TEACH STUDENTS HOW TO LEARN

Twenty-One Strategies to Promote Optimal Learning

Enhancing Autonomy
- Allow students to choose paper, project, or discussion topics.
- Do a weekly goal-setting exercise with your students.
- Discuss attribution with your students.

Enhancing Competence
- Give clear expectations, both with your syllabus and with particular assignments.
- Provide early opportunities for success.
- Test early and often.
- Use one class session to present metacognitive learning strategies.
- Do a 1–2-minute interactive activity for every 10-15 minutes of class.
- Provide targeted feedback, rubrics, and exemplars.

Enhancing Belonging and Relatedness
- Use metacognitive get-acquainted activities.
- Assign authentic, real-world projects.
- Promote cooperative (group) learning.

Enhancing Self-Esteem
- Discuss mindset and emotions with students.
- Let your students know you are human; reveal your struggles in reaching your current level of mastery.
- Provide early opportunities for success.
- Do a reflection activity with students; ask them to reflect on how they have previously achieved mastery.

Enhancing Involvement and Enjoyment
- Connect to student' interests.
- Introduce "switch days," when students have the opportunity to teach and evaluate another student's teaching.
- Play learning games.
- Give students a question or task at the beginning of class that they will be required to answer or execute by the end of class.

Bonus Strategy
- Partner with your campus learning center and encourage your students to do so.
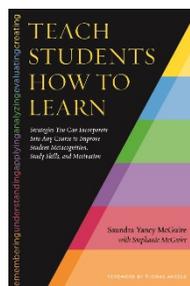
Teach students how to learn (McGuire, S.Y., McGuire, S.)

(Page 94 - Figure 8.8)

Formative Assessment in Science and Mathematics Education

FaSMEd

Five principles for effective questioning

1.   Plan to use questions that encourage thinking and reasoning

Really effective questions are planned beforehand. It is helpful to plan *sequences* of questions that build on and extend students' thinking. A good questioner, of course, remains flexible and allows time to follow up responses.

Beginning an inquiry	- What do you already know that might be useful here? - What sort of diagram might be helpful? - Can you invent a simple notation for this? - How can you simplify this problem? - What is known and what is unknown? - What assumptions might we make?
Progressing with an inquiry	- Where have you seen something like this before? - What is fixed here, and what can we change? - What is the same and what is different here? - What would happen if I changed this ... to this ... ? - Is this approach going anywhere? - What will you do when you get that answer? - This is just a special case of ... what? - Can you form any hypotheses? - Can you think of any counterexamples? - What mistakes have we made? - Can you suggest a different way of doing this? - What conclusions can you make from this data? - How can we check this calculation without doing it all again? - What is a sensible way to record this?
Interpreting and evaluating the results of an inquiry	- How can you best display your data? - Is it better to use this type of chart or that one? Why? - What patterns can you see in this data? - What reasons might there be for these patterns? - Can you give me a convincing argument for that statement? - Do you think that answer is reasonable? Why? - How can you be 100% sure that is true? Convince me! - What do you think of Anne's argument? Why? - Which method might be best to use here? Why?
Communicating conclusions and reflecting	- What method did you use? - What other methods have you considered? - Which of your methods was the best? Why? - Which method was the quickest? - Where have you seen a problem like this before? - What methods did you use last time? Would they have worked here? - What helpful strategies have you learned for next time?

2.   Ask questions in ways that include everyone

It is very important that everyone is included in thinking about the questions asked. Here are three ways that teachers have tried to achieve this:

- **Use a 'no hands up' rule**. After a few hands have gone up some students stop thinking because they know that the teacher will not ask them. When students have their hands up they too stop thinking as they already have the answer they want. 'No hands up' encourages everyone to keep thinking as anyone may be called upon to respond.
- **Ask questions that encourage a range of responses.** Rather than asking for specific right answers, ask for ideas and suggestions: "How can we get started on this?", "What do you notice about this?" Everyone will then be able to offer a response.
- **Avoid teacher - student - teacher - student 'ping pong'.** Encourage students to listen to and to reply to each other's responses. Aim for a pattern more like: teacher - student A - student B - student C - teacher.
- **Arrange the room to encourage participation.** Think about where students are sitting – are there some who cannot hear? Can students see and hear one another so that they can respond to the points another student makes? It is often better to sit students in a U-shape, if possible.

3.   Give students time to think

The time interval between a teacher asking a question and supplying the answer herself, or following up with an additional question or comment, is commonly called 'wait time'. For many teachers, the mean wait time is less than one second (Rowe (1974)[1]). When teachers increase this wait time to between three and five seconds the research shows that students begin to:

- respond at greater length and with greater confidence;
- offer more unsolicited, but appropriate, responses;
- offer more diverse, alternative explanations;
- relate responses to those from other students.

