uganda). In the course of these visits, and in visits with agricultural officers in the field, one could not avoid the strong impression that agricultural training is much more poorly related to the final jobs being done than is the case in similar professions—e.g., medicine or engineering. There are often good reasons for this discrepancy, some of them inherent in the national economies of the countries concerned; but these overall constraints will be discussed separately.

1. Failure to take students' limitations seriously. In the literature of educational psychology, one frequently finds exhortations to the effect that one should "try to reconstruct the learner's life, space, with his tensions and goals and the paths and barriers that he perceives." The remarkable feature of all the programs visited was that this had never been done. In every case teachers confessed that the incoming pupils were more heterogeneous in science background than was desirable. They also freely admitted the students' lack of experience, and their misconceptions about agricultural professions. But there was not a single school which carried on a thorough program of entrance testing, or an adequate program of remedial training in the fields in which students were found to be deficient. Only two colleges (Ethiopia and Zambia) provided a broad enough range of course instruction to insure that pupils could make up their deficiencies in particular areas if they wished. At all schools the staff were defensive about this topic; it is significant that the two least realistic programs were both degree training programs.

2. Reliance upon inappropriate models. The lack of realism in degree training programs is significant. One of the prime reasons for ignoring the fact of the variability in students' backgrounds is the over simplified model which is held in mind by both staff and students of the agricultural professions. In the lower level programs, many staff members seemed to feel that they were training an academically qualified farmer. Strong resentment was often expressed when students did not take to farming in a way which one would expect of career farmers. In higher level programs, on the other hand, staff seemed to feel that they were producing agriculturally qualified scientists. Again, some resentment was expressed when students showed little of the enthusiasms of either career farmers or career scientists. It is superbly ironic that no program admitted to training agricultural administrators—which was what all were producing! (With the exception of a special course at the college in Zambia, agricultural administration was conspicuously absent from all curricula.)

The roots of the problem can be traced to the shared idea that the important dimensions of agricultural training relate to academic qualification. Few teachers seemed to realize that agriculture is not a profession as such; that it is a cluster of professions which are often more different from one another than they are from related fields. There is more variability horizontally, between different sub-specialties, than there is vertically, between different levels of qualification. Yet all the measures used to select students and to reward their progress relate to the vertical dimension, their level of qualification. An agricultural administrator in his office has more in common with his counterparts in other offices—irrespective of their "qualification"—than he does with a field ecologist (a certificate "level" post according to current nomenclature!).

Job analysis shows that field officers in agriculture do a job not much different in many respects from field engineers. The field engineer divides his time between

In all schools, the staff insist that their main limitation is the amount of time available in a three year curriculum. They do not try to teach trainees all that they need to know, nor do they try to instill the self-confidence that comes from a mastery of field skills. In the lower level programs, teachers often insist that what the country needs is a greater supply of men who can do simple things; students, in turn, resent the lack of theory in their training (many complained that they do not even have to think as hard as they did in secondary school). The brighter students often stop cooperating with the institution. They consciously and deliberately waste time, especially in the practicals, and they employ inefficient learning techniques when they do study.

Thus the situation is rather different in degree level programs---which ignore the necessary practical skills---and in lower level programs, which teach the practical skills, but in a rather inefficient way. The difficulty is twofold: none of the schools were allowing enough extra staff to teach motor skills (where the teacher pupil ratio must be a very low one), and few were measuring and rewarding attainment in the learning of skills. There needs to be much more instruction actually going on in practical periods, and much more use of various rewards tied to performance.

It is interesting that in all schools the teachers expressed great faith in the efficacy of instruction through actual apprenticeships on the farm, where a student works as a farm labourer. Teachers do not feel that this is possible in East Africa, and they often complain of the lack of "high standard" farms where students could magically "pick up" modern farming. Although the trainees actually do serve such apprenticeships at ministerial expense during some of their long vacations, these training periods are not regarded as a formal part of the curriculum. They receive no real staff attention: no supervision, and no evaluation. Students realize this, and they waste most of the time during their vacations through lack of direction.

