Module 1: How to Succeed in STEM Courses

Introduction

Science courses are often perceived as difficult, but this difficulty usually arises not from the subject itself, but from unfamiliarity with the way scientific thinking works.

Science is fundamentally about understanding how the natural world behaves. Scientists observe patterns, test ideas, and use mathematical relationships to explain physical phenomena.

Students who succeed in science courses develop a habit of thinking logically and solving problems step by step.

The purpose of this module is to help students understand how to approach STEM courses effectively.

The Nature of Scientific Learning

Science differs from many other subjects because it is based on evidence, measurement, and reasoning rather than memorization.

A scientific idea must satisfy two important requirements:

1. It must be supported by experimental evidence.
2. It must be logically consistent with known physical laws.

Because of this, scientific knowledge develops gradually as new evidence becomes available.

Students studying science should think of themselves as investigators trying to understand how nature works.

Why STEM Courses Can Feel Challenging

Many students initially struggle in science courses for understandable reasons.

Understanding these challenges helps students overcome them.

1. Lack of Previous Experience

Some students enter college with limited exposure to laboratory science.

Topics such as:

• atomic structure
• electric fields
• chemical equilibrium
• wave behavior

may be completely unfamiliar.

This does not mean the student lacks ability. It simply means they are encountering new ideas.

Introductory science courses are designed to build understanding gradually.

2. Abstract Concepts

Many scientific concepts cannot be directly seen.

Examples include:

- atoms
- electromagnetic fields
- gravitational forces
- energy transfer

Although these ideas cannot be directly observed, scientists infer their existence through experiments and mathematical models.

For example, although we cannot see atoms individually, we can measure their behavior through chemical reactions.

3. Mathematics in Science

Mathematics plays a central role in science.

Mathematical equations allow scientists to describe relationships between physical quantities.

Students must be comfortable with mathematical skills such as:

- solving equations
- rearranging formulas
- interpreting graphs
- working with units

In science courses, mathematics is not simply calculation. It is a tool for understanding physical relationships.

Learn From Mistakes

Mistakes are part of the learning process.

When a problem is solved incorrectly, students should carefully review their work and identify the source of the error.

Common sources of error include:

- incorrect formula selection
- algebra mistakes
- unit conversion errors
- misunderstanding the question

Understanding mistakes helps prevent repeating them.

Use Available Academic Resources

Students should take advantage of academic support resources available at the college.

These include:

• tutoring sessions
• instructor office hours
• study groups
• supplemental learning materials

Seeking help early often prevents confusion from accumulating.

Developing Scientific Thinking

Successful science students develop habits of reasoning similar to those used by scientists.

These habits include:

• asking questions
• examining evidence
• testing ideas
• evaluating results

Science is not about memorizing facts. It is about understanding how ideas connect and how physical systems behave.

Example Scenario

A student encounters a physics problem involving motion.

Rather than guessing the answer, the student should follow a systematic process.

Step 1
Identify known quantities.

Step 2
Determine what must be calculated.

Step 3
Select the appropriate equation.

Step 4
Substitute values and solve.

This structured approach can be applied to many scientific problems.

Practical Example

Suppose a car travels at a velocity of 20 meters per second for 5 seconds.

How far does the car travel?

The relationship between distance, velocity, and time is

distance = velocity × time

Substitute values:

distance = 20 × 5

distance = 100 meters

Key Lessons from This Example

Even simple problems illustrate the importance of:

• identifying known values
• selecting the correct equation
• performing calculations carefully
• including units in the final answer

These steps are fundamental in science problem solving.

Practice Questions

1. Why is mathematics important in science?

2. What are two common reasons students struggle in STEM courses?

3. Why is it important to write out each step in a calculation?

4. What should you do if you solve a problem incorrectly?

5. Why is consistent study more effective than cramming before exams?