

CREATING AND FOSTERING A GROWTH-MINDED CLASSROOM

(幫助學生建立一個成長型思維模式的學習環境)

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What is your mindset? ([ref](#))

Mindset Quiz

Place a check in the column that identifies the extent to which you agree or disagree with the statement.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Your intelligence is something very basic about you that you can't change very much.				
2. No matter how much intelligence you have, you can always change it quite a bit.				
3. You can always substantially change how intelligent you are.				
4. You are a certain kind of person, and there is not much that can be done to really change that.				
5. You can always change basic things about the kind of person you are.				
6. Music talent can be learned by anyone.				

What is your mindset? ([ref](#))

Circle the number in the box that matches each answer.

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. ability mindset – fixed	0	1	2	3
2. ability mindset – growth	3	2	1	0
3. ability mindset – growth	3	2	1	0
4. personality/character mindset – fixed	0	1	2	3
5. personality/character mindset – growth	3	2	1	0

Diagnosing your mindset ([ref](#))

Strong Growth Mindset =	45 – 60 points
Growth Mindset with some Fixed ideas =	34 – 44 points
Fixed Mindset with some Growth ideas =	21 – 33 points
Strong Fixed Mindset =	0 – 20 points

Were you surprised?

We can't convince students to keep trying if we don't believe they have the ability to succeed!

Your brain is malleable

- [You can grow your brain](#) by [Lisa Blackwell](#).
- [Neuroplasticity](#) by [Sentis](#) (2:03) - a good visual introduction to the concept of how the brain can be rewired as we learn and think differently.
- [Growth Mindset video](#) by [Infobundl](#) (2:31) - a short talk on how everyone can have a growth mindset.
- [Growing your mind](#) by [Khan Academy](#) (3:04) - Sal Khan explains how your brain grows when you struggle with problems.

so, get that fixed mindset out of your system now!

Best practices for fostering a growth mindset environment (Ref: TEMESCAL REVIEW.PDF)

1. Establish high expectations (not just standards)

Challenge students so they know that they have the ability to meet those expectations.

2. Create a risk-tolerant learning zone

Provide an environment that values challenge-seeking, learning, and effort above perfection.

Best practices for fostering a growth mindset environment (Ref: TEMESCAL REVIEW.PDF)

3. Give feedback focused on process – things students can control not their personal abilities

Avoid praising students for their intelligence and instead focus on explaining the importance of their actions towards success.

4. Introduce students to the concept of the malleable mind

Show students that our brains develop through efforts and learning.

Embed the growth mindset in the course architecture

(Lindsay Larson)

- Place emphasis on **hard work**.
- **Act in faith** that students can transcend their natural talents. Be a growth mindset **role model**!
- Incorporate **learning plans** in which students **set their own goals** for learning and must **check in with them** throughout the semester.
- Assign **student-choice activities** which ask students to evaluate their own developmental needs and weakness.
- Assign semester-long projects that prompt students to **create habits, overcome obstacles, and persist over a period of time**.

So, what do we **say** to foster
a growth-minded learning
environment?

What do you say when your students ... ([ref](#))

struggle despite strong effort

- “You are not there *yet*.”
- “If it were easy you wouldn’t be learning anything!”
- “Look at how much progress you made on this. Do you remember how much more challenging this was (yesterday/last week/last year)?”
- “OK, so you didn’t do as well as you wanted to. Let’s look at this as an opportunity to learn.”
- “I expect you to make some mistakes. It is the kinds of mistakes that you make along the way that tell me how to support you.”

What do you say when your students ... ([ref](#))

struggle and need help with strategies

- “Let me add new information to help you solve this ... ”
- “Describe your process for completing this task.”
- “What parts were difficult for you? Let’s look at them.”
- “Let’s do one together, out loud.”
- “Just try, we can always fix mistakes once I see where you are getting held up.”

What do you say when your students ... ([ref](#))

are making progress

- “I can see a difference in this work compared to _____. You have really grown (in these areas).”
- “I see you using your strategies/tools/note/etc. Keep it up.”
- “Hey! You were working on this for a while and you didn’t quit.”
- “Your hard work is clearly evident in your process/project/essay/assignment.”

What do you say when your students ... ([ref](#))

succeed with strong effort

- “I am very proud of you for not giving up, and look what you have to show for it!”
- “Congratulations – you really used great strategies for studying, managing your time (behavior, etc.).”
- “I want you to remember for a moment how challenging this was when you began.”
- “All that hard work and effort paid off!”
- “What choices did you make that you think contributed to your success?”

