Dissecting 'What the Professor Wants" to achieve a valuable experience (and earn a high grade while you are at it).

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Here is a question I recently asked myself:

Can we teach students how to examine and disect a course in the first week using Bloom's Taxonomy in order (to achieve a higher grade certainly, but also) to assure an experience that will be of the highest value whether or not the instructor is intentional about the design of the course or its objectives? Wouldn't that be a powerful and transferable 'academic' skill?

In 1628 William Harvey published his *De Motu Cordis, or On the Motion of the Heart.* His mentor and teacher had previously discovered the valves in the veins and was perplexed by them. Throughout his lifetime Harvey made hundreds of dissections of people, insects, and animals of every sort. His observations led him to conjectures and experiments with which he could demonstrate that the quantity of blood flowing through the heart was greater than the quantity of blood in the body and therefore it must be circulating. Popularly, Harvey is said to have *observed* that the blood circulates throughout the body. Harvey did nothing of the sort; his feat was of far greater complexity. Harvey built a *foundation* of anatomical knowledge. He *understood* that anatomy presented certain constraints. He *demonstrated* how those constraints eliminated the possibility of Galen's *assertion* that blood forms from food and is absorbed in the tissues. He *analyzed* his results and *speculated and theorized* on the presence of capillaries that were far too small for him to actually see. In the end, Harvey *concluded* that the heart—that organ long thought of as the abode of the soul, the source of all the body's heat, the emotional center that makes us human—was a simple pump. "This is the only reason

for the beating of the heart." Each stage of this discovery is more complex than the last and can serve as a model for students of any discipline. Any college course, as it were, can be *dissected*.

More than any other, I have struggled with that perennially unfortunate student question, "Can you tell me what you want?" In many ways this is an infuriating question, akin to "What do I need to do to get an 'A'?" which implies that the student asking does not intend to do anything more. So infuriating is this question that few professors will even try to give a useful answer. This is quite a pity, because even fewer professors are transparent with what they actually want when it comes to student performance on papers, exams, projects, and group work. Recent years have borne witness to so called 'rubrics' that break down 'learning-objectives' in more or less detail. These are useful, but their focus seems more often than not geared to organizing grading—you will receive between 3 and 7 points if you…—rather than learning. Intentional design of classroom experiences is becoming more frequent even if it remains very rare. Still, even if the instructor of a class is not conscious of their choices students can be very intentional about what they choose to learn in a classroom and how. It turns out not to be particularly difficult to dissect a class to extract the most valuable experiences from it, and to earn a high grade in the process.

Higher Ed has of late has been peppered in jargon. *Learning Outcomes,* like communication skills, intercultural competency, and critical thinking (a term that makes people swoon, though I cannot for the life of me figure out what it means) have been deployed mainly to justify the value of the traditional liberal-arts curriculum in conversations among faculty members and staff. And even though a conversation with students might be very useful, it almost never occurs because we have such a high opinion of what we do, it seems almost that

students will get all these good things from osmosis in the classroom. Or simply by *observing.* We just need to get them to take the right classes and all will be well. At the risk of using too much jargon myself, six genuine learning outcomes can be distilled out of the instructional design and active learning literature (and, in fact, from Harvey's discovery): knowledge, comprehension, application, analysis, synthesis, and evaluation. In normal classes the quantity of what you will be asked to produce will run through this list from high to low. Each of the six is increasingly more difficult than the previous. Most of the former items will happen toward the beginning of the semester, most of the latter items from the end. This means that you should expect the kinds of things you will be asked to do in a course to vastly increase in difficulty and complexity as the semester moves along. Those of us who teach may not actually be aware of this fact; we tend to power through a great deal of 'content' in the beginning of a class, so that we can get to the interesting things by the end. Students do not generally know this, and it gets them trouble. Worse, students often grasp after the minimum required to get a desired grade, leaving the most valuable experiences unrealized. Let's break down that infuriating question and really get at *what the professor wants*.

Knowledge: Contrary to what might be expected, knowledge is the lowest order of business in a course. The professor 'wants' each student to remember previously learned *information.* In lower level courses that information will be part of the course; in upper level courses there will be an assumption that students will bring with them a foundation of terminology, concepts, and facts from one or more previous courses. In the current jargon, this is *content.* In biology this might be processes of a cell or the taxonomy of living things. In history these are the names, dates, and places. In economics, these are the graphs and equations that

you need to memorize for later use. Harvey amassed a huge quantity of facts about the physiology of animals including people. These are the elements that students will be called upon to *arrange, define, identify, label, memorize, name, recognize, reproduce,* or *select*.

Comprehension: Next in order of complexity, comprehension requires a *demonstrated* understanding of the particular facts. Knowledge and comprehension are subtly different. One is the *acquisition* of information and the other is its *articulation.* To comprehend something is to *conceptualize* it, to know the thing and how it fits in with other things. Philosophers often think of comprehension as a kind of knowledge *compression. Understanding* something requires being able to figure out a simple set of rules that explain it. Articulate the simple rules to prove knowledge. Epistemology is the study of knowing, how knowledge is or can be acquired. Harvey was able to *compare* organs and other features across species; in so doing he was able to generalize a vast array of examples into discrete groups. Every course will ask that students *classify, convert, describe, distinguish, explain, generalize, exemplify, indicate, infer, paraphrase, recognize, summarize,* or *translate* acquired facts.