Increasing wait time is difficult. Silence in a classroom can be hard to bear!

- **Talk to students about 'wait time'**. Make sure that students *know* that they must take time to think before responding. (Some teachers even make themselves wait by counting slowly to themselves: "One, two, three, four, got to wait a little more"!)
- **Use "Think - Pair – Share".** Ask the question, give 10 seconds thinking time and then allow 30 seconds for talking to a partner. After this, everyone should be ready with an answer and they should know that anyone may be asked for what they think.
- **Use mini whiteboards**. Ask the students to spend 30 seconds thinking about the problem and jotting ideas for the solution onto their mini whiteboards. Then ask the students to share the ideas they had for starting the problem

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[1] Rowe, M. B. 1974. 'Wait time and rewards as instructional variables, their influence on language, logic and fate control'. *Journal of Research in Science Teaching* 11:81-94.

4. Avoid judging students' responses

Interestingly, Rowe (1974) found that if a teacher made judgmental comments, even positive ones such as "Well done!", then this negatively affected students' verbal performance even with the lengthened wait times. Task persistence was greatest where verbal rewards were fewer. When a teacher judges every response with 'yes', 'good', 'nearly' and so on, students are likely to reason to themselves:

"The teacher said that was good. That is not what I was going to say. So what I was going to say cannot be good. So I won't say anything."

Ask open questions that permit a greater variety of responses and reply to students with comments that do not close off alternative ideas.

"Thank you for that, that is really interesting. What other ideas do people have?"

5. Follow up students' responses in ways that encourage deeper thinking

The following approaches encourage further thinking and dialogue:

Ask students to repeat their explanation	• Can you just say that again?
Invite students to elaborate	• Can you just say a little more about that …
Challenge students to offer a reason	• Can you explain why that works?
Cue alternative responses	• Can you suggest another way of doing this?
Support with non-verbal interest	• Nod head, rotate hand to indicate that you want more …
Encourage students to speculate.	• What would happen if …?
Make challenging statements	• Someone in this group said … were they right?
Allow rehearsal of responses	• Try out the answer on your partner first.
Encourage students to ask questions	• Would anyone like to ask Pat a question about that?
Ask students to think aloud	• Can you go through that step by step?
Encourage students to make connections	• Can you remember something else we did like this …?
Thinking aloud with students	• Let's think this through together …

Planning for effective questioning

Plan how you will arrange the room and the resources needed	Arrange students so that they can see and hear one another as well as the teacher. You may need to rearrange chairs in a U shape or the students could move and 'perch' closer together. Or maybe you will move to the back of the room so that the question is the focus of attention and not the teacher.
Plan how you will introduce the questioning session	Silence will be hard for you to bear in the classroom but the students may find it confusing or even threatening. Explain why there will be times of quiet.
Plan how you will establish the ground rules	If you are using 'No hands up' then you will need to explain this to the students. Some teachers have had to ask their students to sit on their hands so that they remember not to put their hands up. The students will be allowed to put their hands up to ask a question, so if a hand shoots up remember to ask them what question they would like to ask. The students may also be used to giving short answers so you could introduce a minimum length rule e.g. 'your answer must be five words in length as a minimum'.
Plan the first question that you will use	Plan the first question and think about how you will continue. You cannot plan this exactly as it will depend on the answers that the students give but you might, for example, plan ▪ to take one answer and then ask others what they think about the reasoning given ▪ to take two or three answers without comment then ask the next person to say what is similar or different about those answers
Plan how you will give thinking time	▪ Will you allow 3-5 seconds between asking a question and expecting an answer? ▪ Will you ask the students to think – pair – share, giving 30 seconds for talking to a partner before offering an idea in whole class discussion? ▪ Will you use another strategy that allows the students time to think?
Plan how and when you will intervene	Will you need to intervene at some point to refocus students' attention or discuss different strategies they are using? Have one or two questions ready to ask part way through the lesson to check on their progress and their learning.

How Learning Works

Why Do Student Development and Course Climate Matter for Student Learning?

Implications of This Research

What are the implications of the findings on climate for teaching and learning? The first is that learning doesn't happen in a vacuum but in a course and classroom context where intellectual pursuits interface with socioemotional issues. The second is that climate works in both blatant and subtle ways, and many well-intentioned or seemingly inconsequential decisions can have unintended negative effects with regard to climate. Finally, as instructors, we have a great deal of control over the climate we shape, and can leverage climate in the service of learning once we understand how and why it influences student learning. Because of the connections between classroom climate and student development, many of the strategies that help foster a productive climate also encourage student development. The next section offers many such strategies.

