Introduction to Physics

Course Overview

Introduction to Physics is a survey course designed to strengthen scientific reasoning skills, measurement techniques, and safety procedures in the area of physics. Content included will be Basic Mechanics, including both kinematics and dynamics (motion and force), Wave Propagation (sound, light and other EM waves), and Energy, including transfer and conservation. Problem-solving will be stressed along with building resourcefulness. Students will investigate the application of concepts using modern technology. Unit and term examinations are given, along with daily assignments, textbook activities, and laboratory investigation.

Scope and Sequence

Timeframe	Unit	Instructional Topics
10 Day(s)	Unit 1- Kinematics	1.1: Motion and Speed 1.2: Acceleration
10 Day(s)	Unit 2- Dynamics	2.1: Newton's Laws of Motion 2.2: 2-D and Centripetal Motion
15 Day(s)	Unit 3- Wave Mechanics	3.1: General Properties of Waves 3.2: Sound Waves 3.3: Electromagnetic Spectrum Waves
10 Day(s)	Unit 4- Energy	4.1: Forms of Energy 4.2: Conservation of Energy
Ongoing	Unit 5- Strategies to Build One's Own Vocabulary	5.1: Logging With Words and Images 5.2: Chaos to Categories 5.3: Rate and Log- DVD Tool 5.4: Pencil to Publish 5.5: Vocabulary Dice 5.6: Merge and Fork
Ongoing	Unit 6- Technology	6.1: Data Collection and Analysis
Ongoing	Unit 7- Reading and Language Arts	7.1: Reading and Writing in Science
Ongoing	Unit 8- Strategies to Comprehend Concepts	8.1: Synthesizing 8.2: Questioning
Ongoing	Unit 9- Thinking Maps to Organize and Remember	9.1: Double Bubble Map 9.2: Tree Map 9.3: Flow Map

		9.4: Multi-Flow Map 9.5: Brace Map 9.6: Analogy or Bride Map 9.7: Multiple Features Map
Ongoing	Unit 10- Six Trait Writing Model	10.1: Ideas 10.2: Organization 10.3: Voice 10.4: Word Choice 10.5: Sentence Fluency 10.6: Conventions 10.7: Final Copy 10.8: Presentation

Essential Understandings

Identified in each unit

Academic Vocabulary

Vocabulary indicated in each individual unit

Prerequisites

Materials and Resources

1. spiral notebook
2. whiteboard marker
3. pen/pencil
4. physics folder
5. calculator

McLaughlin Thompson, *Physical Science*

Alexander, Fiegel, *Physical Science*

<u>**UNIT: Strategies to Build One's Own Vocabulary_Copy**</u> -- Ongoing

Description
These are strategies for the students. As students gain control of these vocabulary tools they will be able to increase vocabulary proficiency as they gain new knowledge and manipulate content.

<u>**TOPIC: Logging With Words and Images**</u> [Ongoing]

Description
When students use *Log of Words* and Images as a strategy throughout the instructional cycle, they benefit in the following ways:

· Clear up confusions or explain ever-changing understandings
· "Slow down" to wrestle with the tougher parts or focus on the important parts
· Heighten awareness of how one thinks as concepts evolve
· Solidify understandings

<u>**Learning Targets**</u>

Students will record important concepts and continually evaluate their own understanding of content.

Record the words, phrases, and pictures that come to mind as your understanding grows.
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<u>**TOPIC: Chaos to Categories**</u> [Ongoing]

Description
When students use *Chaos to Categories* as a strategy throughout the

Instructional cycle, they benefit in the following ways:

Connect new learning to make meaning.

Create visual cues of what is being read.

Periodically evaluate their understanding

<u>**Learning Targets**</u>

Students will develop thinking about relationships between concepts and solidify their understandings.

