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MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

INSTITUTO UNIVERSITÁRIO DE TRÁS-OS-MONTES E ALTO DOURO

MONTHLY REPORT - IUTAD - PURDUE - AID

March 1982, J. L. Ahlrichs

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Research:

Engra. Ana Luisa Pires and I collected a second round of 17 foliage samples from wet land, lameiro, pastures in the Montelegre area. She has completed the collection in other areas of Tras-os-Montes. This is for her work on Mg, Ca, K, and Al content of regional forages. Tissue analysis on her material is just starting. We are waiting the arrival of glassware and equipment to speed these analyses. Professor Rhykerd, who visited here last summer, has encouraged us to try to find someway for Engra. Pires to come to Purdue for a few months to work with him. Is there a possibility of Procalfer or other funds for such a bolsa?

The first Mg, Ca, and Mn analyses of our grape leaf tissue by Engr. Coutinho shows a beautiful relationship between foliage deficiency symptoms for Mg, the Mg content of the tissue, and the Mg content of the soil. This is encouraging us to expand our plans for spray treatment of grape foliage with magnesium salt solutions this summer. We hope that we can eliminate the Mg deficiency by either foliar applied Mg salts or with dolomitic limestone applied to the soil. In contrast to the deficiency of Mg, the Mn levels are high enough to cause toxicity.

We collected our first vineyard soil for a greenhouse experiment on pH and seedling grape root response to acidity levels.

A green house experiment with Engra. Portela and Engr. Coutinho on wheat, rye, and triticale response to liming on a pH 4.7 soil shows no visual response to the liming. Harvest in April and subsequent analysis of the tissue will tell us more.

Soil Testing:

The Procalfer equipment apparently is still in Customs in the airport where it has been now for several months. Our work would be greatly expedited if someone could get it released to us soon.

Teaching:

The Soils group has initiated a biweekly meeting to discuss their teaching and research activities. This is an encouraging move. [illegible] weekly meetings of the working group of [illegible] and biweekly meetings of our [illegible] of 60, and I have [illegible]

I have led in the preparation of more teaching specimens, aids, models etc. which the soils teachers are enjoying using this semester.

My observation is that most of the teachers at IUTAD are truly trying to do a good job of teaching. However, many of the younger as well as some of the older teachers could benefit from help in the art and science of teaching. With this motivation I presented a seminar on teaching a month ago and this month I have written a manuscript entitled "For Better University Teaching" which I hope can be translated to Portuguese and distributed.

To aid in developing the English language competency of the faculty, I have started two English classes, Tuesdays and Thursdays from 5-7pm.

John Foley and I expedited the purchase of 75 student texts for use in undergraduate classes in agricultural English.

Other:

Dr E. P. Christmas visited one day with us at the Institute. He is an assistant director in the extension administration at Purdue and is also an agronomist. He is in Portugal with Procalfer for one month.

I attended the Portuguese Soil Science Society meeting in Lisboa and also a ceremony at the Embassy for all persons who had been on bolsas to the USA in 1981.

The Institute included Prof. Foley and I in their special guest group for the visit of the Prime Minister to Vila Real and for the first formal awarding of university degrees to the graduates of last year.

I corresponded with many colleagues in the States last month to obtain literature from current thesis research activities for use by Engrs. Nuno Moreira and Armando Mascarenhas in their doutoramento studies.

We completed a report from a preliminary field and lab study of the nature of the ash pollutant deposited on far. land near the silicon plant on the Douro.

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FOR BETTER UNIVERSITY TEACHING

J. L. Ahlrichs

INTRODUCTION

The quality of university teaching in the world is quite low. University teachers typically have no training in the art and science of teaching. They seldom read journals or books on the theory and practice of teaching. Only our students, who must sit in our classrooms for many hours, truly know how effective or ineffective we are.

Fortunately it is not difficult to be a good teacher. Let us first analyze several of the roles of the teacher and then suggest some simple practices to improve teaching. In the process we will mention several "Principles of Learning". Finally, we should discuss how to build a system of improvement into our teaching so that each year we are better teachers, but this last item must wait for another paper.

THE THREE ROLES[1]

Three roles of a teacher are:

1. Expert
2. Formal Authority
3. Facilitator

We are the "Experts" in our disciplines. There may be others more expert, but almost all university teachers are sufficiently expert for the university students they teach. Certainly we must continue our scholarly reading and work. However, it is characteristic of new teachers to worry about being insufficiently expert when, in fact, their greatest weakness usually is in the role of "Formal Authority" and the role of "Facilitator". Students will criticize some ineffective professors for knowing too much about the subject. In reality it is not that they know too much (are too expert); It is that they do not function well in roles 2 and 3.

Role 2, the Formal Authority, means that the teacher decides. In This role we look over the past research and all of the books and journal articles written about the subject matter and then decide what small portion is important for

(1) A modified use of [illegible] from [illegible] Mc Keachie, Teaching Tips - A Guidebook for the Beginning College Teacher, ed. 5, 1957. D. C. Heath and Co., Lexington, Mass.

students in their first, second or subsequent course. In this role of "Formal Authority" we teachers also set the grading standards and do the testing.

Many of us fail miserably in these several aspects of role 2. As the Formal Authority we do some selecting of what is important, but we either do not share our decisions with the students, or our decisions are vague and general. For example, a soils, biology or chemistry teacher who says that one of his objectives is for students to "understand redox reactions" has neither helped himself nor his students much, because good scientists are still spending lifetimes working on the understanding of redox systems. Our selections must be more definitive than this.