WHAT STRATEGIES DOES THE RESEARCH SUGGEST?

Here are a number of strategies that may help you encourage student development and create a productive classroom climate. Most of these strategies work toward both goals, reinforcing our claim that student development must be considered in the context of the course environment.

Strategies That Promote Student Development and Productive Climate

Make Uncertainty Safe For those students who are comfort- able in black and white worldviews, there can be an emotional resistance to intellectual development, and it might be important to support them in dealing with ambiguity. There are various ways to do this. Validate different viewpoints, even unpopular ones. Explicitly let students know that part of critical thinking is to embrace complexity rather than oversimplify matters. Explain that even though it might seem frustrating, the point of classroom discussions is not to reach consensus but to enrich everybody's thinking. Model this attitude in your disciplinary context.

Resist a Single Right Answer Textbooks present information very linearly, but knowledge is generated and contested over time. If you want students to be in dialogue with the texts in your discipline, create a structure that can support it. You can ask students to generate multiple approaches to a problem or debate a devil's advocate position. Ask them to articulate their perspective before you volunteer yours so as not to bias them. When appropriate, use assignments with multiple correct solutions.

Incorporate Evidence into Performance and Grading Criteria If you want students to support their opinions with evidence, use rubrics and other tools to scaffold this practice. You can educate students to use the rubric by asking them to read each other's work and circle the pieces of evidence to highlight them visually. Incorporating evidence in your grading scheme will also reduce "grade grubbing" based on the notion that personal opinions are subjective and cannot be graded fairly.

Examine Your Assumptions About Students

Becauseassumptions influence the way we interact with our students, which in turn impacts their learning, we need to uncover and at times question those assumptions. It is common for instructors to assume that students share our background and frames of reference (for example, historical or literary references). It is equally common to make assumptions about students' ability (for example, Asian students will do better in math), identity and viewpoint (for example, students share your sexual orientation or political affiliation), and attributions (for example, tentative language indicates intellectual weakness). These assumptions can result in behaviors that are unintentionally alienating and can affect climate and students' developing sense of identity.

Be Mindful of Low-Ability Cues

In their efforts to help students, some instructors inadvertently send mixed messages based on assumptions (for example, "I'll be happy to help you with this because I know girls have trouble with math"). These cues encourage attributions focused on permanent, uncontrollable causes like gender, which diminish students' self-efficacy. Instead, it is more productive to focus on controllable causes, such as effort (for example, "the more you practice, the more you learn"). A "throw away" comment on an instructor's part can send an unintended but powerful message that may saddle students' identity with negative perceptions related to their group membership and influence their perception of the course climate.

Do Not Ask Individuals to Speak for an Entire Group

Minority students often report either feeling invisible in class or sticking out like a sore thumb as the token minority. This experience is heightened when they are addressed as spokespeople for their whole group, and can have implications on performance (for example, if they become non-engaged, angry, or combative). These emotions can disrupt students' ability to think clearly, be logical, solve problems, and so on.

Reduce Anonymity

Creating an effective learning climateoften includes making students feel recognized as individuals, both by the instructor and by peers. Making an effort to learn students' names, providing opportunities for students to learn each other's names, inviting students to office hours, going to a student's theater production or sports event, and so on, can help to break down the barriers created by large classes.

Model Inclusive Language, Behavior, and Attitudes

Just as instructors operate under a set of assumptions that may or may not be true, so do students. Addressing these assumptions (for example, that we all share a common heritage, set of experiences, or goals) by modeling inclusiveness can provide a powerful learning experience for all students. For instance, avoid using masculine pronouns for both males and females or, when you use American idioms, explain them for the benefit of non-native English speakers. These types of behaviors can "catch on" in a classroom and create a climate that is welcoming to all rather than demotivating to some who do not feel represented or validated. Feeling included and not marginalized is essential for the development of a positive sense of identity.

Use Multiple and Diverse Examples Multiple examples are important if students are to understand that theories and concepts can operate in a variety of contexts and conditions, and they also increase the likelihood of students relating to at least some of them. So, for instance, plan examples that speak to both sexes, work across cultures, and relate to people from various socioeconomic statuses, traditional age as well as adult returning students. This simple strategy can help students feel connected to the content, that they belong in the course or field, and reinforce their developing sense of competence and purpose.

Establish and Reinforce Ground Rules for Interaction Ground rules can help to assure that peers are being inclusive and respectful in order to create an effective learning climate and promote students' development. To generate maximal buy-in for the ground rules, you can involve students in the process of establishing them. See Appendix E for an example of such a process. Of course, you will still need to occasionally reinforce the ground rules and correct students for the occasional non-inclusive behavior or disrespectful comment.