<u>**TOPIC: Rate and Log - DVD Tool**</u> [Ongoing]

Description
When students use *Rate and Log* as a strategy throughout the instructional cycle, they benefit in the following ways:

Clear up confusions or explain ever-changing understandings

"Slow down" to wrestle with the tougher parts or focus on the important parts

Heighten awareness of how one thinks as concepts evolve

Confirm, build upon or reshape schema

Solidify understandings

Learning Targets

Students will explain ever-changing understandings and reshape schema.

TOPIC: Pencil to Publish [Ongoing]

Description
Pencil to Publish is used when students are asked to recall everything they know or think they know about a particular topic, they are improving their skills in becoming more independent readers and focusing on some critical reading strategies:

Connecting new knowledge to make meaning.

Thinking ahead to what might be coming in the text.

Regularly evaluating their own understanding.

Having a plan for how to approach a task.

Learning Targets

Students will connect new knowledge to make meaning and think ahead while reading.

TOPIC: Vocabulary Dice [Ongoing]

Description
When students use *Vocabulary Dice* as a strategy throughout the instructional cycle, they benefit in the following ways:

Clear up confusions or explain ever-changing understandings

"Slow down" to wrestle with the tougher parts or focus on the important parts

Heighten awareness of how one thinks as concepts evolve

Allow more deeply developed thinking about relationships between concepts

Solidify understandings

Learning Targets

Students will develop relationships between concepts.

<u>**TOPIC: Synthesizing**</u> [Ongoing]

Description
Benefits of **SYNTHESIZING**:
·uses schema to help understand new information
·uses schema to enrich interpretations
·prioritizes thinking
·allows deep thinking about relationships between concepts
·clears up confusion
·confirms schema
·builds and creates new schema
·solidifies understandings
·develops awareness of thinking

Learning Targets

Students will complete the vocabulary tool by comparing and recording similarities and differences.

<u>**UNIT: Strategies to Comprehend Concepts_Copy**</u> -- Ongoing

<u>**TOPIC: Synthesizing**</u> [Ongoing]

Description
Benefits of **SYNTHESIZING**:
·uses schema to help understand new information
·uses schema to enrich interpretations
·prioritizes thinking
·allows deep thinking about relationships between concepts
·clears up confusion
·confirms schema
·builds and creates new schema
·solidifies understandings
·develops awareness of thinking
·expands thinking
·allows for consideration of larger issues and ideas
·results in questioning, inferring and connecting

Learning Targets

Students will show ownership of I Remember strategy.

I Remember strategy builds the habit of flexibility in reading rate, chunking information, and stating information in one's own words.

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Students will show ownership of Rank Ordering strategy.

Rank Ordering strategy will support positive thinking, deeper thinking, solid understandings, and consideration of larger issues and ideas.

Students will show ownership of RCRR strategy.

Read-Cover-Remember-Retell (RCRR) RCRR builds the habits of chunking thoughts and restating understanding and slowing one's own thoughts while reading.

Students will show ownership of the Key Word strategy

Key Concept:

When students use the **Key Word** Strategy, they pause after each paragraph or small chunk of text and select a word or short phrase that best represents the main message in that portion of text. Students will benefit in a variety of ways:

- · Students must pause frequently and consider the content of what was just read. This slows reading pace.
- · Students make a conscious effort to identify the most important information in each paragraph.

By slowing down and thinking about the information, children are more likely to incorporate new knowledge into their prior knowledge.

Students will show ownership of the Making Connections strategy.

Clears up confusion
Confirms and reshapes schema
Heightens awareness of one's thinking

- · Information I KNEW
- · Information I LEARNED
- · Merge and write an overview of new understandings

Students will show ownership of the Say Something strategy.

Students are invited to share personal responses, make connections, develop inferences, and ask questions after thinking about what was read/said and then react to it. It will work with any book; it can carry students to higher levels of thinking while encouraging language development.

Students will show ownership of VIP strategy.

VIP strategy develops habits of flexible reading rates, merging of new ideas, and restating in one's own words.

TOPIC: Multi-Flow Map [Ongoing]

Learning Targets

Students show ownership of the I Wonder strategy.