What do you say when your students ... ([ref](#))

succeed easily **without** effort

- “It’s great that you have that down. Now we need to find something a bit more challenging so you can grow.”
- “It looks like your skills weren’t really challenged by this assignment. Sorry for wasting your time!”
- “I don’t want you to be bored because you are not challenging yourself.”
- “You are ready for something more difficult now.”
- “What skill would you like to work on next? What topic would you like to learn more about next?”

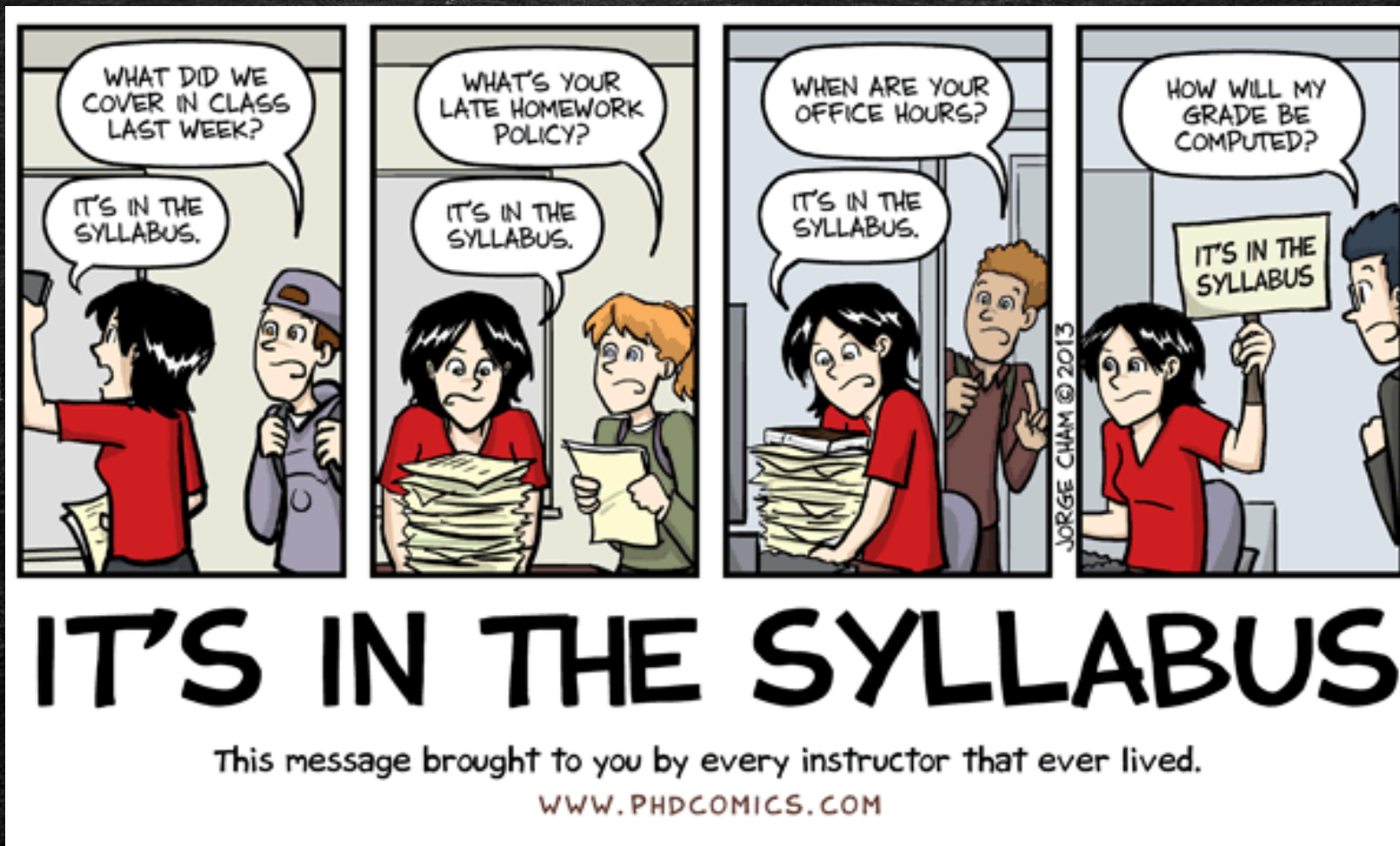
Now, what do we **do** to foster
a growth-minded learning
environment?