Application: It is one thing to memorize something, but quite another to apply that knowledge to a particular context or situation. This is where the real, higher-order learning begins, where *content* makes way for *method*. Seldom will a student ever be simply required to learn *information.* Students will nearly always be asked to apply those learned facts, equations, and concepts to real and theoretical contexts. Application is the cousin of theory; theory produces knowledge but application *does something* interesting with it. Students will be called upon to *use* their comprehension to explain new situations. Harvey applied Galen's theory of the nature of blood and the function of the heart and found that it did not survive scrutiny

when it was applied to the physiological context of the body. Activities will call on students to *apply, compute, demonstrate, discover, dramatize, illustrate, manipulate, modify, operate, predict, relate, sketch,* and *solve* problems using the *content* provided.

Analysis: Though we bandy the word around to mean *thinking*, analysis has a technical meaning. Analysis calls on the student to conduct a detailed examination of the structure of a field or topic by *breaking down those ideas into simpler parts* asking them to construct evidence to support the generalizations that make those ideas useful. In chemistry analysis is used to identify processes, components, and properties of reactions. Business courses teach students to examine financial statements to say something about the economic prospects of a firm or consumer and producer data, or commodities to talk about markets. Economics seeks to break down a wide range of phenomena from individual behavior to global capital flows in order to build models with predictive potential. Engineering courses analyze systems failures to improve design features in a vast field of materials, systems, mechanisms. History analyzes intellectual, cultural, economic, and social movements in order to say complex things about the motivations of people throughout recorded time. Linguistics analyzes language itself placing human culture under the microscope. Literary theory breaks down the elements of books, poems, and stories to examine literature as both a work of art and as a cultural repository. Mathematical analysis includes calculus and other fields dealing with the infinite, the ultimate generalization. Philosophy breaks down even basic concepts and propositions themselves, things that we lay-people would consider intuitive and not subject to critique. Statistics analyzes collected data, weighing sample size and representation, context, scale, and technique in order to provide the basis for argumentation for nearly every discipline studied. In nearly every course offered,

whether it is expressly spelled out, students will be asked to look at a particular situation, break it down into constituent parts, and asked to argue generalizations from them. Harvey broke down all of the anatomical parts of the circulatory system in the body so that he could examine them all in isolation. Students appraise, breakdown, compare & contrast, criticize, differentiate, distinguish, infer, model, outline, problematize, relate, separate, and test.

Synthesis: Here is where things really get interesting. Students are asked to *breakdown* larger structures into component parts to see how they work and then they are often asked to *reassemble* them in different ways to do novel things. Problem solving is often an act of synthesis that is combining two or more things into something new. Synthetic things are said to be 'artificial' and have thus been given a bad name, not so in this particular sense, they are, after all, things made by 'artifice', that is, deliberately and with skill. Synthesis is where students are asked to apply creativity to problems. After breaking down the heart, blood, and veins, after contextualizing them, only then did Harvey put them all back together in a way that made sense. Hence, the body's furnace was transformed into a pump, the body's fuel was transformed into a carrier of fuel, and the blood was said to circulate *through* the tissues and not just *to* them. Students following Harvey's lead will arrange, assemble, collect, combine, compose, construct, design, develop, formulate, generate, relate, reorganize, and revise.

Evaluation: This is the abode of *mastery*, where students are asked to make and defend judgments based on evidence and on hypotheses. Informed opinion backed up by evidence will always succeed where *I think, I feel, I believe* fail. This is where students will be asked to devise and defend arguments and value judgments. Harvey was not able to *prove* that the heart was not a furnace. He was not able to *prove* that it was not the abode of the soul or the font of

intelligence, or the organ that produced emotion. He was able to show that the heart *moved* the blood rather than producing it for the consumption of the other organs, and that concise argument, even though he had to speculate on significant portions of the circulatory system, relegated older theories of the heart's function to poetic metaphor. And like Harvey, students will appraise, argue, assess, conclude, defend, discriminate, evaluate, explain, judge, justify, interpret, predict, support, and value their positions in every course.

If students acquire a copy of the syllabus as soon as possible, it is a relatively simple task to *breakdown* and *analyze* the material to be covered. Most of the work before midterms will be Knowledge, Comprehension, and Application. Most of the tasks between midterm and finals will involve Analysis, Synthesis, and Evaluation. Students who seek to engage all of these forms of learning will not only be able to manage their time well completing their assignments in a timely fashion, but they will also be able to *evaluate* 'what the professor wants'. Earning the desired grade in the course is almost a byproduct. Of far greater importance is that students learn how to derive the best *experience* and the *deepest learning.* Moreover, this skill is the one that life-long learners never stop using. And isn't that the skill at the heart of the liberal arts?