Good readers ask themselves questions before they read, while they read, and after they have finished reading.

Students will show ownership of First Thoughts and Revised Questions strategy

This strategy helps students wrestle with tougher parts, probe into new areas, formulate new beliefs, and draw conclusions.

Students will show ownership of Questons Searching For Answers strategy

This strategy helps students explain ever changing understandings, draw conclusions and wrestle with new information.

Students will show ownership of Two Page Note Taking strategy

This strategy helps students slow down and focus on important parts, practice note taking strategies, analyze information and draw new conclusions.

Description
As students manipulate content in a Thinking Map they gain awareness and increased understanding of the content area concepts.

TOPIC: Double Bubble Map [Ongoing]

Description
·Compare and contrast
·Prioritize importance within a comparison
·Comparison

Learning Targets

TOPIC: Tree Map [Ongoing]

Description
·Classification
·Main Idea/Details
·Persuasive
·Theme

Learning Targets

Students will construct a Tree Map to classify or sort main ideas from details.

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Students will construct a Tree Map to classify or sort main ideas from details.

TOPIC: Flow Map [Ongoing]

Learning Targets

TOPIC: Multi-Flow Map [Ongoing]

Learning Targets

Students will organize cause and effect information and make predictions.

TOPIC: Brace Map [Ongoing]

Learning Targets

Students will organize information for technical writing.

Students will organize information from whole to part.

Students will recognize physical realtionships of an object.

TOPIC: Analogy or Bridge Map [Ongoing]

Learning Targets

Students will compare and reason analogies.

Students will solve analogies.

TOPIC: Multiple Features Map [Ongoing]

Learning Targets

Students will classify multiple sources of information.

Students will organize information by attributes, traits or properities.

UNIT: Kinematics -- 10 Day(s)

Description
The methods of decribing motion (Kinematics) will be studied through a variety of activities. Through mathemetical and graphical analysis students will investigate motion, speed and acceleration. A working vocabulary of scientifics descriptions will also be developed.

Academic Vocabulary
Rate, Speed, Velocity, Constant Velocity, Instanteous Speed, Average Speed, Reference Point, Motion, Position, Time, Independant Variable, Dependant Variable, Acceleration, Frame of Reference

Unit Level Key Questions
How can you describe motion using mathematics, graphical analysis and proper scientific terminology?
Can you differentiate rate, speed, velocity and acceleration?
Can you solve problems using a 4 step flow map?
What are the requirements to making a proper graph to analyze data collected in lab?

Materials and Resources
Science Text, Guinness Book of World Records, ESPN video, whiteboards, LabPro: attachments and software, variety of lab materials and worksheets.

TOPIC: Motion and Speed -- 6 Day(s)

Description
Students will learn to describe the motion of object using proper scientific terminology, mathematics and graphs. Practice describing motion will occur during a variety of lab investigations and whiteboarding activities.

Learning Targets

Differentiate between rate, speed and velocity.

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Assessment: Whiteboard activities (F)
Labs (F) (S)
Teacher observation (F)
Peer feedback and discussions (F)
Science/math activities (F) (S)
Unit test (S)

Use and apply scientific terminology, mathematical and graphical analysis to describe motion.

Scientific terminology related to motion and speed will be developed and implemented into the writing and speaking process.

Assessment: Presentation (S)
Written activity (F) (S)
Labs (S)
Journal (F) (S)
Teacher observation (F)
Peer feedback (F)

Identify, recall, explain, select and formulate mathematical relationships between distance, velocity and time.

Assessment: Labs (F) (S)
Teacher observation (F)
Peer feedback (F)
Unit test (S)

Use, create and apply graphical models to analyze data collected in the lab.

Assessment: Labs (F) (S)
Unit test (S)
Teacher observation (F)
Peer feedback (S)
Activity sheets (F) (S)

Practice, apply and memorize specific kinematic definitions

Assessment: Unit test (S)
Rate and Log (F) (S)
Vocabulary Dice (F)
Chaos to Categories (F)

TOPIC: Acceleration -- 4 Day(s)

Description
Students will describe the acceleration of an object using gaphical and mathematical analysis.