Action plan

1. Write your **syllabi** with *positive* and *promising* languages
2. Instill in students a *growth mindset* on the **first day of classes** (and reinforce the idea throughout the semester)
3. Embrace **mistakes**
4. Use **assessments for learning** (a form of formative assessment)
5. Provide *timely, goal-directed* **assignments and targeted feedback.**

STEP 1: Write your
syllabi with *positive* and
promising languages

Who reads the syllabus? ([ref](#))



Effective syllabi should be filled with **positive** and **promising** language

- ✓ Use Ken Bain's ideas for an invitation ([ref](#))
- ✓ Be mindful of the expressions of expectations
- ✓ Explain instructor's role and role modeling
- ✓ Can be ambitious, but should be realistic
- ✓ Provide honest appraisal of how student learning will be analyzed
- ✓ Use warm language whenever possible

*“What makes a great teacher great? They believe 2 things fervently: teaching matters and **students can Learn.**” – Ken Bain*

Ingredients of a promising syllabus ([ref](#))

1. The Promise (*e.g., course objectives, student Learning outcomes*)

Syllabi should explain what students will take away from the course instead of what the teacher will cover.

A promising syllabus

1. lays out promises and opportunities offered by the course
2. identifies the type of questions posed
3. summarizes the types of knowledge gained and abilities developed by the end of the course (e.g., intellectual, physical, emotional, social.)

Example promises (course objectives)

Cold

This course is an introduction to mathematical optimization techniques. You will learn to use the Simplex Method to solve linear programming problems. Duality, sensitivity analysis, and integer programming problems will also be discussed.

Warm

Have you ever thought about how UPS optimizes its delivery routes to reduce miles driven and unnecessary stops? Have you thought about how big box corporations make decisions about how much of a certain item to produce to maximize profit, given their limited labor and machine hours? Were you ever curious about what the least expensive way of combining various amounts of available foods in a diet that meets a person's nutritional requirements is? In this class, we will have an opportunity to learn the mathematical language to frame some of these questions as linear, integer, or nonlinear programming problems. You will ride through the course as a decision-maker, helping your ``imaginative'' company to optimize their objective (e.g., minimize cost or maximize profit) using math and Excel.

Example promises (learning outcomes)

To take charge of your own education, you must be **willing to read** the texts, **ask questions**, **actively engage** in discussions, and **struggle with** practice problems. Every mistake you make, every question you ask, and every time you successfully solve a problem on your own, **your brain grows a little bit stronger and smarter**. Your **efforts** to involve in all of these aspects of learning will help to **prepare you for the workforce and/or further scientific studies**. In short 15 weeks,

1. you will **master** the process of setting up and solving linear and nonlinear programming problems using the methods introduced in class.
2. you will **be aware of** the types of industry problems that can be transformed into linear and nonlinear programming problems.
3. you will **know how to use Excel** to solve linear/integer/nonlinear programming problems.
4. you will **acquire the ability to communicate** your ideas clearly through mathematically sound writing and conversations (using LaTeX & Piazza).

Ingredients of a promising syllabus ([ref](#))

2. Formative Activities (e.g., homework, readings, participations, discussions, writing, etc.)

Syllabi should explain what students will be doing to realize the promises of the course.

A promising syllabus

1. avoids language of demands (e.g., you should ..., you will ..., if you don't ...)
2. allows students to have control over their education (e.g., allow choices in assignments, encourage creativities.)

Ingredients of a promising syllabus ([ref](#))

3. Progress Evaluation (e.g., exams, final project, grading policy, etc.)

Syllabi should begin a conversation about how the teacher and the student would best come to understand the nature and progress of the student's learning.

A promising syllabus

1. deemphasizes outcomes, focuses on **process** and **effort**
2. provides opportunities for **growth**

Example phrases in syllabi

Exams are designed to assess your mastery of core concepts presented in class, online forum, practice problems, and readings. They are written at a level for you to be successful.

What would you expect to get out of this class?

What can I do to help you succeed?

Evaluation: Grades are designed to measure the level of your understanding against the learning objectives. They are not indicators of your smartness nor goodness of fit; rather, indicators of your efforts by the time the exams are taken.

These **practice problems** allow you to examine your own understanding of the topics -- catch up if you cannot fully grasp the materials in class, reinforce the concepts if you have no trouble absorbing the materials in class, and most importantly, stimulate your mind to pose further, deeper questions to be investigated.

Attendance: Given the discussion-based nature of this class, daily attendance is expected, as many discussions and activities are nearly impossible to replicate outside of class. I understand that sometimes 'life happens' and you are forced to make decisions between class and those 'life events,' but please know that your decisions will have consequences.

