A practical approach to the teaching of soil morphology, genesis, and classification

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ABSTRACT

Mapping the soils on a section of land in soil morphology (or soil classification) classes is often done, but using the guidelines of Soil Taxonomy to carry out the mapping project can make the experience more meaningful. Students are enrolled in a special problem class. They seek permission from landowners and explain to them their plans for the class project. The Soil Scientist today should be taught how to map, classify, and interpret the characteristics of the soils for best land use. In this project the students defend their work and interpret the constructed mapping units to the landowners and to a number of professional Soil Scientists and Agronomists. A final exam consists of a graphic oral report in the presence of professionals. During this exam each team presents its report to an audience consisting of a variety of professional people. Recently an exam audience included a cartographer, a correlator, an assistant soil scientist, several graduate students, three professors, and other people who meet monthly in a lunch seminar. Students who have been involved in this innovative teaching project have proven to be more highly trained than their peers who do not receive the special training. Many recent Oklahoma State University graduates in responsible positions are capably solving complex problems concerning agricultural and non-agricultural land use.

Additional index words: Field study, Land use teaching.

Students graduating in Agronomy are faced with the dilemma caused by a statement heard by a professor from a landowner and business man, “I am not going to listen to a college graduate telling me what to do in land use.” This statement represents an important problem for our graduates in Soil Science. Innovation in teaching soil science appears to be a necessity for future soil scientists.

Planning the Soil Survey

After enrollment at Oklahoma State University in the special soil survey course, two undergraduate students were assigned to a soil survey team. They visited the county courthouse and obtained from the County Assessor’s office names of landowners who might cooperate with them on a soil survey project. They visited with landowners to tell them what they planned to do and how the landowner would benefit from the soil survey. After this explanation they asked for permission to work on their land.

Several factors are considered in planning the soil survey of a section of land. Copies of the most recent aerial photos can be obtained as an aid. The proper scale is important to show accurately differences in soils and to provide information for urban-fringe planning, construction, waste-disposals, tax assessments, and many other agricultural, non-agricultural and educational uses for the land.

Reviews are made by the students of previous soil surveys for the area. Soils known to occur in the area are listed and descriptions of them obtained. Numbers are assigned to mapping units, and new numbers added as mapping develops new units. Previous surveys are scanned for data, and plans made for securing new data. These data include yields of major crops and laboratory analysis of important soils.

Reading assignments from Soil Taxonomy (1) and the Soil Survey Manual (2) are assigned for the following subjects: (a) Units of Soil Classification and Mapping, (b) The Soil Mapping Legend, (c) Plotting of Soil Boundaries in the Field, (d) Collection of Soil Samples, (e) Writing of Descriptions of Soil Pedons, and (f) Productivity Ratings and Yields.

Students are introduced to laboratory and field project personnel; our personnel often include graduate students in our Soil Morphology Program and Soil Characterization Laboratory, and other project and professional workers. In one case a former Soil Conservation Service worker of 35 years experience (Earl Nance) was hired to help with this project. Students were assigned to work closely with Mr. Nance on inside preparations and outside functions related to making and using Soil Surveys.

Soil Mapping

Landscape features are studied in the assigned section and in adjoining lands. Stereoscopes are used to help with the landscape analysis. The variations of drainage and topography, along with parent materials, are noted as the areas are traversed in early stages of soil survey. Vegetation differences along with crop growth are also observed and noted. Separations of landforms, erosion, and slope differences are indicated on the map. Soil profiles are examined on systematic traverses using a mechanical soil probe and augers. The soils are ob-
served at approximately 60 m intervals. Differences in depth, texture, permeability, color, organic matter, pH, slope, and erosion are noted. Important soil differences separated on the photos are used for the creation of the mapping units. Block diagrams show the relationship of soil-forming factors to important soil series and landforms.

Interpretations for Users

In order to provide soil information related to soil potentials and/or limitations for the many users of the map, the students prepare tables which provide soil behavior information.

The tables allow predictive information for farm planners, farmers, ranchers, and resource managers. These tables are usually in the form of land use capability groupings, range sites, and yield potentials. Information on soil qualities such as shrink-swell, flooding, permeability, erosion, and productivity are included in tabular form. Interpretations are made for recreational uses, suitabilitys for septic tanks, housing developments, roads, streets, and agricultural uses.

Survey Progress Reviews

Progress is reviewed regularly to give technical guidance to students. Accumulated problems are answered in the field along with checking the technical accuracy of mapping and soil classifications. Care is taken to answer unresolved problems of the students. The need for each mapping unit is checked, and plans are given for improvements. Symbols and legends are corrected if needed. Field sheets are checked for accuracy. A common boundary is checked by two teams in the field. Acreage is determined by use of a planimeter.

Completed soil descriptions, copies of computer printouts, and interpretive tables are assembled into a Soil Survey Report. Tables and charts containing soil property and soil quality information and data are prepared for an oral report using posters and the blackboard.

Final Review

The students present their results to professionals for review. The audience comprises personnel from the state and county offices of the Soil Conservation Service, university professors, graduate students, and enrolled students. People assemble in a seminar room for the final review. Reviewers vary from one year to the next, depending upon who is available. Suggestions for improvements in the soil survey are voiced by the "professionals." The needs for good, accurate maps are emphasized. Students in groups of four, consisting of two teams, present their Soil Surveys by use of posters, colored slides, and illustrations. Each student presents a part of the survey. The meeting is open for questions based on their survey results and interpretations, with the students providing the answers.

Discussions usually revolve around land use, prime agricultural lands, zoning, construction (school), waste disposal, housing developments, range wildlife, recreation (golf course fairways, hiking, parks), and others.

Results of Teaching Innovation

The new approach to the teaching of Soil Survey provides soil scientists the opportunity to meet with people to explain their product (Soil Surveys) and how it can be used for the benefit of mankind (food, clothing, shelter, environment, pollution). Soil scientists of the future need to be not only technically trained but people-oriented. They need to be able to explain and defend their work to all users.

Retired professional workers, when carefully selected, can be used efficiently by universities in one-fourth, one-third, and one-half time technician positions. These professionals can give a different prospective to learning than the science-oriented professor. Rubbing shoulders with experience helps the students gain confidence in their work. Students are provided with a learning situation to apply theory which adds another dimension to their learning techniques. Professionals also become acquainted with students who will be looking for jobs.

Soil Surveys provide excellent training for future work in Soil Science and other agronomic jobs: range managers, appraisers, resource managers, developers, interpretive soil scientists, golf course architects, and farm planners.

CONCLUSION

Since this technique has been used for students to supplement course work in Agronomy at Oklahoma State University, more graduates are being employed as soil scientists, agronomists, conservationists, resource managers, forest and range managers, and in other agronomic jobs. Several recent graduates, who are now working in Colorado, Oklahoma, and Texas, are being selected either for leadership positions or further training in planning good land use. Some of their success can be attributed to their learning experiences obtained from this special problems course, which exposed the students to people with a working knowledge of Soil Taxonomy. Future agronomists who take similar types of training will be better equipped than earlier graduates to successfully solve many of the complex land use problems in today's society.

LITERATURE CITED