

Assessing Concepts, Skills, and Employer Expectations for Improvement of Plant Pathology Foundation Courses and Curriculum



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Background

This project originated in the Teaching Committee of the American Phytopathological Society, as an effort to provide resources to plant pathology instructors and other faculty involved in curriculum development and review. The committee had noted variable opinions among instructors regarding critical knowledge and skills for undergraduate courses, and a wide range of resource availability for teaching these courses. There were also concerns about the impact of online courses on the kinds of hands-on skills historically emphasized in general plant pathology classes. No information was available to support recommendations for knowledge or skills content in undergraduate plant pathology courses.

Objectives

- 1) Profile intro/general Plant pathology courses in the US.
 - Determine “standard” material for course content evaluation;
 - Assess extent and delivery of hands-on skills development;
 - Determine prevalence of online delivery modes and impacts on incorporation of hands-on learning;
 - Assess utilization of high-impact teaching techniques in introductory plant pathology courses.
- 2) Assess employer expectations of undergraduate plant pathology courses, and of undergraduate plant science degree programs, in general.
- 3) Determine the extent to which educator emphases and employer expectations align with one another, and make recommendations to remedy misalignments, as indicated.

(Results for research objectives in gray are not presented on this poster.)

Methods

Two surveys were developed. An educator survey, distributed to instructors of undergraduate plant pathology courses, included questions on faculty and institution type, courses taught, content knowledge & skills included, and instructional techniques employed. An employer survey, distributed to employers in plant sciences, included questions on employer type, job functions, employer expectations for students who have taken a general plant pathology course, desired knowledge and skills for BS degreed employees in general, and areas in which recent graduates are currently not meeting expectations.

Results

Instructors reviewed a list of topics, and scored each as (1) do not cover, (2) cover minimally, or (3) cover as a learning objective; 14 topics were distinguished with mean scores above 2.5 and at least some coverage in over 90% of classes (Figure 1). While educators and employers aligned well on most content knowledge, results indicated several skills gaps, in which employers expected high competency, and current courses placed low emphasis (Figure 2).

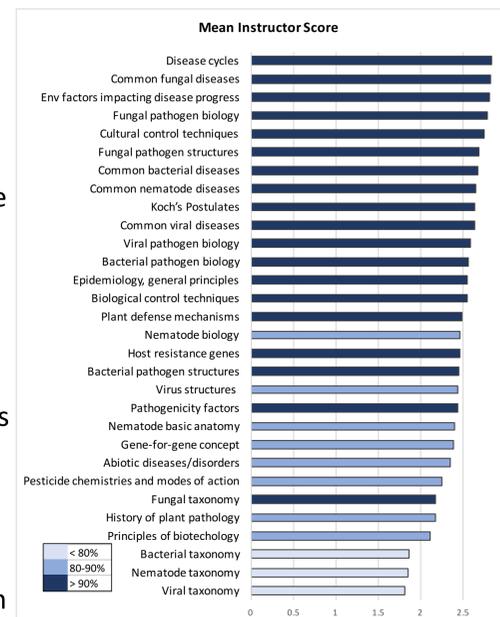


Figure 1. Topic emphasis among introductory courses. Mean scores reflect emphasis on a 3-point scale as (1) not covered, (2) minimal coverage, or (3) covered as a learning objective. Bars are shaded to show percent of courses in which the topic is covered (sum of 2 + 3 ratings over total).