STEP 2: Instill in students a *growth mindset* on the **first day of classes**

(and reinforce the idea throughout the semester)

Importance of the first day ([ref](#))

- **First day is probably the most important day of the semester.** More important than most people realize.
- Dismiss students early after covering syllabus and icebreaker, or overload students with class information and subject content are both counterproductive. (*Perlman and McCann, 1999*)
- Should accomplish the following goals on the first day:
 1. **Foster instructor-student rapport**
 2. Communicate key elements and expectations for the course
 3. **Promote desired student behaviors**
 4. Actively involve the students

Foster instructor-student rapport: strategies to create a welcoming environment

1. Greet the students

Greeting students can range from simply smiling and saying “hi” as they enter the classroom to informal conversations before the class starts.

Question: What does this look like in your classroom?

Question: What to do? What not to do?

(e.g., Conversations about students’ personal matters? Ask students about how their day has been going? Have intimate conversations with students in the front?)

2. Share information about yourself

Providing information that shows students you are competent in the subject matter can instill a sense of optimism in students (Hayward, 2001).

Question: What information do you share with your students and why?

Question: What to do? What not to do?

(e.g., Your recent honeymoon in Hawaii? The fact you struggled to learn the materials for the class you are teaching? How would you like to be called? Why are you enthusiastic about the course? Your educational background? This is the first time you are teaching this class?)

3. Address the students

Do students prefer if you call them by their first name, last, or nickname? It shows respect to ask.

Question: How do you do this in your class?

Question: What to do? What not to do?

(e.g., What is your preferred gender pronoun (PGP)?)

4. Learn students' names

Learning the names of your students as quickly as possible is an effective way to establish early instructor-student rapport and increase student engagement.

Question: How do you do this in large-lecture vs. small-lecture classes?

5. Share (appropriate) personal experiences

Instructors are people, too! It helps students relate to the instructor when the instructor shares stories of struggles and how they overcome those struggles.

Question: What do you share with your students to build connections on the first day?

6. Use icebreakers with an agenda

Use ice breakers to

- deliver a message
- get to know the students right away
- reduce anxiety
- establish a safe learning environment

+ Share your favorite ice breaker activity ~

Communicate key elements and expectations for the course

Communicate key elements

- ✓ Share information without overwhelming students.
- ✓ **Overview** of the syllabus.
- ✓ **Explain outcomes and objectives** for the course.
- ✓ Often need to present course/review material on the first day.

Question: How can this be done effectively?
How do you do this in your classroom?

**Promote desired student
behaviors**

Promoting desired student behaviors

- + Start and stop class on time.
- + Have students **share** what they want to know, their **expectations** for the course, or **fears** about the class.
- + Ensure students **why they need to learn** the materials
- + Give students **opportunities to interact**.
- + **Identify learning outcomes throughout** the course not only at the beginning/end of the course.
- + **Allow students to provide self-assessment** throughout the course.

Question: How can this be done effectively?
How do you do this in your classroom?

Actively involve students

Strategies to actively involve students

- + If possible, **break up lecture**, questions, discussion, etc.
- + **Wait 5-10 seconds** after asking a question to let students respond.
- + Have students **write down their answers** first before answering questions.
- + **Take polls** for answering questions.

Question: What else do you do in your classroom to involve students?

Growth mindset on the first day?

First class impressions

- ✓ Does the information discussed promote a fixed or growth mindset for the first day?
- ✓ Does this create an experience that fosters growth?

How to create an environment that fosters growth on the first day?

- ✓ Note opportunities for 'failure'?
- ✓ Note 'high stakes' and 'low stakes' activities?

STEP 3: Promote learning
through *mistakes*,
assessments, and *feedback*

Celebrate mistakes ([ref](#))

“Making mistakes is THE most useful thing to be doing (especially true in math classes).”

– Jo Boaler

“We are raising a generation of children (...) who are terrified of blundering, of failing, or even sitting with the discomfort of not knowing something for a few minutes.”

– Alina Tugend

Ways to celebrate mistakes in class ([ref](#))

“Start classes with the norm, that you love and want mistakes.”

“Don’t just praise mistakes, say why they are important.”

“Give work that encourage mistakes.”– Jo Boaler

Example: An orbiting spaceship releases a probe that travels directly away from Earth. The probe’s distance s from Earth after t seconds is given by $s = 600 + 5t$. (1) What would be an appropriate unit for s and why? (2) What does 600 represent in that equation?

