LEARNING MODEL

Problem-Based Learning

Goal, Overview, and Application

Goal

At Macmillan, our goal is to drive learner outcomes. One important aspect of this is to leverage findings from the Learning Sciences to apply to product design, iteration, and implementation.

Overview

A Learning Model is a visualization of the instructional and assessment elements that underlie a learning experience and help instructors and institutions understand how a well-designed experience may drive impact. This Learning Model is based on research and practices in Active Learning, a pedagogy that has a substantial body of research demonstrating that it drives student engagement, satisfaction, and performance.

Application

This Learning Model underpins how we're developing a next-generation of learning products; however, it may be adopted or adapted for other learning experiences.

Research Foundation and Process

Foundation

This Learning Model is based upon a thorough literature review of educational research by learning researchers.

Process

Initially, our Learning Research team conducted several literature reviews in order to formulate this learning model, which then underwent a series of reviews, including:

- Internal review by a team of 4 learning scientists,
- External review by a team of 7 students, and
- External review by our 5-person Learning Research Advisory Board.

All of these researchers, contributors and reviewers are listed to the right.

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Components

Student Success
Opportunities to support student outcomes beyond course instruction and assessment.

Metacognition
Opportunities to engage in metacognitive activities that prompt evaluation of developing knowledge.

Instructional Content
Opportunities to provide new or review learning-objective aligned instructional information.

Assessment
Opportunities for formative and summative assessment activities that assess learning objectives.

Scaffolded Discovery Learning Activities
Opportunities to engage in problem- and project-based activities and scaffolded collaboration.

Elements

Motivation **Relevance**
Self-Regulated Learning **Study Skills**

Preflection
Reflection

Materials (Publisher, Supplemental, Reference, OER)
Lecture
Instructional Reviews

Integrated Formative Assessments
Practice/Homework
End of Unit or Term Summative Assessments

Project Segment **Small Group Problem Solving**
Novel Problem or **Large Group Discussion**
Case Study

PROBLEM-BASED LEARNING

BEGINNING OF TERM And throughout

Motivation
- Self-Efficacy
- Persistence

Self-regulated Learning
- Study Skills
- Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study
- Relevance
- Preflection

DURING CLASS

Small Group Problem Solving

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

AFTER CLASS

Practice / Homework

Reflection

END OF UNIT

Self-regulated Learning
- Study Skills
- Testing Strategies

Instructional Review

Summative Assessment

This Learning Model is comprised of four parts: Beginning of term, which is intended to encompass the first few periods or week, and then a cycle that continues throughout the term, with learning elements happening before, during, and after class.

For this model, "class" can be face-to-face, blended, or online. Also, this model can be applied to a class that meets once a week or multiple times per week.

PROBLEM-BASED LEARNING EXAMPLES

BEGINNING OF TERM
And throughout

Motivation

Provide growth mindset videos if the class population could benefit from them

Self-Efficacy   Persistence

Self-regulated Learning

Have an explicit activity in which students write down what knowledge and/or skills they hope to get out of the course that can be revisited throughout and during end of unit summarizations.

Study Skills   Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Provide a complex, real-world problem/case study with appropriate scaffolding to help students work through the new problem with the right level of support to challenge and engage them..

Novel Problem / Case Study

Relevance   Preflection

DURING CLASS

Small Group Problem Solving

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

Have each learner represent different points of view or roles when engaging in small group problem solving.

Have artifacts that small groups create available via a shared class webpage for reference during group discussion.

AFTER CLASS

Pract...   ...flection

Assign a discussion post as part of the homework requirements.

END OF UNIT

Assign small group study sessions to encourage review and peer collaboration.

Self-regulated Learning

Study Skills   Testing Strategies

Instructional Review
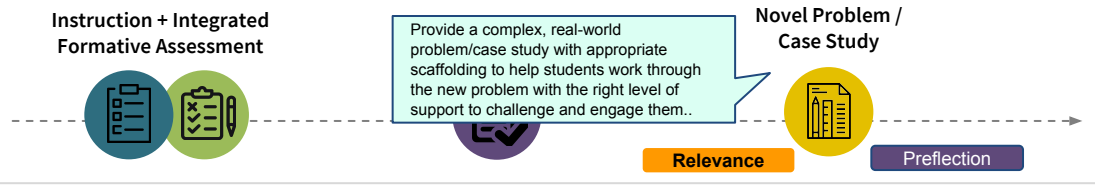
Summative Assessment

This Learning Model provides many opportunities to personalize the depth and frequency of activities to meet the needs of both instructors and students.