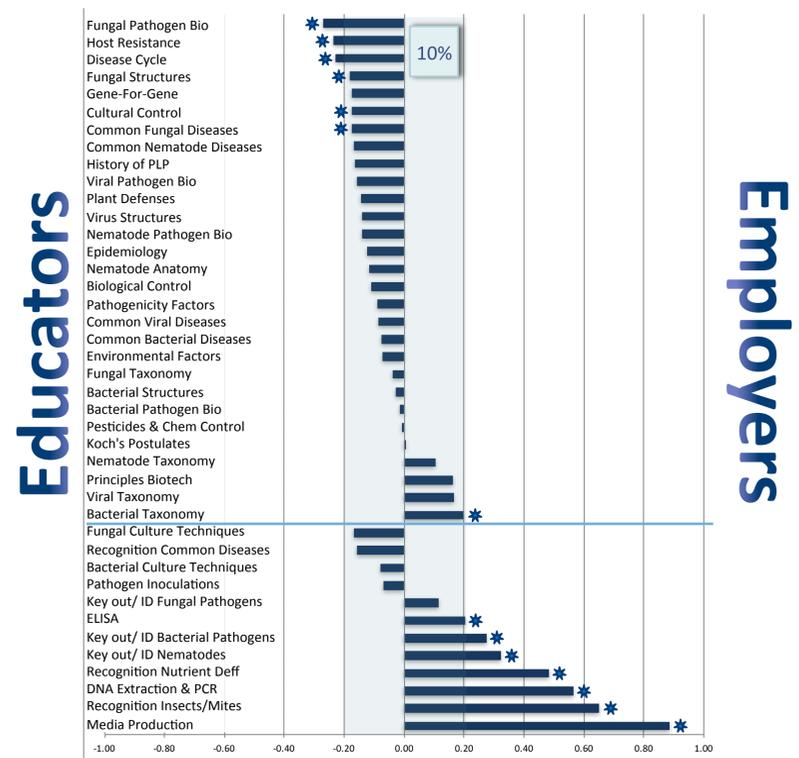


Figure 2. Alignment of educator emphasis and employer expectations. Bars show mean differences on a 3-point scale as (1) not covered / no knowledge expected, (2) minimal coverage / some knowledge expected, or (3) covered as a learning objective / high degree of competency expected. Stars indicate significant differences (t-tests, $\alpha = 0.05$); horizontal line divides knowledge content from skills.

Employers identified the following 10 skills, in descending order, as most critical for entry-level employees: adaptability, teamwork, interpersonal communications, listening, time management, multicultural awareness, computer skills, writing skills, operation of basic laboratory equipment, knowledge synthesis. Attributes most frequently cited as lacking among recent grads were basic lab skills, writing skills, statistical skills, and readiness to learn new skills (Fig. 3). Though >70% of courses surveyed included a required lab component, microscopy, pipetting/measuring, record-keeping (lab notebooks), and ability to use general lab equipment were all specifically mentioned as skills frequently lacking among new hires, as was field experience.

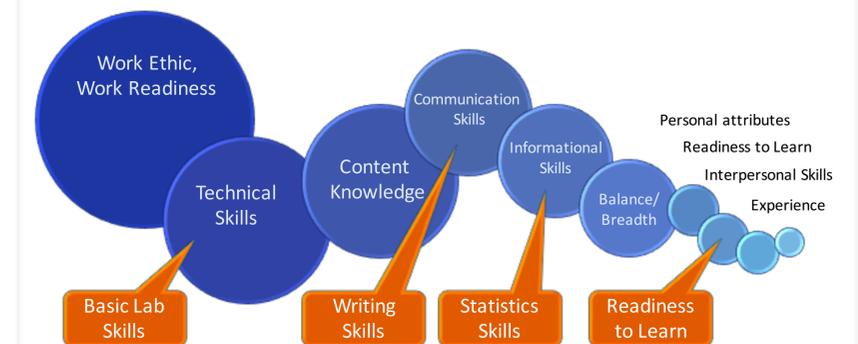


Figure 3. Employer Laments: Skills cited by employers as lacking among recent graduates with BS degrees in plant science fields. Areas of circles are proportioned to responses within each category; call-out boxes highlight the top four specific complaints.

Implementation

Within plant pathology courses, we have identified content areas which may merit increased emphasis. Many of the needs and expectations expressed by employers, however, must be addressed at a curriculum level. In order to help both instructors and faculty involved in curriculum development, we are developing the following resources, based on this research:

- An instructor workshop to be held at the annual APS meeting; instructors will be asked to bring their current syllabi, and will work in groups to plan specific changes in content and/or delivery modes.
- A web resource for faculty and administrators; this will house summary information from the study, implementation ideas generated by workshop participants, and a collection of teaching resources (assignments, lesson plans, lab protocols) specific to the identified skills gaps.
- A manuscript (in preparation) for publication in Plant Disease; upon publication, a notice and link will be sent to the instructor distribution list and department chairs, to ensure visibility to those in key course and curriculum roles.