Finally, it was remarkable how little relationship there was between University or college farms and the agriculture typical of the country in which the farms are located. Because teachers have the persistent misapprehension that they are training either farmers or scientists, they insist that the farm be representative of the best that is possible: large-scale, capital intensive, fully mechanized. In fact the farms were often merely convenient sites for the carrying on of staff research---most staff members regard themselves as scientists, not farmers. Participation by students in experimental work---what one could call micro-horticulture---was supposed to teach them how to generalize about improving peasant agriculture! Students never shared in the management of these large farms; their records---if kept at all---were immaterial and obviously only "make work"; and they are thereby deprived from learning any of the secondary lessons which should accompany field experience: an awareness of the constraints which affect small farming, a knowledge of the labour requirements of given field types, a first-hand appreciation of the costs of different alternative, etc. In short, farming is taught as a form of modern technology, not as an applied science suited to African conditions. Teachers seldom know anything about local farming, except that it is unscientific. They teach farming by inventing a catalogue of modern farm operations, witnessed by students but not practised.

In only four out of the thirteen programs visited were there duplicate stores of equipment to allow instruction to follow a different calendar from that followed by the farm. For learning to be efficient, practicals must parallel the lectures which refer to them, preferably on the same day. In this case they will then follow an order different from that inherent in the farm year, since teaching moves from the simple to the complex operations. Additionally, teaching covers all types of systems, not only the ones which are economic on a large, mechanized farm. Wherever there was considerable practical teaching going on, one finds an inherent conflict between the farm manager (who wants to run a taut ship) and the agronomy lecturers, who wish to give students field practice at the expense of numerous mistakes. A partial solution is to make the crop husbandry lecturer senior to the farm manager, and to give each class its own equipment separate from that of the farm. The situation is further improved if students do their practicing on small holdings, where their mistakes can be noticed and corrected, and where they can gain essential managerial practice. From the learning standpoint, a self-contained small holding with its own stores and one for which students supply all the labour, all the records, and all the decisions is infinitely superior to a large farm where they are supposed to mysteriously absorb farming skills.

Nevertheless, a number of schools have tried small-holding instructional units, and abandoned them. They require a great deal of careful supervision, and cannot be merely another of the large-farm manager's responsibilities. They do not work if used only for demonstration purposes. And, because students do provide essential services on them (which they do not on the large farm), the small units are an embarrassment during vacations.

5. Social Environment. The "role structure" of institutions is very precise and rigid. Teachers rarely have friends among the students, or even know them as individuals. They do not eat with students, nor join them in recreation unless obligated to. As a consequence of the considerable social distance always maintained, teachers get their information about students from other teachers, and the "rules of thumb" commonly shared about student motivation, thinking, etc. are based upon misinformation. Teachers seldom go into the field themselves, and the daily life they lead is not one which would be a possibility for a field officer. They have continuous access to cars, money, travel, books, etc. to the extent that they serve as a model for student aspirations, they serve as an incentive to leave agricultural careers! Also, the more subtle attitudes a teacher might have--his love of natural history, his interest in scientific farming, his personal standards of achievement and performance--are not communicated in the formal setting of classroom instruction.

Instead, students quickly sense the disdain that many teachers express in class towards traditional farming. Teachers try to build up morale by associating themselves and their students with modern agriculture; and they communicate this professionalism at expense of traditional farming (which students already despise). The segregation of instructional materials to fit the rubric of traditional course topics releases the teachers from any responsibility for understanding local agricultural practices. A few, by reason of past experience, have a sympathetic awareness of the considerable complexity of native farming; but most, as newcomers to both East Africa and to college teaching, react defensively by making invidious comparisons. Students are encouraged and rewarded in their great faith that mechanization is the ultimate solution to all agricultural problems.

In their dormitory and out-of-class life, students acquire secondary drives which compete with their conception of the sacrifices necessary in extension service. Most feel that the sacrifices are going to be necessary; they could not qualify for University, hence must take whatever they can get. Nevertheless, the institution itself provides many incentives and rewards for adopting this attitude. It sets prestige standards which are unattainable in the field. It rewards academic achievement, but not all-round performance. It leaves the student to cultivate his own interests, which are set by his peers. He uses his spare time to talk politics, to read light novels, or to go off to town. While in town he may often try to pass himself off as a student in some other institution, and he is rewarded in this deception by acquiring social approval. In short, the social life of an agricultural college replicates most features of life in secondary school, and it heightens the students' learning of high standards of personal well being. The administrators of a training college do not think of the institution itself as a training environment; and so the Government pays the costs of maintaining many services which are themselves powerful deterrents to the success of the institution's aim. These points apply in some measure to all training programs, but they are most true of University level agricultural training.

