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The Skill Acquisition Process Relative to Ethnobotanical Methods

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Editorial

Ethnobotany is an interdisciplinary field in that it utilizes methods from a wide array of science traditions, especially botany and anthropology. Ethnobotanical specialties, such as medical ethnobotany, require knowledge and skills in additional areas, such as chemistry, medical anthropology and pharmacology, in order to be sufficiently competent to define and undertake the more specialized ethnobotanical research. However, some skills transcend disciplines. Basic computer competence is needed in virtually all studies to organize and analyze research data.

The potential number of skills and methodologies required to be an ethnobotanists can be overwhelming, particularly if you are expected to be highly trained in each activity. Perhaps it is unrealistic to demand high proficiency in all activities. If so, is there a way that we can systematically identify the attainment of skill levels in ways that help us discuss appropriate types of proficiency? For example, there is a vast difference between someone who has learned how to use a GPS receiver to determine the latitude and longitude of a collection location and someone who understands the differences between using a latitude-longitude and the UTM models. Does everyone need to understand the models, or are there times where a tool is useful just for data collection?

Dreyfus & Dreyfus (1986) proposed a five-stage skill acquisition model to describe the general skill acquisition process that people undergo when they begin to learn and then master a new skill. They argue that the progression from novice to expert is dependent on the individual's scope of perception and experience with the task at hand. Their model was developed based on recurrent learning patterns observed during skill-acquisition research involving airplane pilots, chess players, automobile drivers, and adult learners of a second language. Their five stages are termed 1) novice, 2) advanced beginner, 3) competent, 4) proficient, and 5) expert (Figure 1). They observed that at

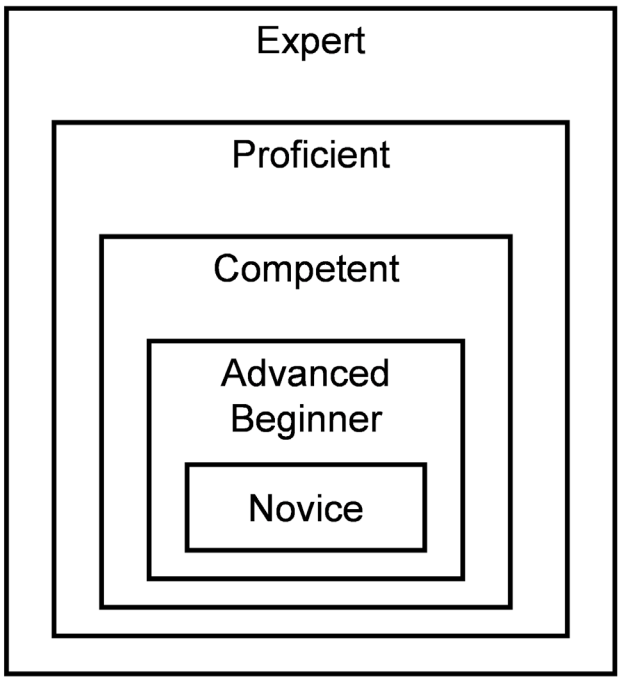

Figure 1. Five stages of skill acquisition.

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each stage, an individual becomes familiar with a skill by continually performing a series of activities. The first two stages rely heavily on following a set of rules pertaining to the technical aspect of the skill. The third stage is transitional in that a person begins to take on more responsibilities by becoming involved in the decision making process of projects that utilize the skill. People who have attained the fourth and fifth stages are making decisions without being consciously aware of their applying the rules learned during the first and second stages. The last two stages essentially separate a person from being a follower of rules to an effective decision maker.

We believe that Dreyfus & Dreyfus (1986) were generally characterizing skill acquisition stages with the following attributes:

- **Novice**: Follows the rules, requires specific rules for specific circumstances, and takes no responsibility other than following the rules.

- **Advanced Beginner**: Expanded view of situations in which the skill is applied, begins to transfer rules to related situations, still makes decisions based on rules, and does not experience personal responsibility.

- **Competent**: Senses that the number of rules is becoming excessive, begins to organize rules by developing principles, starts developing information on the relative importance of particular rules, and begins to experience responsibility relative to decision-making resulting from the application of rules.

- **Proficient**: Problems are solved intuitively based on extensive previous experience, sees the "whole picture," and applies conscious decision-making by formulating a plan of action.

- **Expert**: Doesn't go through the normal processes but intuitively senses what should be done, often without the need for analysis.

McClatchey (2006) has called for publication through this journal that will make available a range of intellectual tools needed by ethnobotanists, particularly for those researchers who live in areas of the world who don't have access to abundant literature. The goal is to improve access so that all people will be able to do high-quality research. We concur with this need to make information widely available if the overall quality of ethnobotanical research is to be improved.

The Dreyfus & Dreyfus (1986) model provides a substantial organizational framework that can be used describe specific types of skills needed for each ethnobotanical method. The models also forces a consideration of the order in which skills should be acquired.

When we tried to apply skill acquisition model to ethnobotanical situations, we were struck with the similarity of the skill levels to the types of activities undertaken in a normal scientific research program. Just as in the Dreyfus & Dreyfus (1986) model, there are five types of research activities, each with an increasing level of involvement and responsibility. We note in this list the corresponding skill-levels activities.