Make Sure Course Content Does Not Marginalize Students Think about whether certain perspectives are systematically unrepresented in your course materials (for example, a course on family focusing only on traditional families, or a course on public policy ignoring race issues). Neglecting some issues implies a value judgment, which can alienate certain groups of students, thus impeding their developing sense of identity.

Use the Syllabus and First Day of Class to Establish the Course Climate First impressions are incredibly important because they can be long-lasting. Your students will form impressions about you and the course on the first day, so set the tone that you want to permeate the semester. Think through how to introduce yourself and the course. How will you balance establishing your competence and authority with coming across as supportive and approachable? What kind of icebreaker can help students get to know each other and become comfortable with you and the course while engaging the content meaningfully?

Set Up Processes to Get Feedback on the Climate Because some alienating attitudes, behaviors, and language function under the surface (that is, they are subtle), it is not always easy to get a sense of whether everyone in the class feels equally valued, accepted, heard, and so on. You can continually monitor the cli- mate—particularly in courses dealing with sensitive issues—by asking student representatives who meet with you on a regular basis to share feedback from the class, or through an early course evaluation that specifically asks about climate issues. You can also videotape yourself or ask a third party (a TA, a teaching center consultant, a colleague) to sit in on your class and collect data on your interactions with students. Indicators to monitor can include noticing which groups are called on, interrupted, asked less sophisticated questions, or given acknowledgment for their contributions more than other groups.

Anticipate and Prepare for Potentially Sensitive Issues We usually know from our own or our colleagues'

past experiences what issues seem to be "hot topics" for some of our students. Preparing students to learn from these opportunities requires careful framing (for instance, an acknowledgment that the topic can have personal significance for many students and also an articulation of the expectations for the tone of the discussion), an explanation for why the course is dealing with the issue (for instance, the necessity to hear all sides of the debate to arrive at a multifaceted understanding), and ground rules (see above) that assure a civil discussion.

Address Tensions Early If you are closely monitoring the climate and it becomes apparent that you or others are inadvertently shutting people out, marginalizing others, "pressingsome- one's button," and so on, address the issue before it gets out of hand. This may mean apologizing for yourself or others, if war- ranted (for example, "I'm sorry if some of you interpreted my comment as …"), taking a student aside after class to explain the impact of a comment, explicitly discussing the tension (for example, "Some people believe it racist to say …"), or delving into the issue through a series of questions (for example, "What are other ways people might perceive that statement?"). Remember that college students are learning to manage their emotions and sometimes don't know how to express them appropriately. In these cases, you might want to discuss intent versus impact (for example, "You probably did not mean this, but some people might interpret your comments as sexist because …"). This strategy protects students who make unsophisticated comments so that they do not shut down and foreclose further development, while acknowledging the frustration of the rest of the class.

Turn Discord and Tension into a Learning Opportunity Students need to learn that debate, tension, discord, and cognitive dissonance are all opportunities to expand one's perspective, delve deeper into a topic, better understand opposing views, and so on; hence, we need not avoid them. However, because college students are still developing social and emotional skills, these can often overshadow intellect, logic, and rational thinking. As a result, we need to work to continually shape our classroom climate. So do not foreclose a discussion just because tensions are running high; rather, funnel those emotions into useful dialogue. For example, you might ask students to take on another perspective using a role play, take a time out (for example, write their reactions down so that they are more useful and constructive), or simply explain how and why discomfort and tension can be a valuable part of learning.

Facilitate Active Listening Sometimes tensions arise because students are not hearing what others are saying. To build this important skill and enhance classroom interactions, you might ask students to paraphrase what someone has said, followed up by a series of questions as to whether their perception was inaccurate or incomplete. You can also model this skill yourself by paraphrasing a student's response and then asking whether you captured their perspective accurately.

SUMMARY

In this chapter, we have argued that we need to consider

students holistically as intellectual, social, and emotional beings. We have reviewed the research that documents how students are still developing in all these areas and in their sense of identity, and we have documented how their level of development can influence learning and performance. Likewise, we have argued that we need to look at our classrooms not only as intellectual but also social and emotional environments, and we have shown that all these facets of the course climate interact with student development and impact learning and performance. We also have shown that although instructors can only encourage development, they can have a great impact on the course climate. Our hope is that instructors can be more intentional in how they shape their course's climate and, consequently, student learning.

Excerpt from the book:

How Learning Works

Seven Research-Based Principles for Smart Teaching

Susan A. Ambrose, Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, Marie K. Norman