6. Training of teachers. In the foregoing remarks there has been an undercurrent of blame against the teaching given in agriculture. The teaching is indeed not adequate, but the blame does not lie with teachers. By and large, the Governments have not closely examined the needs of agricultural training when they set up higher level institutions. Most of the certificate and diploma level colleges had their origins as lower level training institutes, usually accepting standard eight or ten entrants. Teachers were seconded from local staff in the parent ministries. There was no need to recruit teachers in competition with other programs, and in general the instruction was at a low enough level so that almost any teacher could be asked to teach almost any subject. The curriculum was decided largely by the Principal: at beginning of term he would look over his stock of teaching recruits, demand one or two more from the ministry, and then teach whatever he could persuade his subordinates to accept as their schedule. At most certificate schools the weekly teaching load runs at about twenty-five hours, a figure comparable to that in low level teacher training colleges. When the manpower situation made it advisable to escalate the status of the professional training to be given, no provision was made for finding teachers suited to more advanced and more specialized training.

At the diploma level, you cannot get a soils scientist who will also teach the courses in agricultural economics. A diploma college competes directly with University level for its teachers, and pays them comparable salaries. As a consequence, the staff turnover at all institutions visited was in excess of 30% per annum. But in no cases had the Government allowed innovations which would have accommodated to the new situation, where the majority of all teachers are strangers to their job.

In summary, what are the unique features of local administration in Tanzania which must be accommodated for in training agricultural officers? The following trains are especially relevant:

- 1 The agricultural officer, at both district and regional levels, is usually the highest trained individual in the administration. As such, he is a member of committees dealing with all the natural resources, and he is looked to for advice on such matters. He will usually chair any committee which works on natural resource projects, whether they be in forestry, fisheries, plant husbandry, animal husbandry, land planning, or conservation.
- 2 Other ministries and units of government are organized to provide the facilities and staff for presenting agricultural advice. Through the medium of the Development Committees, the agricultural officer has access to the resources of all other departments; through the District Training Centers, he has teaching facilities for use in any sub-section of the country. The shortage is in qualified information, not in the organization to transmit it.
- 3 National ideology distrusts the successful individual farmers who are most likely to implement change. The independent government has favoured increased agricultural administration over increased extension, and attention given to groups over attention given to individuals.
- 4 Almost all local projects in one way or other involve agriculture. There are five ministries with major responsibilities in agricultural development, and all are likely to draw upon field staff from time to time. The responsibilities of different ministries and even of different departments compete with one another.
- 5 Historically, the extension service has concentrated upon transmitting central directive relating to agriculture. These central directives were not applicable in many areas, and the population has learned to ignore them. In those areas where the colonial government tried to force people to undertake land conservation or resettlement, people were able to use party agitation to defeat agricultural policy. Politicians are wary of re-opening such issues.
- 6 Tanzania does not carry out either market research or feasibility research. The information gleaned from the departmental research stations cannot be used as a basis for regional recommendations, although it is so presented. In practice both regional and district staff must provide their own research, however limited, and their own means of checking upon the effectiveness of their own efforts.
- 7 The very high rate of rotation in senior staff means that an agriculturalist can anticipate working with many different crops and on many different types of projects in different areas within a few years of his entry to service.
- 8 The criteria which is coming into use for evaluating the success of local extension is the fulfillment of production targets. These are set by the Directorate of Planning in consultation with local agriculturalists; there is a tremendous need for a better system of gathering information about crop outputs, and for a higher caliber of planning within the Directorate.
- 9 There is a tremendous difference between the effectiveness of Regional Development Committees and District Development Committees. With the growing infrastructure below the District level, the District Agricultural Officer becomes the only specialist in contact with any local farmers, and the key man among district level staff. He must be able to cooperate with community development.
- 10 The quality of training given to Assistant Field Officers is sufficient to let them perform most routine assignments. They are under-utilized at present, through the lack of well trained supervisory staff. Effective senior staff generally do a great deal of re-training their junior staff, and must be prepared to be self-sufficient in technical knowledge.
- 11 Most members of the agricultural department enter directly upon administrative or teaching duties as soon as they complete training; they depend entirely upon their training for their knowledge of agriculture in all its aspects.
- 12 There are several crucial development - oriented jobs for which no training now exists: (1) scheme management, (2) agricultural administration, (3) agricultural planning, and (4) agricultural teachers.