1. **Data**: Use a tool or methodology to collect data values (Novice activity).
2. **Analysis**: Use the data values in an application (such as a software program) to determine the aggregate properties of the data which have been collected (Advanced Beginner activity).
3. **Problem**: Develop an appropriate sample scheme and apply the analysis results to the solution of a specific problems (.Competent activity)
4. **Hypothesis**: Generate a series of hypotheses that define specific problems that need to be investigated within a fairly specific context (Proficient activity).
5. **Theory**: Develop theories that best describe the operation of the system under study, comparing and contrasting this to other situations and systems (Expert activity).

We believe that there are implications of the level of skill attained for a particular ethnobotanical method in how a researcher carries out a scientific study. For example, learning to use a particular method to collect data is just a starting point of a larger endeavor. You are anchored at the "novice" end of the level of skill acquisition if you are only able to collect data. Basic data collection is, of course, a vital process. The additional skill levels are just as important. Skills at these higher levels are needed to address the other aspects of the process of scientific investigation, including the formation of testable hypotheses and the development of theory (activities done by those who are competent and expert). The various skill levels depend on each other. This does not imply that the activities are necessarily done by separate people. Research investigators who work at the higher cognitive levels should also be proficient at all the lower levels.

An expert is able to start at the theory end and work toward the application of the tool (or methodology). The expert picks the right tool to be used to collect data, knows how to use this tool, is aware of tool's limitations, and can spot invalid data values. Novice investigators are "tool" focused and are simply data collectors. A novice doesn't look forward to how the data will be analyzed and doesn't make the connection between the data and ethnobotanical theory.

Table 1. Hypothetical examples of ethnobotanical research projects divided into research activities and the associated skill levels.

Example A. Forced relocation of ethnic group. **1.** **Data**: Reads an existing informed consent document to a community and leads free-listing exercises in community groups (Novice activity). **2.** **Analysis**: Determines the appropriate composition of the community groups and does basic analyses of the species reported by each group (Advanced Beginner activity). **3.** **Problem**: Locates the appropriate number and type of communities, contacts the appropriate people in the communities, adapts the informed consent documents, and validates the plant reports (Competent activity). **4.** **Hypothesis**: Establishes the region in which the study will take place so that there are appropriately contrasting communities and sample groups and decides on the appropriate analysis methodology (Proficient activity). **5.** **Theory**: Evaluates the role of plant knowledge in the communities of the ethnic group that was sampled, including comparisons to communities that were not relocated and to other ethnic groups who have undergone similar changes (Expert activity).
Example B. Sustainability of a harvested forest species. **1.** **Data**: Observes, collects and enters data for analysis on the quantity of the species harvested (Novice activity). **2.** **Analysis**: Performs basic statistical analyses on the harvest data (Advanced Beginner activity). **3.** **Problem**: Establishes the areas in which samples should be taken, the frequency of sampling, the sampling methodology, verifies the general reliability of the data, and examines the data analyses for trends (Competent activity). **4.** **Hypothesis**: Poses questions that relate to the distribution, phenology, growth and reproductive rates of the plants relative to the distribution, population growth, and harvesting practices of the people (Proficient activity). **5.** **Theory**: Evaluates the cultural conditions surrounding the use of the plant species relative to alternative species, traditional cultural values, and outside influences (Expert activity).
Example C. Medicinal plant use in a community. **1.** **Data**: Conducts surveys in a community by asking which plants are used and the diseases that they treat; compiles tables of the results (Novice activity). **2.** **Analysis**: Aggregates the data species and use data with higher-order classifications and enumerates the reporting frequencies (Advanced Beginner activity). **3.** **Problem**: Locates study communities in appropriate areas and obtains permission to conduct surveys; collects voucher specimens to document the surveys (Competent activity). **4.** **Hypothesis**: Poses questions that relate to changes or differences in the traditional medicinal system and proposes places where there are contrasting situations within the same culture (Proficient activity) **5.** **Theory**: Evaluates the community perceptions of disease and its treatment, analyzes the skills and knowledge of different members of the community, dissects the knowledge acquisition process, and predicts the potential impacts of introducing alternative medicinal systems and the consequences of land use changes (Expert activity).

We can show the relationships of the research levels to skill activities with several hypothetical examples (Table 1). Note that throughout this system, a person who works at a higher level (e.g., analysis versus data) is expected to be able to work at the lower level, too.

The hypothetical studies are intended to demonstrate that people who are more skilled can work at a higher level. For a study to be successful, one or more people should be working at each skill level. The details will vary in a real study although we expect the pattern of abstraction will remain approximately the same.

Using a skill-acquisition approach for the description of ethnobotanical methods raises a number of questions.

- What is the skill level that should be the target of a particular ethnobotanical research method?
- What is the skill level that would motivate a person to use and maintain an ability to use the method?
- Is attaining a higher skill level an important inducement to adopt and use a method?

- All skill levels require some maintenance. At what skill level does this maintenance cost exceed the benefits of maintaining the skill level?
- Are skills maintained in ways that are different than how they are acquired?

We believe that McClatchey (2006) has called for more than a "Methods Book" for ethnobotany. As ethnobotanists, we have the skills in examining how people are involved in the use of technology. Our proposal is that authors who respond to McClatchey's challenge should incorporate information about skill acquisition patterns into their manuscripts.

Literature Cited

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