The components are meant to identify goals or milestones during an active learning experience. They provide flexibility in course design and meeting frequency. The activities used to accomplish each component can vary widely - some examples are given in the callouts.
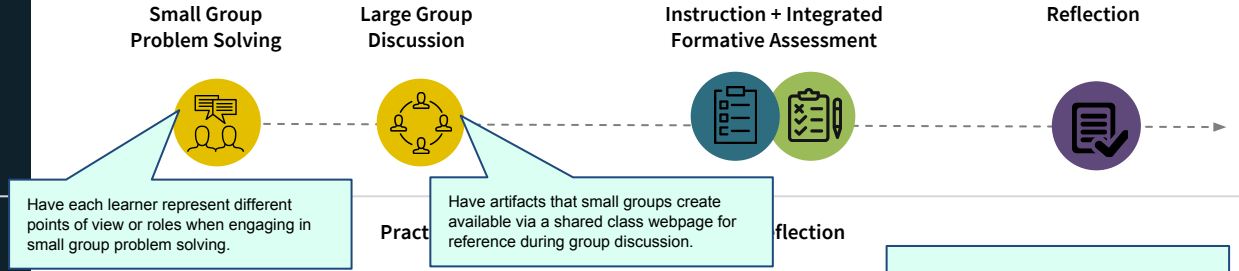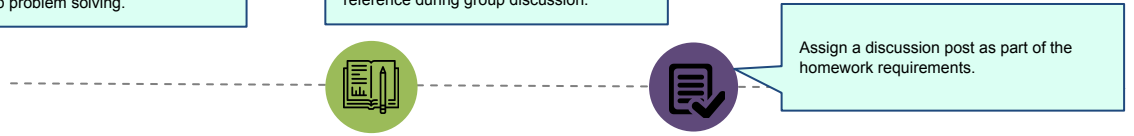
BEGINNING OF TERM
And throughout

Motivation

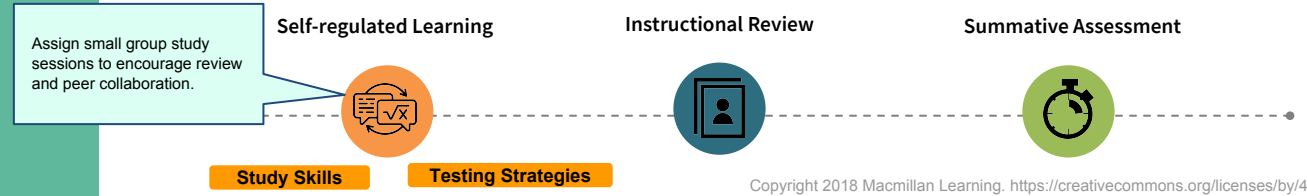Self-regulated Learning

Self-Efficacy | Persistence

Study Skills | Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study

Relevance | Preflection

DURING CLASS

Small Group Problem Solving

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

AFTER CLASS

Practice / Homework

Reflection

END OF UNIT

Self-regulated Learning

Instructional Review
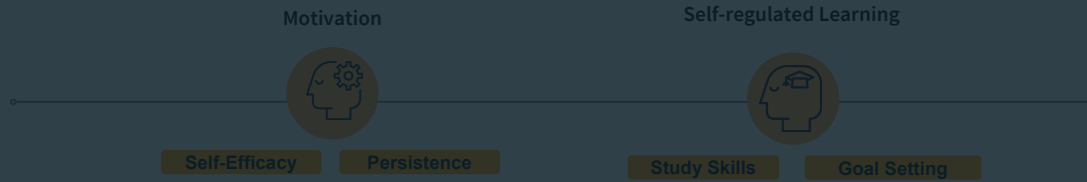
Summative Assessment

Study Skills | Testing Strategies

EXPLANATION

At the beginning of the term, it is important to help set up students for success - to be effective, motivated, and self-directed.

Techniques includes:
- Promoting a growth mindset,
- Fostering student self-efficacy,
- Educating students on effective study skill techniques, and
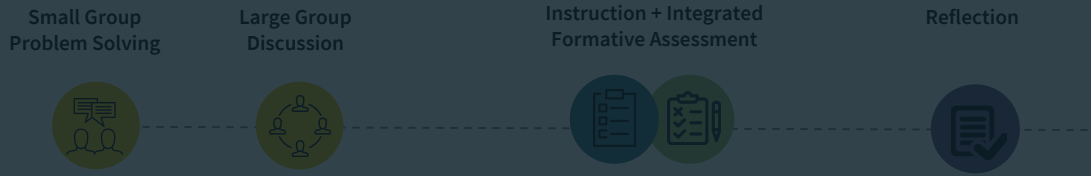- Encouraging students to set and track their own goals.

