

A point for debate**There are no skills to be learned in biostatistics!**

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A point for debate is a regular feature that will appear in the Gulf Medical Journal. Issues that are of interest to health professions teachers or to clinicians, but over which there is no consensus, will be presented under this section. They would include diagnostic procedures, interpretation of findings, treatment modalities, or educational themes or viewpoints. The primary aim is to initiate debate and discussion, eliciting differing viewpoints. When the Editor feels that the topic has received adequate analysis, the discussion will close with a conclusion where possible, and when such is not feasible, even agreeing to disagree.

Citation

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In formal courses of study, skills are learned in laboratories, wards or operating rooms. They are then assessed in a comparable setting, and where the real-life situations cannot be used, through high fidelity simulations.

Skills here, of course, means the performance of procedures. Examples are measuring the blood pressure using a mercury sphygmomanometer, performing a venepuncture, preparing a blood film or administering a local anesthetic.

Teachers often use the term skills to refer to the abilities that students acquire outside the traditional lecture hall or the seminar room. Do many of the abilities learned in the computer lab or during histology 'practicals' qualify to be designated as skills?

Furthermore, there is confusion as regards the use of the term application. Most teachers are familiar with the taxonomy introduced by Benjamin Bloom in 1956 to classify learning objectives¹. The three widely used domains carry the labels cognitive, psychomotor and affective. For the non-aficionado of educational jargon, the corresponding terms would be knowledge, skills and attitudes, with skills being the counterpart of psychomotor competencies.

Each of the three domains has its own hierarchy or a series of levels of achievement, the one at a higher level incorporating or building

upon the abilities acquired at a lower level. Bloom's hierarchy in the cognitive domain begins with knowledge, and moves through comprehension, application, analysis and synthesis to evaluation, the last being the highest level. Application is using the knowledge already acquired in a new situation. It could include the use of rules, concepts, principles or theories in novel settings, and for effective application the student should possess the requisite knowledge and comprehend (understand) it.

In Bloom's taxonomy, application, thus, is a definite level in the cognitive domain, and has a meaning that is more specific than that which exists in its routine use in the English language.

Let us look at how a learner driver acquires the competencies necessary to be permitted to take a vehicle among other vehicle users on a public road. He has to learn the traffic rules and the meanings of traffic signs (cognitive abilities) in addition to being able to manipulate the vehicle without injury to others or himself (psychomotor abilities). The psychomotor competencies are initially acquired in a safe environment, within the premises of a driving school, and then, armed with a certain degree of abilities, the learner enters the real-life setting of the road under the guidance of a tutor. Both are learning situations, the latter giving the learner the opportunity to transfer the competencies that he had already acquired to a situation that has greater fidelity. With proven mastery of the (psychomotor) skills and adequate knowledge and the ability to make meaning of the

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signals (comprehension and interpretation), he then is ready to be allowed to drive on his own.

An essential element in learning biostatistics involves making calculations and arriving at decisions based on the conclusions. The developments in IT have allowed us to use the computer and statistical software packages to derive these extremely useful numbers. It is important, though, to remember that long before computers became a dime a dozen, students learned and used the same statistics, with the tools being a mere pencil and a sheet of paper.

The computer learning sessions in biostatistics courses are routinely labeled as *practicals*, but what exactly is the practical (or psychomotor) aspect in them? The only manipulative skill in these exercises is the tapping at a keyboard or pressing the button of a mouse; the ability that really matters is the cognitive process that goes on within the learner's mind, such as the choice of the correct statistical tool and the justifiable interpretation of the results. The latter naturally are abilities in the cognitive domain.

There are many other areas in which the term skill is used to refer to cognitive abilities. Examples abound when one looks at what goes on under histology practicals or radiology teaching sessions, or when interpreting an ultrasound scan or an EKG. The task that the health professional student has to do is to look at lines and shapes of various colors or objects of various shapes and sizes that are arranged – on a radiographic film, a strip of paper or a computer display unit (monitor) – in a variety of two-dimensional configurations and then determine what they represent, whether they are normal or variants of the normal, and

when deviations are detected, what these changes signify. A close look at the mental processes involved shows that the abilities called upon for success fall at different levels in the cognitive domain. The situation will certainly be different if, for example in histology practicals, the student is required to prepare a specimen for examination, stain it, place on the microscope stage and stabilize using the stage clips, and then adjust the coarse focus and the fine focus without damaging the slide so that the object of interest can be viewed through the eyepiece lens. As is being often done today, in contrast to what transpired in the bad old days, a member of the support staff gets everything ready and in place to produce some form of image. It is not uncommon in histology 'practicals' for teachers to instruct the students, "Do not move the slide and do not change the focus", which removes even the minimal amount of psychomotor ability that would have come into operation.

Taxonomies and hierarchies are there to facilitate communication, and to ensure that important abilities are learned by the student and assessed by the examiner. If we as teachers wish to use the categories described by Bloom, let us go with the meanings ascribed to them. *Skill* and *apply*, for example, have specific meanings in the educational setting, and their nonchalant use needs to be discouraged.

Reference

1. Bloom B. S. Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain. New York: David McKay Co Inc.; 1956.