What are the special attributes a Field Officer will require to perform his job effectively? There is a grave disparity in the way expatriate teachers talk about the field officer's jobs, and the way manpower planners do. Teachers, and for that matter planners, refer to the field officer as a "technician," i.e., a man who carries out instructions passed down to him from on high. The situation is assumed to be as follows. A developing country has shortages of technicians at all levels. It is easier and cheaper to train a technician to do a limited and specialized job than to train him comprehensively. The decision-maker is analogous to the manager of an aircraft factory--i.e, a "degree man"; the technician to the gang foreman supervising the hammering of tin sheets. Because a degree man can make decisions for a large number of technicians, we should increase the number of middle-grade technicians to do the narrow specialties required out on the job.

The weakness lies in the analogy. Agriculture is not a process of pounding out tin sheets, and a developing country is not a carefully planned and produced aircraft factory. In the organization of agricultural administration, the top jobs (which are given to degree men) are purely administrative; they do not require special intelligence or training. The middle range jobs are the complex ones: these are the ones which must change as the economy changes, which must devise new techniques and decide when to discard old ones, which must feed accurate and relevant information to the top. In fact, the "technician" is already present: most "certificate men" are actually under-employed for their level of training, through the lack of good supervision. It is the field officer who must serve as the "catalyst", the one to (1) adjust imprecise central directives to environmental realities, (2) gather, evaluate, and process information on the farmer's reactions and on the feasibility of various projects, (3) organize and supervise field staff with simple skills in their contacts with farmers. As a cadre, then, the field officers perform a far greater diversity of jobs than do "degree men". A training program must prepare the entire cadre, not just one individual who may draw a limited job for a short period in his career. Over the lifetime of a field officer's career, you will find that he participates in (a) teaching, (b) administration, (c) research, (d) evaluation, (e) planning, (f) farm management. In a situation where the quality of central organization, advice, and research is low, the jobs requiring the highest qualifications are the middle-range executive jobs. The existing training in East Africa has paid far too much attention to the formal content of instruction, and little attention to the functions which must be performed by the man trained.

The manpower situation in Tanzania dictates a need for the following specialists:

1. Administrators: Men to relieve the field staff of the load of organizing projects which are fundamentally administrative and not agricultural in nature.
2. Teachers: Agriculturalists to serve in the FTC and DTU institutions.
3. Planners: Agricultural economists to evaluate programs, gather crop-production statistics, set production quotas, determine regional priorities.
4. Researchers: Agriculturalists to take over the work of the research stations.
5. Scheme Managers: Agriculturalists specially trained as labour organizers.

These men need to share the following characteristics: (1) feedback--ability to gather information and prepare it for other uses, (2) organizers--ability to lead a team of men to accomplish set goals, (3) persuaders--ability to instruct in agricultural techniques, (4) renovators--ability to keep themselves and their staff up-to-date in knowledge and techniques, to train themselves for new jobs, (5) diagnosticians--ability to solve agricultural problems through the application of intellect.

General principles of learning can be applied to most situations; provided one knows the nature of the tasks being prepared for and the historic backgrounds of the individuals being trained. From what we have already reviewed about the nature of the agriculturalist's job in Tanzania, and about the qualities of the educational system, what tactics might be employed to make the student's learning of agriculture as efficient as possible? We might:

- 1 Broaden the scope of rewards used by the institution, and relate these rewards directly to improved performance. Differentiate progressive from non-progressive learners in each type of learning, and use the reward system to stimulate individuals to progress on their own apart from their clique.
- 2 Increase the feedback given to a student, so that he is constantly aware of his progress and immediately aware of success in any one aspect of training.
- 3 Postpone specialization as long as possible, to allow the individual to acquire new interests needed for good performance in new fields, to allow him time to form a realistic assessment of his own aptitudes and of the real nature of various agricultural professions, and to give the Institution time to measure his capabilities and direct him accordingly.
- 4 Introduce a wide range of new interests into the curriculum as early as possible, but in the meanwhile draw upon his existing interests--his enjoyment of field trips, his desire to master the personal skills of driving, typing, etc., his curiosity about the physiology of sex--to involve him in new fields of knowledge (ecology, agricultural mechanics, genetics).
- 5 Use staff members in the field as models for an attractive career conception. Provide pleasant opportunities for students to observe staff members carrying out field duties, and allow students to participate with them.
- 6 Increase the amount of staff-student contact within informal learning situations, where participation is a reward for good performance.
- 7 Change the emphasis of class instruction from the transfer of information to the transfer of techniques of observation and problem solving; drill students in these techniques constantly, measure their progress, and reward achievement. Train students to organize and present information; not repeat it.
- 8 Organize new conceptual materials into small units, which can be mastered on first presentation, and which logically and hierarchically related to one another. Allow students a time and a place for individual study.
- 9 Provide for frequent review sessions, where students verbally and actively reconstruct previously learned materials. Make use of student-staff seminars, and also of student teaching, to aid in retention.
- 10 Increase the number of times an item is practised and the variety of ways it is presented by coordinating courses so that each one builds upon and maintains what has been previously learned; also, so that individual lectures in different departments reinforce one another.
- 11 Minimize interference between learnings by avoiding lectures in succession on the same topics, or involving similar activities; provide rest periods after each major laboratory or demonstration period. Make use of meals, tea, outside lectures, etc. to break up the monotony of the daily schedule.
- 12 Watch carefully for undesirable secondary learning that may grow out of a situation by association, and, insofar as is possible, maximize the number of learning situations where students will be learning correct behaviour as well as information in the same setting--i.e., field instruction.
- 13 Introduce the learning of motor skills early in the curriculum. Present new skills in short practice periods in their simplest components; allow for individual practice; measure and reward progress; practice the final mastery of complex motor skills under realistic field conditions; "overlearn" such skills.
- 14 Teach students supervisory and administrative skills, and measure their performance under field conditions.