BEGINNING OF TERM
And throughout

Motivation

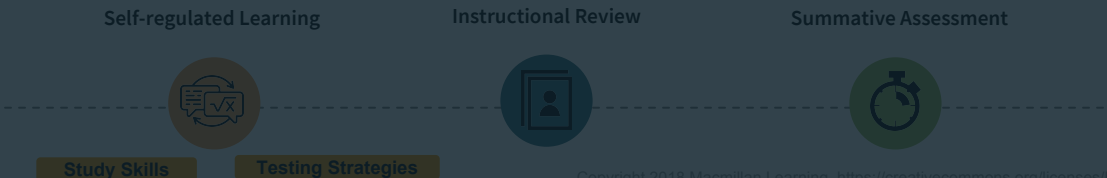Self-regulated Learning

Self-Efficacy | Persistence

Study Skills | Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study

Relevance | Preflection

DURING CLASS

Small Group Problem Solving

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Instruction + Integrated Formative Assessment

Reflection

AFTER CLASS

Practice / Homework

Reflection

END OF UNIT

Self-regulated Learning

Instructional Review
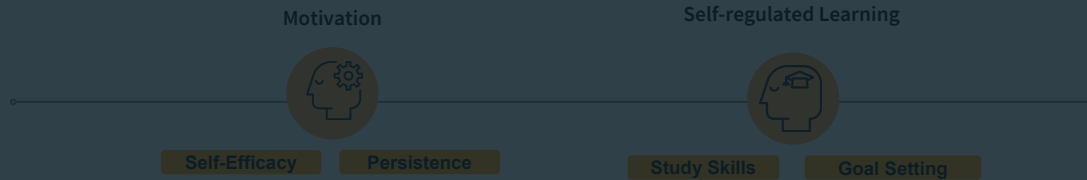
Summative Assessment

Study Skills | Testing Strategies

EXPLANATION

From this point, the Learning Model gets divided into things students should do before, during, and after class to optimize their learning.

Before class, students should:

- Clearly understand the relevance of the subject matter to their lives, programs-of-study, other course content, and/or careers.
- Access instructional materials, such as readings or videos.
- Take low-stakes formative assessments to test their own understanding and to revisit difficult material.
- Reflect on their learning, what it means to them, and what questions they may have.
- Be presented with a problem or case study to address during class.
- Engage in preflection aligned to the problem/case study in preparation for problem solving during class.
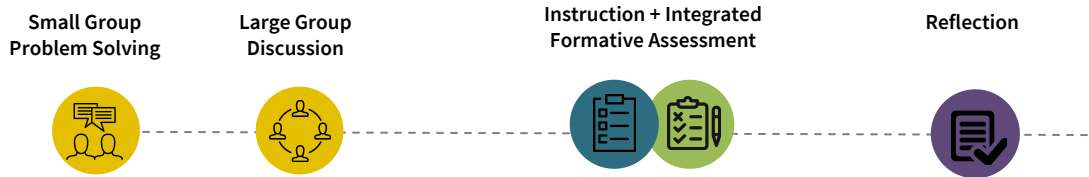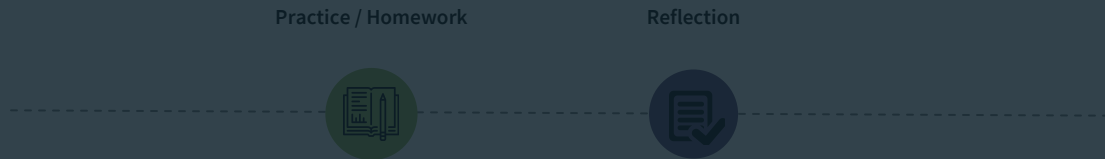
BEGINNING OF TERM
And throughout

Motivation
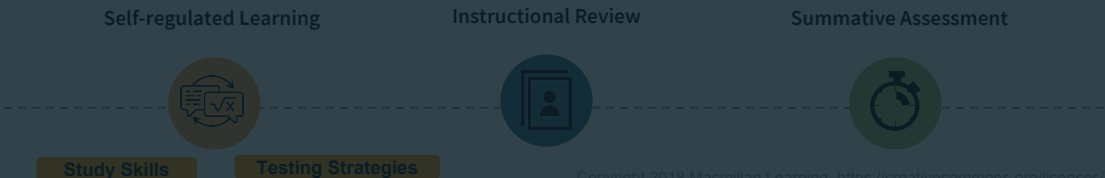Self-regulated Learning

Self-Efficacy | Persistence
Study Skills | Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment
Reflection
Novel Problem / Case Study

Relevance | Preflection

DURING CLASS

Small Group Problem Solving
Large Group Discussion
Instruction + Integrated Formative Assessment
Reflection

AFTER CLASS

Practice / Homework
Reflection

END OF UNIT

Self-regulated Learning
Instructional Review
Summative Assessment

Study Skills | Testing Strategies

EXPLANATION

This stage in the Learning Model is focused on what students should do during an active learning class.

