H9 Teaching Morphological Species Identification to Forensic Science Students: Advantages, Problems, and Results

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After attending this presentation, attendees will have a better understanding of instructing students in morphological species identification through the use of dichotomous keys. A dichotomous key guides the user through species determination for a specimen by providing a series of dual-choice nodes that center around morphological differences. Each choice leads to either a new set of dichotomous choices or a species decision. Attendees will also observe the ability of students to successfully apply this method to unknown entomological specimens. Of central focus to training students in species identification is the idea that dichotomous key nodal decisions take the user down specific pathways to a final species designation by not focusing on the organism as a whole, but rather specific parts that the alpha taxonomist has designated as important diagnostically. Thus, if followed correctly, the user should arrive at the correct species designation as long as the species evaluated are included in the dichotomous key.

This presentation will impact the forensic science community by providing an understanding on how accurately students can identify adult blow flies (Diptera: Calliphoridae) using a dichotomous key. Insects present at crime scenes need to be successfully and accurately identified to aid in these investigations by providing information such as Time Of Colonization (TOC), which can be linked back to a time since death. Species identification using a morphological dichotomous key cognitively falls under pattern recognition, which is part of the perception and problem-solving aspect of cognitive science. The critical difference between other forms of pattern recognition and dichotomous keyed species identification is that the dichotomous key approach provides rigorous, step-by-step, pre-determined instructions to arrive at the pattern conclusion (a species). These patterns are grounded in an extensive scientific literature going back to the Systema Naturae by Carl Linnaeus in 1735 and currently outlined by the International Code of Zoological Nomenclature (ICZN code). If followed, this approach forces the user out of top-down processing mode and into a bottom-up processing mode, whereby the parts of the organism are first understood and, from those partial understandings, a full understanding of the species identity of the specimen is achieved. This bottom-up approach has a critical advantage — it eliminates the possibility of forming biases that result from top-down processing.

These data were evaluated from an introductory-level forensic analysis course to understand the student's ability to utilize a dichotomous key. There were several opportunities for the students to record their nodal decisions along with their confidence level with the use of a tabular format. For each decision the student made, they ranked their confidence level using a Likert scale (1-5). Along with individual decision recording, they also conducted a post-decision comparison with their partner, following a think-pair-share active learning model. If their answers were not the same, they re-evaluated their decision making, along with a re-analysis of the specimen until a mutual evidence-based decision was reached. How successful the students were in making the correct identification was analyzed, along with the examining the correlation between confidence and correctness. From these data this presentation seeks to improve student training in the use of dichotomous keys for species identification, which then can be used

to provide standard operating procedures for how forensic entomologists should approach and document the pattern recognition task at hand in a way that limits the influence of bias.

Dichotomous Key, Species Identification, Student Instruction