Types of questions vs. mindsets

SHORT CLOSED

tasks can lead students to think school is all about **PERFORMING**, not **LEARNING**.

OPEN tasks promote a growth mindset because they provide opportunities for students to **STRUGGLE** and **UNDERSTAND** content more deeply.

Students are forced to **MAKE CHOICES**, allowing them to think, learn, and grow through these tasks.

Open tasks promote a growth mindset

Examples of closed and open tasks

Q1: Fill in the blank: $4*2 = \underline{\quad}$, $5-2*(4/2) = \underline{\quad}$, $8/(9-3*4) = \underline{\quad}$.

Q2: Use all four arithmetic operations (+/-/*/) to construct an expression whose answer is equal to 32.

Q3: Find the perimeter of the given rectangle.

Q4: Construct two rectangles with a perimeter of 26.

Q5: Use the vertical line test to show that $f(x) = x^2 + 4$ is a function.

Q6: Give an example of a relation that is not a function.

Q7: What is the angle between $u = \langle 1, 2, 3 \rangle$ and $v = \langle 3, 2, 1 \rangle$?

Q8: Construct two vectors whose angle between them is acute. Justify your answer.

Now, try to come up with your own examples of open and closed tasks.

Make challenge the new comfort zone ([ref](#))

“We should make kids feel cheated if the work is too easy for them, or if the teacher glossed over their errors and don’t give them good feedback.”

– Carol Dweck

**Assessments for a
growth mindset ([ref](#))**

The fixed mindset testing culture (in math)

- The current testing culture (in math) makes students afraid of making mistakes and enforces a fixed mindset.
- If success is about doing well on tests, then students don't see mistakes playing a role.
- Mathematics should never be associated with speed (ref from Neuroscience).
- Timed tests cause early onset of math anxiety.

Develop assessments for learning

Summative – test at the end of a unit to see if material has been learned (e.g., exams).

Formative – assessments during learning (e.g., term papers, homework).

Assessments for learning – helps students develop a **growth mindset** by focusing on their **learning** and **understanding** instead of just the **final grade**.

Assessments for learning

“Assessments for Learning is based on the principle that students have a full and clear sense of where they are going and what they have to do to be successful.”

– Jo Boaler

Where they are

A4L: ways to close the gap

Where they need to be

Assessments for learning (Ruth Butler)

A comparison
between
students who
received

grades only

vs.

diagnostic feedback only

vs.

grades + feedback

*Significantly
higher
achievement*

Principles for designing A4L (Jo Boaler)

1. Set (mathematical) **goals** for students, *not a list of chapter titles and content*, but details of important ideas and how they are linked. For example,

I have understood the difference between mean and median and when they should be used.

2. **Students** then **assess their own work against the statement**. Students start to take more responsibility for their learning as they became aware of what they should be learning and what the important ideas are.

*“Low-achieving students are often low achieving because **they don't know what's important** or what they are meant to be paying attention to.”*

Some formative assessment strategies ([ref](#))

(Comments) Write **descriptive comments** on student work helping them see how they can improve their work or what they've done that really worked for them.

(Metacognition) Complete a metacognition table at the end of classes:

What did we do?	Why did we do it?	What did I learn today?
How can I apply it?	What questions do I still have about it?	

(Listening) Have students explain to you how they know something is true. Try and see from their explanation if they have any misconceptions.

Some formative assessment strategies ([ref](#))

(Doodle it) Have students draw what they understand, instead of writing it.

(Self-assessment) After the students have finished a writing assignment, let them evaluate themselves using the same metric you do. Discuss their self evaluation.

(Exit Slip) Hand out a slip of paper with a few simple questions. Students give them to you as they leave your class.

1 Things I learned today ..

2 Things I found interesting

...

3 Question I still have ...

Key ingredients to feedback ([ref](#))

“**Goal-directed** practice coupled with **targeted feedback** are critical to learning” (Ambrose et al., *How Learning Works*, 2010).

1. Practice is **goal-directed**
2. Practice is **productive**
3. **Timely** feedback
4. Feedback at an **appropriate level**

Reflections

Take a moment to think about the type of **assessments**, **assignments**, and **feedback** you consistently use in your class. Do they promote a growth or fixed mindset?

What would you do differently in conducting your classes in the future (to promote growth mindsets)?

Thank you for having a
growth mindset today ...

This talk is available through

http://web.csulb.edu/~jchang9/files/gm_wksp_talk_jmc_2017.pdf