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The Right Questions, The Right Way

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What do the questions teachers ask in class really reveal about student learning?

It is perhaps the most familiar of all classroom routines: A teacher asks the class a question, several students raise their hands, the teacher selects one of those with a hand raised, the student gives a response, the teacher evaluates the student's response, and the cycle begins again. Education researchers call it the *standard classroom transaction model* or just *I-R-E* (for initiation-response-evaluation). You will find this model played out in the vast majority of classrooms in every country in the world. Teachers use this routine to assess where students are so that they can plan next steps. Yet just about every aspect of this scenario actually gets in the way of learning—and it doesn't provide enough information on what most students in the class know and need to learn.

What's Wrong with the Traditional Routine?

The fundamental flaw in the traditional questioning model is that it makes participation voluntary. The confident students engage by raising their hands—and by engaging in classroom discussion, they become smarter. But others decline the invitation to participate and thus miss out on the chance to get smarter.

This creates what Keith Stanovich (1986) once called an educational *Matthew effect*, an idea drawn from the biblical passage that reads, "For the one who has will be given more, and he will have more than enough. But the one who does not have, even what he has will be taken from him" (Matthew 25:29). Psychologists call it the multiplier effect, made famous by Malcolm Gladwell (2008) in his book *Outliers*. The oldest children in their grade experience early success, which leads to greater effort, which leads to still greater success. The younger students feel unsuccessful and often concentrate on other pursuits.

A second problem with the traditional approach is that even if a teacher chooses students at random, the teacher will only be assessing the understanding of one or two students. Making an instructional decision about what to do next with a class on the basis of the responses of one or two students is unlikely to be a recipe for success.

The third problem with the standard questioning model is that teachers rarely plan the questions they use. When, as teachers, we ask questions and get the answers we were hoping for, we generally conclude that students' learning is on track. But if the questions have not been carefully planned, there is a real danger of concluding that the students are on the right track when, in fact, their understanding of the subject is quite different from what we intend.

There are solutions to these problems that any teacher can implement, at little or no cost. These solutions have been known for years, yet they are still rare in classrooms.

No Hands Up

Perhaps the simplest way to improve classroom questioning is simply not to ask for volunteers, but instead to choose a student at random. Students raise their hands only to ask questions, not to answer them. Such a move is unpopular—teachers find it difficult to manage, students who used to raise their hands in response to every question can't show off their knowledge, and students who used to have a quiet life now have to pay attention. But in terms of small changes that can have big effects, "no hands up" may be the most significant thing a teacher can do.

Selecting students at random is more difficult than teachers think. When time is tight, teachers are often drawn to "the usual suspects" for a good strong response. This is why some sort of randomization device is helpful. Many interactive whiteboards have randomizers built into the software, randomizers can be downloaded from the Internet, and there are even smartphone apps for randomizing. However, for random questioning, it is hard to beat students' names on tongue depressors.

Many teachers prefer to choose the student first and then ask the question, but this is generally a bad idea, because as soon as students know who is going to have to respond to the question, all the other students can relax. It is far better to ask the question first, give students time to think of a response, and then pick a student at random to respond.

The danger here is that the teacher will select a student for whom the question is too easy or too hard. There is certainly no point in asking a student a question the teacher knows the student cannot answer, but when teachers assume they know which students can answer and which cannot, they tend to produce self-fulfilling prophecies. As one student I interviewed about "no hands up" said, "I never knew my classmates were so smart."

One way to make questions suitable for any student is to pose them in a way that allows students to engage with the question at a number of different levels. For example, rather than asking students to answer a math question, the teacher could pose two questions of differing difficulty on the board and ask, "Which of these two questions is harder and why?" The ensuing discussion will raise all the important mathematical issues that the teacher needs to cover, but the question has been posed in an inclusive way that enables more students to contribute, thus supporting differentiated instruction.

As the work of James T. Dillon (1988) has shown, it is particularly effective to forgo questions entirely and instead make statements to which students are expected to respond. Through follow-up, the teacher can deal with any misunderstanding or other issue that the response reveals without "wrong-footing" students from the outset.

For example, rather than asking students in a world history class, "Which country was most to blame for the outbreak of World War I?" which is likely to have students just plumping for different countries, the teacher might make the statement, "Russia was most to blame for the outbreak of World War I," and expect students to react. And rather than saying, "What do you mean by that?" the teacher could say, "I'm confused by what you're saying." The differences are small, but research by Dillon and others shows that these small changes can have a big effect on the length and depth of student responses.

The whole idea that students should always answer teachers' questions correctly is actually rather odd. If the students are answering every one of the teacher's questions correctly, the teacher is surely wasting the students' time. If the questions are not causing students to struggle and think, they are probably not worth asking. As I say to students, "Mistakes are evidence that the questions I asked are tough enough to make you smarter." Of course, the best teachers have always said that making mistakes is OK, but recent research has shown that making mistakes in learning is actually better than not making mistakes (Huelser & Metcalfe, 2012). When students are taught material and tested on their recall, the students who did badly on the test and are shown their mistakes and the correct answers are the students who score best on a post-test weeks later.