Learning Targets

The learner will be able to describe the acceleration of an object mathematically and graphically.

Graphical models of acceleration will be used to develop mathematical relationships that help describe the accelerated motion of an object. Scienctific terminology related to describing accleration will also be developed. Real world descriptions will also be used to help student make connections with the concepts learned and practical applictions.

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<div align="center"><u>UNIT: Dynamics</u> -- 10 Day(s)</div>

Description

Concepts related to what causes motion will be investigated trough a variety of activities. The development and applications of Newton's Laws of Motion will be discussed in addition to projectile motion investigations. Centripetal motion concepts will also be introduced. Real world applications including seat belt use will be stressed.

Academic Vocabulary

Inertia, Force, Acceleration, Newton's 1st, 2nd, 3rd Law of motion, Momentum, Mass, Weight, Balanced Forces, Terminal Velocity, Air Resitistance,Gravity, Conservation of Momentum, Net Force, Projectile, Vertical Motion, Horizontal Motion, Centripetal Force/Acceleration, Weightlessnes, Satellite

Unit Level Key Questions

How can the law's of motion be used to descibe why an object acts the way it does?

How can components be used to describe the motion of a projectile?

How does the motion of a satellite compare to a ball tossed through the air?

How are satellites used in today's world?

Materials and Resources

Science Text, Variety of Lab materials, Computer/NASA and satelite internet sites, NASA space shuttle video, and variety of worksheets

<u>TOPIC: Newton's Laws of Motion</u> -- 5 Day(s)

<u>Learning Targets</u>

The learner will investigate and make predictions based on the interactions of forces

The interaction of forces as described by Newton's Laws will be reseached and investiged. Balanced and unbalanced forces will be investigated as will force pairs. Implications of force interaction will be introduced. The use of seatbelts and other practical applications will also be discussed.

<u>TOPIC: 2-D and Centripetal Motion</u> -- 5 Day(s)

<u>Learning Targets</u>

The learner will use components of Projectile Motion and Changes in Motion to predict the motion of an object

Horizontal and vertical motion will be discussed and investigated. The resulting path of a projectile will be studied as will motion along a curve. Satellite motion will be introduced with additional investigation of their importance and use in todays society.

<div align="center"><u>UNIT: Six Trait Writing Model_Copy</u> -- Ongoing</div>

Description

The LCASD uses the Six Trait Writing Model as a framework for teaching stronger writng skills within actual student writing activities. It is a powerful way to learn and use a common language to refer to characteristics of writing as well as create a common vision of what 'good' writing looks like. Teachers and students can use the 6+1 Trait model to pinpoint areas of strength and weakness as they continue to focus on improved writing.

Academic Vocabulary

Ideas

The Ideas are the heart of the message, the content of the piece, the main theme, together with all the details that enrich and develop that theme.

Organization

Organization is the internal structure of a piece of writing, the thread of central meaning, the pattern, so long as it fits the central idea.

Voice

The Voice is the writer coming through the words, the sense that a real person is speaking to us and cares about the message.

Word Choice

Word Choice is the use of rich, colorful, precise language that communicates not just in a functional way, but in a way that moves and enlightens the reader.

Sentence Fluency

Sentence Fluency is the rhythm and flow of the language, the sound of word patterns, the way in which the writing plays to the ear, not just to the eye.

Conventions

Conventions are the mechanical correctness of the piece-spelling, grammar and usage, paragraphing (indenting at the appropriate spots), use of capitals, and punctuation.

TOPIC: Ideas [Ongoing]

Description

Ideas

The Ideas are the heart of the message, the content of the piece, the main theme, together with all the details that enrich and develop that theme. The ideas are strong when the message is clear, not garbled. The writer chooses details that are interesting, important, and informative-often the kinds of details the reader would not normally anticipate or predict. Successful writers do not tell readers things they already know; e.g., "It was a sunny day, and the sky was blue, the clouds were fluffy white ..." They notice what others overlook, seek out the extraordinary, the unusual, the bits and pieces of life that others might not see.