Recommended Innovations

An Outline of Special Features Recommended for
the Agricultural College of Tanzania

The College should:

- 1 Initiate farm economic research locally, and coordinate all agricultural economic research nationally in order to test the feasibility of research results.
- 2 Designate the LPTC site as an Applied Research Institute to stimulate local agricultural economic research and to attract outside funds and staff.
- 3 Develop the college library as the central repository for all research materials in agriculture, including all government reports in this field.
- 4 Delimit as its special responsibility training in the fields of (a) agricultural extension, (b) agricultural education, (c) agricultural planning, (d) agricultural research, and (e) farm management.
- 5 Devise means of cooperating with other institutions in training cooperative, administrative, and community development officers.
- 6 Cultivate liason with the Region through cooperation in regional development planning and joint collection of agricultural information.
- 7 Strengthen relationship to the University by sharing a Director of Applied Research and by requesting that one third of basic science posts be filled by men also qualified to teach within specialized fields of agriculture.
- 8 Create a special relationship with a traditional farming area nearby and with a development scheme for training students in the field through "host families."
- 9 Arrange for students to spend short vacations at farmer training centers carrying out evaluations of the effectiveness of extension methods.
- 10 Rotate students' short vacation assignments to include some experience in each of Tanzania's major agricultural producing regions and to cover all crops.
- 11 Arrange for brief recruiting "safaris" by staff members during their vacations to visit secondary schools and present the case for agricultural professions.
- 12 Broaden the academic year from nine to eleven months through including supervised vacation employment for students, with four terms a year.
- 13 Create several new posts--a farm practicals supervisor, a research director, an off-campus extension supervisor, and an evaluation specialist--to enable the college to plan and coordinate all of the students' learning experiences.
- 14 Begin an entrance testing program to locate weaknesses in prior preparation and to indicate students' aptitudes for different types of agriculture.
- 15 Record cumulative records of students' achievements in (a) classroom learning, (b) field skills, (c) research prowess, and (d) field extension performance.
- 16 Introduce training in research methods, communications, and public administration into the syllabus.
- 17 Innaugurate weekly lectures and field trips as a planned part of the syllabus on topics not covered within the classroom curriculum.
- 18 Require a separate research essay each term which students will prepare from their own reading of a standard reading list and from library research.
- 19 Administer bi-weekly tests/^{to}measure student progress and/^{to}reward consistent work.
- 20 Teach crop husbandry both through classes and in extra-curricular assignments, within the context of farm management rather than farm technology.
- 21 Establish small-holding farm units for which students will supply labour, management, and records and conduct all out-of-class teaching on these units.
- 22 Reserve the large farm for the demonstration of farming techniques during the laboratory periods of science and agriculture courses, using local exercises.
- 23 Develop the college's own program for training the best junior staff to become assistant field lecturers, to compensate for the scarcity of permanent senior staff.
- 22 Organize an annual teacher's seminar to coordinate and improve the syllabus.
- 23 Institute a follow up program to support graduates with technical information once they are on the job, and to maintain their morale and professionalism.

This work is licensed under a
Creative Commons
Attribution – NonCommercial - NoDerivs 3.0 Licence.

To view a copy of the licence please see:
<http://creativecommons.org/licenses/by-nc-nd/3.0/>