Another failure in the role of Formal Authority is that of teaching one thing and then testing over another. We may not think that we are doing it, but too often we are. Thus, we add the title of "dishonest" to our title of "ineffective".

Role 3, Facilitator, is the role of helping students with their learning. If we have the desire to help students, and if we know something about the "Principles of Learning" then we can truly facilitate the success that students have with our discipline.

Most university teachers talk too much. The Chinese proverb which says "Tell me and I'll forget" also says "Show me and I may remember" and "Involve me and I'll understand". This proverb should give us some clues as to why we often fail as the Facilitator.

IMPROVEMENTS

Now let us look at improvements which we can make. Since you are an expert in your discipline and I am an expert in mine we need not discuss role 1 any further. We will make our improvements in role 2 and role 3.

In role 2, as the Formal Authority, we must first decide what it is that the students should be able to ...(sketch, explain, solve, identify, recite, build, compare, balance, etc.) and also the conditions under which they should be expected to do it. For example, we won't ask them to "understand redox reactions". Understanding is an open-ended, nebulous thing which we can not really test anyway. Instead, we will tell them "given the products of an oxidation of ferrous sulfate by chromic acid, be able to set up the equation and balance it". We now have something specific to teach and they have something specific to learn.(2)

(2) For more information read the [illegible] book by [illegible] Mager "Preparing Instructional Objectives", ed. 2, Fearon Pub. [illegible], Belmont, CA, US[illegible].

Perhaps we want more knowledge of redox than this so we write six or eight or ten more objectives. Another example might be "given the oxidation states of the reactants and the products, be able to balance any redox equation". Notice that we don't play guessing games with our students. We tell them what they need to be able to do and the conditions under which they should be able to do it (i.e. given the oxidation states and the equation, they need to be able to balance it).

Any small unit of work, such as redox reactions, should probably have from five to fifteen objectives stated in this manner. Let us say that we have ten objectives on redox reactions. We teachers need these objectives before we start to prepare our teaching, and the students need their copy before the lesson is taught. Now we are organized! We have ten objectives clearly stated for the students. We must teach them to do these ten things. They now know what it is that they must be able to do, and they can decide which they can do and which they can't. They know what they must study and with which topics they need help.

Finally, writing the exam is now very simple. We write questions carefully to fit those ten objectives. "Carefully" means that if we said in our objectives that we would give the products and the reactants and that the students would have to balance the equation, then our test question must give the products and the reactants. We write the test directly from the written objectives. We know that we are more expert than our young students in doing redox equations, so we do not need to prove our superiority by deflating their fragile egos with "dishonest" questions. Honest questions are those written to test what the objectives stated.

Writing good objectives is not easy but it is worthwhile. It organizes us. Students value a well organized teacher. With our objectives printed and in their hands the students have a good guide for their study, we have a good guide for our teaching, and we are suddenly giving "fair" and "honest" exams. All of this is good for student morale, and the credibility of our teaching program improves. These well written objectives have other positive values but we haven't space to discuss more here.

In role 4, the Facilitator, we need to look for ways to help the students learn. Are there some principles of learning which could be useful to us in our teaching? I think so.

The principle of "Active Participation": Remember from the Chinese proverb "Involve me and I'll understand"? The student who even qualitatively adds ferrous sulfate to chromic acid to see the orange chromic ion change to the green chromous ion upon reduction has been involved. This "Active Participation" principle is our justification for laboratory classes, but I contend that involvement should also be present in our lecture classes.

The principle of "Practice": Something experienced many times is remembered longer and recalled easier. So, in our teaching we must make opportunity for our students to use things repeatedly after we have first studied them. Require use again in subsequent labs and problem sets until they have had the experience many times, often in slightly different situations.

The principle of "Contrast": Working first with the highly contrasting extremes such as as young unweathered soil versus an old highly weathered one emphasizes the differences. Later it is easier to detect lesser differences in soils with similar weathering.

The principle of "Individual Differences": Some students learn from our explanations, some prefer or need various textbook explanations, and some will need or want tutoring. Have we made provision for students to learn the same material in several ways? Remember that we do not care what method students use to learn; We only care that they do learn.

The principle of "Readiness": The student may not be ready to learn the next step in calculus today when we are trying to teach it because he is still confused about some item in trigonometry which he needs for this step in calculus. Tomorrow, when he has figured out the trigonometry needed, he will be ready. Will someone in our teaching group be available to help him then? This infers that we must arrange for someone in our teaching group always to be available to students outside of the normal classroom.

These few principles (there are others) may give us ideas on how to facilitate student learning. Each of our objectives (remember rule 2) should have a best way to be taught (with experiments, demonstrations, slides, movies, blackboard sketches, talking, etc.), but if we find that our "best way" on each is only to talk about it, then we almost certainly are a poor facilitator. Good specimens, demonstrations, illustrations, pictures, etc. give strong support to our words.

CONCLUSIONS

Students expect their teachers to be experts and we are. They expect us to sort out what is important, to help them learn this, and finally to test them honestly to determine whether or not they have learned it. To help them learn, they expect good assistance (based on principles of learning) from sympathetic teachers who take time to help students. These are reasonable expectations.

As teachers we are employed to help young people learn. If we select and write good objectives for each days work, share these objectives with the students, search for the best ways to teach each objective, and test by these same objectives, then we will have better university teaching.