Learning Targets

TOPIC: Organization [Ongoing]

Description

Organization

Organization is the internal structure of a piece of writing, the thread of central meaning, the pattern, so long as it fits the central idea. Organizational structure can be based on comparison-contrast, deductive logic, point-by-point analysis, development of a central theme, chronological history of an event, or any of a dozen other identifiable patterns. When the organization is strong, the piece begins meaningfully and creates in the writer a sense of anticipation that is, ultimately, systematically fulfilled. Events proceed logically; information is given to the reader in the right doses at the right times so that the reader never loses interest. Connections are strong, which is another way of saying that bridges from one idea to the next hold up. The piece closes with a sense of resolution, tying up loose ends, bringing things to closure, answering important

questions while still leaving the reader something to think about.

> **Learning Targets**

TOPIC: Voice [Ongoing]

Description
Voice
The Voice is the writer coming through the words, the sense that a real person is speaking to us and cares about the message. It is the heart and soul of the writing, the magic, the wit, the feeling, the life and breath. When the writer is engaged personally with the topic, he/she imparts a personal tone and flavor to the piece that is unmistakably his/hers alone. And it is that individual something-different from the mark of all other writers-that we call voice.

> **Learning Targets**

TOPIC: Word Choice [Ongoing]

Description
Word Choice
Word Choice is the use of precise language that communicates not just in a functional way, but in a way that moves and enlightens the reader. In good descriptive writing, strong word choice clarifies and expands ideas. In persuasive writing, careful word choice moves the reader to a new vision of things. Strong word choice is characterized not so much by an exceptional vocabulary that impresses the reader, but more by the skill to use everyday words well.

> **Learning Targets**

TOPIC: Sentence Fluency [Ongoing]

Description
Sentence Fluency
Sentence Fluency is the rhythm and flow of the language, the sound of word patterns, the way in which the writing plays to the ear, not just to the eye. How does it sound when read aloud? That's the test. Fluent writing has cadence, power, rhythm, and movement. It is free of awkward word patterns that slow the reader's progress. Sentences vary in length and style, and are so well crafted that the writer moves through the piece with ease.

> **Learning Targets**

TOPIC: Conventions [Ongoing]

Description
Conventions
Conventions are the mechanical correctness of the piece-spelling, grammar and usage, paragraphing (indenting at the appropriate spots), use of capitals, and punctuation. Writing that is strong in conventions has been proofread and edited with care. Handwriting and neatness are not part of this trait. Since this trait has so many pieces to it, it's almost a holistic trait within an analytic system. As you assess a piece for convention, ask yourself: "How much work would a copy editor need to do to prepare the piece for publication?"

> **Learning Targets**

TOPIC: Final Copy [Ongoing]

Description
Students use a variety of strategies to move through the editing process to produce a final written copy.

> **Learning Targets**

> **Description**
> **Presentation**
> Presentation combines both visual and verbal elements. It is the way we "exhibit" our message on paper. Even if our ideas, words, and sentences are vivid, precise, and well constructed, the piece will not be inviting to read unless the guidelines of presentation are present. Think about examples of text and presentation in your environment. Which signs and billboards attract your attention? Why do you reach for one CD over another? All great writers are aware of the necessity of presentation, particularly technical writers who must include graphs, maps, and visual instructions along with their text.
>
> **Learning Targets**

UNIT: **Wave Mechanics** -- 15 Day(s)

Description
General properties of waves will be investigated and concepts related to their motion will be developed. The transmission and productions of sound waves and the workings of the electromagnetic spectrum will also be investigated. Their importance in society and technological advances will also be researched.

