Coincidentally, I got two messages a few days apart: one asking me about my experience with “mediation analysis” and another that advertised a seminar on “mediation and moderation”. Here are (de-identified) excerpts including my response.

**Message**

“Hello Dr. Shahar,

We have recently been discussing mediation analysis. Do you have any experience with mediation analysis and if so, could you recommend any resources on methods/packages?

From preliminary research, I've found Baron and Kenny (1986) four step regression analysis approach, Judd and Kenny (1981) and Sobel (1982) approach for calculating indirect effects, and various approaches for statistical tests of the indirect effect. I'm also looking into the R mediation package.

Any further suggestions would be appreciated!”

**My (edited) response:**

I have no experience with "mediation analysis", but I know the following very well:

We think that A-->B, and want to know: 1) if I mediates the effect (A-->I-->B), at least in part; 2) what is the effect of A on B that is not mediated by I? 3) what is the effect of A on B that is mediated by I?

From the perspective of causal diagrams, which is absent from your citations and framework, we know the following:

1) The association between A and B can also change "after adjustment for I" due to colliding bias, and no statistics can tell that. In others words, what is claimed to be mediation may be, in part, plain bias.

2) It is quite possible that a so-called partial effect does not exist beyond the level of a mathematical exercise. Commentary on my website (“on effect modification and its applications”): <http://www.u.arizona.edu/~shahar/commentaries.html>

3) If we want to test, A-->I-->B, we don't need any special analysis. We can test three effects  (A-->I, I-->B, A-->B), separately, and pay attention to sources of bias when estimating each effect. If "partial effects" do not exist in causal reality, nothing more needs to be done. If partial effects do exist, a causal diagram can help control colliding bias when "adjusting for I". Colliding bias is a kind of bias that many statisticians do not acknowledge. (For example, what statisticians call "informative censoring" in a type of colliding bias.) I am pretty sure that statistics texts (especially dating back to the 1980s) have no solid writing about what I wrote here.

**And here is an excerpt from the advertisement:**

“This seminar focuses on two topics in causal analysis that are closely related and often confused. Suppose we have three variables, X, M and Y. We say that M is a mediator of the effect of X on Y if X carries its influence on Y at least partly by influencing M, which then influences Y. This is also known as an indirect effect of X on Y through M. On the other hand, we say that M moderates the effect of X on Y if that effect varies in size, sign, or strength as a function of M. This is also known as interaction.

Although these concepts are fairly simple, the statistical issues that arise in estimating and testing mediation and moderation effects turn out to be rather complex and subtle. … has been among the leading recent contributors to the literature on these methods. He has developed powerful new methods for estimating mediation and moderation effects and special software tools that can be used with SAS or SPSS. In this seminar, you will learn about the underling [*sic*] principles and the practical applications of these methods.

The seminar is divided roughly into three parts:
1. Partitioning effects into direct and indirect components, and how to quantify and test hypotheses about indirect effects.
2. Estimating, testing, probing, and visualizing interactions in linear models.
3. Integrating moderation and mediation by discussing how to estimate conditional indirect effects, determine whether an indirect effect is moderated (moderated mediation) and whether moderated effects are mediated (mediated moderation).”

**To which I replied:**

“Just an interesting math, or math at the service of science?”

To my mind—the former.