During class, students should:

- Collaborate in small groups in order to begin to make connections, discover ideas, and share questions.
- Discuss common themes as a larger group, surfacing common misconceptions and new ideas.
- Participate in an "active and constructive lecture" by responding to questions and generating ideas.
- Participate in integrated formative assessment, so that the instructor can make adjustments and provide interventions in real time.
- Participate in a reflective exercise at the end of class to assess their own understanding and provide insight about issues and concerns.

BEGINNING OF TERM
And throughout

Motivation

Self-regulated Learning

Self-Efficacy   Persistence

Study Skills   Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study

Relevance   Preflection

DURING CLASS

Small Group Problem Solving

Large Group Discussion

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Reflection

AFTER CLASS

Practice / Homework

Reflection

END OF UNIT

Self-regulated Learning

Instructional Review

Summative Assessment

Study Skills   Testing Strategies

EXPLANATION

This stage of the Learning Model is focused on after class.

After class, students should:
- Complete additional formative assessment (e.g., homework) that comprehensively addresses learning goals specific to this segment of instruction -- revisiting things covered before and in class and beyond.
- Reflect on their learning and any lingering questions or areas for improvement.

BEGINNING OF TERM
And throughout

Motivation

Self-regulated Learning

Self-Efficacy   Persistence

Study Skills   Goal Setting

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study

Relevance   Preflection

DURING CLASS

Small Group Problem Solving

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

AFTER CLASS

Practice / Homework

Reflection

END OF UNIT

Self-regulated Learning

Instructional Review

Summative Assessment

Study Skills   Testing Strategies

EXPLANATION

This stage of the Learning Model is focused on the end of the term.

At the end of a module, unit, or term, students should:
- Revisit study skills in the context of test-taking strategies.
- Access an instructional review, either through notes, revisiting instructional materials, or a scheduled lecture.
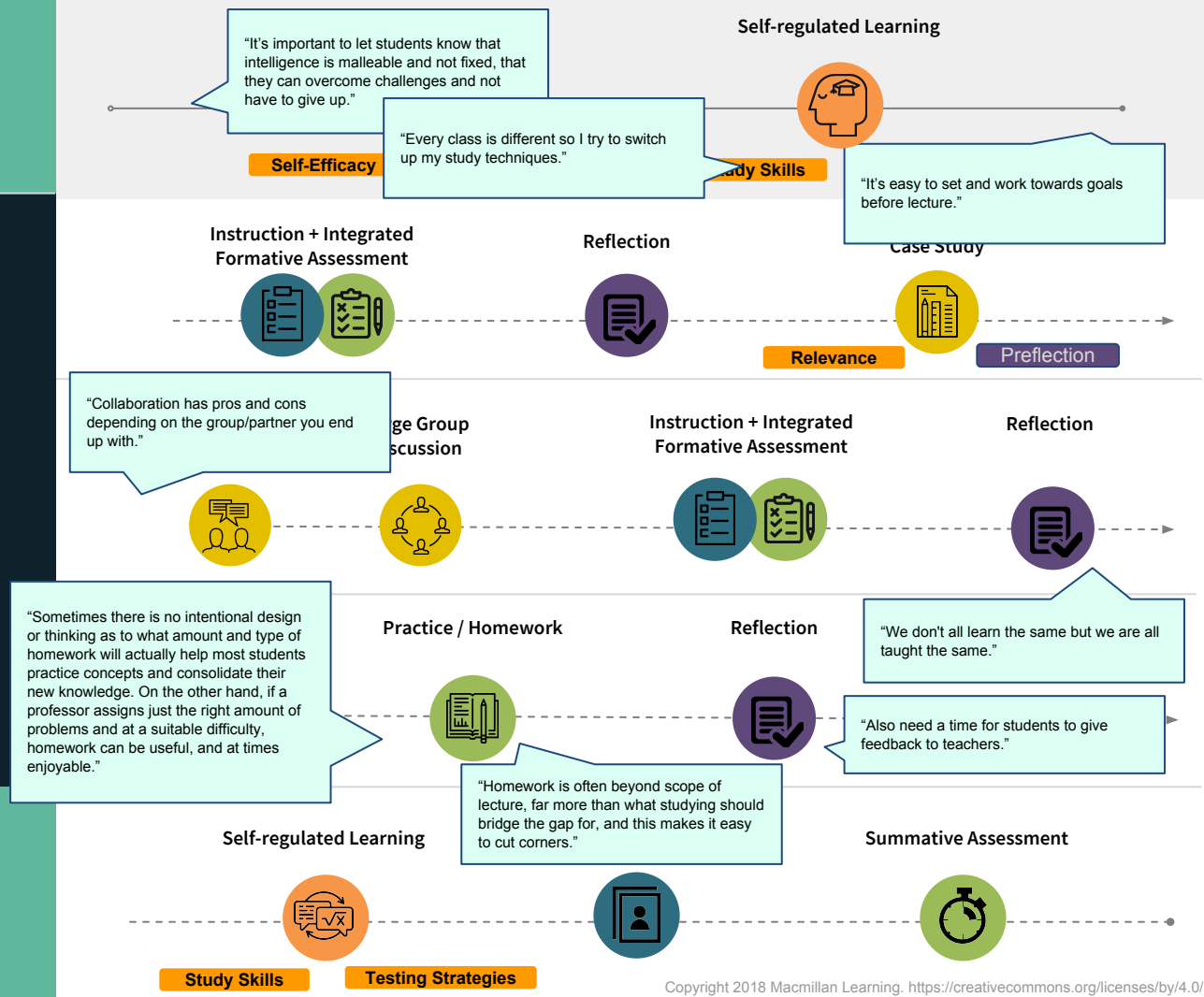- Participate in end of unit assessments.