The no-hands-up approach can make discussions more engaging, but this approach still only assesses the learning of a few students. To plan next steps, teachers need information from every student in the class.

All-Student Response Systems

In higher education, electronic voting systems or "clickers" have enabled professors to make their lectures much more interactive. However, in classrooms of 20 to 30 students, the cost of the necessary equipment and the time required to set it up may outweigh the benefits. In addition, the fact that electronic voting systems enable the teacher to have a record of every response made by every student seems to be at variance with the idea of the classroom as a safe place for making mistakes.

I prefer low-tech solutions for quickly assessing student understanding: ABCD cards students hold up to answer multiple-choice questions, dry-erase boards students write answers on, and having students hold up a number of fingers. None of these ideas is new. After all, the dry-erase board is simply the 21st century's version of the student slate. The powerful thing about all these approaches is that the teacher can quickly scan the students' responses and make an immediate decision about what to do next.

To make scanning easier, I recommend the use of multiple-choice questions. If a teacher asks students to write their own answers to a question on dry-erase boards, the teacher has a complex data-processing task: making sense of 30 idiosyncratic responses in seconds. However, if the teacher asks a multiple-choice question, the potential variety of the students' responses is more manageable.

The problem with multiple-choice questions is that they take time to construct, and it is practically impossible to invent a good multiple-choice question on the fly. Yet if students write more than three words each on a dry-erase board, then in a class of 30, the teacher has over 100 words to read, so it's important to keep it simple. If a question is likely to require a longer response, then it may be more appropriate to issue each student an index card and ask students to write their responses on the card. If this is done toward the end of a lesson, the teacher can ask students to hand in these "exit passes" as they leave the class.

If the students turn in the cards anonymously, then the teacher can just make a decision about where to begin the next lesson. If, however, the students write their names on their cards, the teacher can assign students to sit at different tables for the beginning of the next lesson, either by grouping students with significant misunderstandings at one table and working with them while the rest of the class works on extension material or by creating mixed-ability groups so students can compare responses and help one another.

Planning Questions

When teachers plan lessons, they generally plan, in considerable detail, the kinds of activities in which they will engage the students, the learning intentions of the lesson, and a number of other features. It's far less common for teachers to plan the questions they will use to determine whether the instruction has succeeded. The result is that questions often do not reveal important aspects of students' thinking, and therefore important misunderstandings go undetected. When teachers are aware of common student misunderstandings, they can construct questions ahead of time that reveal where students are confused.

For example, consider the following mathematics question.

Simplify the following fraction: $16/64$

If a student (correctly) responds that the fraction can be simplified to $\frac{1}{4}$, many teachers would conclude that the student understands how to simplify fractions. However, some students simplify this fraction not by realizing that the denominator is four times as large as the numerator, but by "cancelling" the sixes in the numerator and denominator: $16/64$. In this case, an incorrect strategy leads to a correct response. With a different question, such as being asked to simplify $24/48$, the student using this method would respond with $2/8$, and we would realize there is something wrong.

In English language arts, students may answer questions correctly by using a rule that any word that ends in *-ly* is an adverb, which works much of the time but not with words like *leisurely* or *lovely*. Using one of those words in a question about parts of speech will reveal students' incomplete understanding.

In science, young children can often appear to distinguish living things from nonliving things on the basis of whether they move. Such a naïve strategy will yield the correct answer if students are asked whether rocks, cats, or birds are living, but not if the teacher asks whether buses, computers, trees, or grass are living. We want students with the right thinking and students with the wrong thinking to give us different answers. If students with the right thinking and students with the wrong thinking give us the same answer, the question is not particularly useful.

Planning questions is especially important when teaching academic subjects because we cannot peer into students' brains to see what is going on. When a right-handed student throws a baseball standing with the right foot in front of the left, or when a violin student holds the bow with the hand below the bow rather than above, it's obvious what is going wrong. But with academic subjects, we have to elicit evidence of student thinking so that we can give useful feedback. When people think about formative assessment, they usually think about feedback, but you can't give good feedback until you find out what's going wrong in the first place.

A Good Place to Start

Questioning and discussion are key aspects of teachers' work in classrooms, and yet too often, classroom discussions involve only the most confident students, ignore what is happening in the heads of those not volunteering to participate, and rely on prompts and questions that have not been planned in advance. By picking students at random and by using all-student response systems at least once in every 20 to 30 minutes of group instruction, teachers can ensure that their decisions are based on the learning needs of the whole class. By planning their questions, teachers can ensure they are tapping into deep issues of learning, rather than skating across the surface.

These three ideas—no hands up, all-student response systems, and planning questions—are not the only, or even the most, important aspects of teaching. Trying to manage the learning that is happening in 30 different minds at the same time will always be extraordinarily challenging. But by increasing the engagement of students, and thus improving the feedback from the teacher, we can make a real difference. One teacher described the process as making the students' voices louder and making the teacher's hearing better. Sounds like a good place to start.

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