Academic Vocabulary
Amplitude, Compression, Diffraction, Refraction, Reflection, Frequency, Interference, Rarefaction, Doppler Effect, Resonance, Transverse Wave, Wave, Wavelength, Surface Wave, Electromagnetic Wave, Mechanical Wave, Surface Wave, Compressional Wave, Music, Pitch, Medium, Ultrasonic, Infrasonic, Reverberation, Crest, Trough, Noise

Unit Level Key Questions
How can waves be classified?

What characteristics to waves have in common?

How is a sound wave produced, propogated and detected?

How are electromagnetic waves used in today's world?

Materials and Resources
Science Text, Variety of Lab Materials, LabPro: attachments and software, Computer/Internet resources, variety of worksheets.

TOPIC: **General Properties of Waves** -- 5 Day(s)

> **Learning Targets**
>
> The learner will be able to describe the production and transmission of EM Waves
>
> The electromagnetic spectrum will be investigated. The history, characteristics, dangers, discovery and the uses (commercial, industrial, medical and scientific) will be researched and presented to the class. Coopereative groups and research skills will be used to accumulate the knowledge that will be presented in this unit. All the spectral components

TOPIC: Sound Waves -- 5 Day(s)

Learning Targets

The learner will be able to describe the production and transfer of sound waves.

The production and transmission of sound waves will be introduced. Human perception (hearing) will be looked at from a physiological point of view, with the components of the ear discussed. Music and the workings of various instruments will be used to help develop a working scientific vocabulary on the subject. Also include will be the discussion of sonic and ultrasonic technology and their place in society.

TOPIC: Electromagnectic Spectrum Waves -- 5 Day(s)

Learning Targets

The learner will be able to describe the production and transmission of EM Waves

The electromagnetic spectrum will be investigated. The history, characteristics, dangers, discovery and the uses (commercial, industrial, medical and scientific) will be researched and presented to the class. Coopereative groups and research skills will be used to accumulate the knowledge that will be presented in this unit. All the spectral components will be discussed, but a major emphasis on visible light will be included in the unit.

UNIT: Energy -- 10 Day(s)

Description
The conservation and transfer of energy will be introduced and investigated. Reseach will be done reguarding the types and forms of energy and their interaction with matter. Real world applications will also be discussed and societies dependance on energy resourses will provide constructive debates.

Academic Vocabulary
Heat, Conduction, Convection, Radiation, Kinetic Energy, Potential Energy, Temperature,

Unit Level Key Questions
How is energy produce, used and transfered in today's world?

Materials and Resources
Science Text, Variety of Lab materials, Computer/Internet Resources and worksheets.

TOPIC: Forms of Energy -- 5 Day(s)

Learning Targets

The learner will be able to identify the various forms of energy and discuss some examples of their transfer from one form to another.
A review of terminology including: heat, work, energy and temperature, will lead to the concept of forms of, and transfer of energy through matter. Heating and cooling systems will be discussed, and the workings of a heat engine will be investigated. Open discussion of efficiency will be introduced with students encouraged to make plans for future energy resource usage.

TOPIC: Reading and Writing in Science [Ongoing]

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Learning Targets

The learner will investigate, present and defend the need and usage of an alternative energy source.

Students will research and use a choice of presentation styles to share information regarding alternative energy sources. Environmental impact, cost efficiency and societal acceptance will be discussed.

UNIT: Technology -- Ongoing

Description
Through technology applications student will research, experiment, collect data, and use laboratory simulations to investigate the topics covered throughout the term.

Materials and Resources
Computer, Internet Resources, LabPro and attachments, Data Analysis Programs: LoggerPro and Graphical Analysis programs, Presentation Programs: Inspirations and PowerPoint

TOPIC: Data Collection and Analysis [Ongoing]

Learning Targets

The learner will use a variety of computer interface probes to collect data and the appropriate software to analyze and present their findings.

UNIT: Reading and Language Arts -- Ongoing

Description
6+1 trait writing, reading strategies and outlining are incorporated into lessons throughout the class.

TOPIC: Reading and Writing in Science [Ongoing]

Learning Targets

The students will implement reading and writing strategies into their science education