STUDENT FEEDBACK

BEGINNING OF TERM
And throughout

Self-regulated Learning

"It's important to let students know that intelligence is malleable and not fixed, that they can overcome challenges and not have to give up."

"Every class is different so I try to switch up my study techniques."

"It's easy to set and work towards goals before lecture."

Self-Efficacy

Study Skills

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Case Study

Relevance

Preflection

DURING CLASS

"Collaboration has pros and cons depending on the group/partner you end up with."

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

AFTER CLASS

"Sometimes there is no intentional design or thinking as to what amount and type of homework will actually help most students practice concepts and consolidate their new knowledge. On the other hand, if a professor assigns just the right amount of problems and at a suitable difficulty, homework can be useful, and at times enjoyable."

Practice / Homework

Reflection

"We don't all learn the same but we are all taught the same."

"Also need a time for students to give feedback to teachers."

"Homework is often beyond scope of lecture, far more than what studying should bridge the gap for, and this makes it easy to cut corners."

END OF UNIT

Self-regulated Learning

Summative Assessment

Study Skills

Testing Strategies

Our student codesigners offered excellent insights into the relative value of specific elements from a student perspective.

They thought that the mindset and reflection elements were the most valuable. This was partly because these ideas appealed to them, and partly because they had negative associations with other elements, including traditional "one-size fits all" lectures, unfair collaboration, and misaligned homework.

Other comments, both positive and negative, are indicated in the callouts.

BEGINNING OF TERM
And throughout

Motivation

Self-Efficacy   Persistence

Self-regulated Learning

"Case study instruction helps students see the relevance of the content. If you're trying to solve the problem without the sufficient background knowledge, it can be frustrating, so the learning process should couple relevance with instruction and formative assessment to gauge understanding." - Dr. Dolan

BEFORE CLASS

Instruction + Integrated Formative Assessment

Reflection

Novel Problem / Case Study

Relevance   Preflection

"In problem-based learning, there should be ambiguity and no clear right answer. Otherwise, we're not preparing students for real life." - Dr. Dede

DURING CLASS

Small Group Problem Solving

Large Group Discussion

Instruction + Integrated Formative Assessment

Reflection

"Part of this reflection can be on whether to reformulate the problem based on progress so far. Also, reflection is useful on what role you are playing in the group and how that is helping you learn." - Dr. Dede

"In this model you have to allow the process of discovery through collaboration and active learning so people actually learn in a different way. But there is a much greater responsibility on staff to monitor and check what's been learned and fill in gaps. There is a big issue around how you develop staff capacity and competence to actually implement this kind of learning." - Dr. Thomas

AFTER CLASS

END OF UNIT

Self-regulated Learning

Study Skills   Testing Strategies

Instructional Review

Summative Assessment

INSTRUCTOR FEEDBACK

Our Learning Research Advisory Council offered insights into the relative value of specific elements from a learning sciences and instructor perspective.

They emphasized the importance of persistence, reflection, and assessment. This feedback underscores the importance of elements that support student success, application of knowledge and skills, and data-based interventions.

Other comments, both positive and negative, are indicated in the callouts.

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