# CURRICULUM CONNECTIONS

## Flight of the Butterflies in 3D (film)

(http://www.thehenryford.org/events/butterflies.aspx)

Flight of the Butterflies 3D is an interconnected scientific adventure story that spans not only thousands of miles, but generations. It's about the remarkable Monarch butterfly migration, the most incredible migration on Earth, and the determined scientist who spend 40 years trying to discover exactly where the butterflies mysteriously disappeared when they flew south for the winter.

### National Science Content Standards

**K-4**

- A. Science as Inquiry
  - Understandings About Scientific Inquiry
- C. Life Science
  - Characteristics of Organisms
  - Life Cycles of Organisms
  - Organisms and Their Environments
- E. Science and Technology
  - Understanding about Science and Technology
- F. Science in Personal and Social Perspectives
  - Changes in Environments
  - Science and Technology in Local Challenges
- G. History and Nature of Science
  - Science as a Human Endeavour

**5-8**

- A. Science as Inquiry
  - Understandings About Scientific Inquiry
- C. Life Science
  - Regulation and Behavior
  - Population and Ecosystems
  - Diversity and Adaptations of Organisms
- E. Science and Technology
  - Understanding about Science and Technology
- F. Science in Personal and Social Perspectives
  - Populations, Resources and Environments
  - Natural Hazards
  - Risks and Benefits
  - Science and Technology in Society
- G. History and Nature of Science
  - Science as a Human Endeavour
  - History of Science

**9-12**

- A. Science as Inquiry
  - Understandings About Scientific Inquiry
- B. Life Science

- Biological Evolution
- The Interdependence of Organisms
- Matter, Energy and Organization in Living Systems
- Behavior of Organisms

F. Science in Personal and Social Perspectives
- Population Growth
- Natural Resources
- Environmental Quality
- Natural and Human-Induced Hazards
- Science and Technology in Local, National and Global Challenges

G. History and Nature of Science
- Science as a Human Endeavour
- Historical Perspectives

<u>Michigan Science Grade Level & High School Content Expectations</u>

Grade 1

L.OL.01.13 Identify the needs of animals.

L.OL.01.21 Describe the life cycle of animals including the following stages: egg, young, adult; egg, larva, pupa, adult.

Grade 3

L.OL.03.32 Identify and compare structures in animals used for controlling body temperature, support, movement, food-getting, and protection (for example: fur, wings, teeth, scales).

S.RS.03.18 Describe the effect humans and other organisms have on the balance of the natural world.

S.RS.03.19 Describe how people have contributed to science throughout history and across cultures.

E.ES.03.52 Describe helpful or harmful effects of humans on the environment (garbage, habitat destruction, land management, renewable, and non-renewable resources).

Grade 4

S.RS.04.18 Describe the effect humans and other organisms have on the balance of the natural world.

S.RS.04.19 Describe how people have contributed to science throughout history and across cultures.

L.OL.04.16 Determine that animals require air, water, and a source of energy and building material for growth and repair.

L.EC.04.11 Identify organisms as part of a food chain or food web.

Grade 5

S.RS.05.17 Describe the effect humans and other organisms have on the balance in the natural world.

S.RS.05.19 Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures.

L.EV.05.11 Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in their environment.

L.EV.05.12 Describe the physical characteristics (traits) of organisms that help them survive in their environment.

L.EV.05.14 Analyze the relationship of environmental change and catastrophic events (for example: volcanic eruption, floods, asteroid impacts, tsunami) to species extinction.

Grade 6

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| S.RS.06.17 | Describe the effect humans and other organisms have on the balance of the natural world. |
| S.RS.06.19 | Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures. |
| L.EC.06.21 | Describe common patterns of relationships between and among populations (competition, parasitism, symbiosis, predator/prey). |
| L.EC.06.32 | Identify the factors in an ecosystem that influence changes in population size. |
| L.EC.06.41 | Describe how human beings are part of the ecosystem of the Earth and that human activity can purposefully, or accidentally, alter the balance in ecosystems. |
| L.EC.06.42 | Predict possible consequences of overpopulation of organisms, including humans, (for example: species extinction, resource depletion, climate change, pollution). |

Grade 7

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| S.RS.07.19 | Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures. |
| S.RS.07.17 | Describe the effect humans and other organisms have on the balance of the natural world. |
| E.ES.07.41 | Explain how human activities (surface mining, deforestation, overpopulation, construction and urban development, farming, dams, landfills, and restoring natural areas) change the surface of the Earth and affect the survival of organisms. |
| E.ES.07.42 | Describe the origins of pollution in the atmosphere, geosphere, and hydrosphere, (car exhaust, industrial emissions, acid rain, and natural sources), and how pollution impacts habitats, climatic change, threatens or endangers species. |

Grade 9-12 Biology

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| B1.2k | Analyze how science and society interact from a historical, political, economic, or social perspective. |
| L3.p2A | Describe common relationships among organisms and provide examples of producer/consumer, predator/prey, or parasite/host relationship. *(prerequisite)* |
| L3.p2B | Describe common ecological relationships between and among species and their environments (competition, territory, carrying capacity, natural balance, population, dependence, survival, and other biotic and abiotic factors). *(prerequisite) .* |
| L3.p3A | Identify the factors in an ecosystem that influence fluctuations in population size. |
| L3.p4A | Recognize that, and describe how, human beings are part of Earth's ecosystems. Note that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. |
| B3.1A | Describe how organisms acquire energy directly or indirectly from sunlight. |
| B3.4C | Examine the negative impact of human activities. |
| B3.4e | List the possible causes and consequences of global warming. |
| B3.5B | Explain the influences that affect population growth. |
| B3.5d | Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages. |

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| B3.5e | Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems. |

## Flight of the Butterflies Educator Guide

(English: http://www.thehenryford.org/education/erb/FlightOfTheButterfliesEducatorGuide.pdf)
(Español: http://www.thehenryford.org/education/erb/ElVueloDeLasMonarcaGuiaDelEducador.pdf)

Common Core State Standards for English Language Arts:

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|---|---|
| **Kindergarten** | |
| W.K.7 | Participate in shared research and writing projects. |
| W.K.8 | With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. |
| SL.K.1 | Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups. |
| **Grade 1** | |
| W.1.7 | Participate in shared research and writing projects. |
| W.1.8 | With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. |
| SL.A.1 | Participate in collaborative conversations with diverse partners about *grade 1 topics and texts* with peers and adults in small and larger groups. |
| **Grade 2** | |
| W.2.7 | Participate in shared research and writing projects. |
| W.2.8 | Recall information from experiences or gather information from provided sources to answer a question. |
| SL.2.1 | Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups. |
| **Grade 3** | |
| W.3.7 | Conduct short research projects that build knowledge about a topic. |
| SL.3.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly. |
| **Grade 4** | |
| W.4.7 | Conduct short research projects that build knowledge through investigation of different aspects of a topic. |
| SL.4.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly. |
| **Grade 5** | |
| SL.5.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade5 topics and texts*, building on others' ideas and expressing their own clearly. |
| **Grade 6** | |
| SL.6.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 6 topics, texts, and issues*, building on others' ideas and expressing their own clearly. |

Grade 7

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|---|---|
| W.7.1 | Write arguments to support claims with clear reasons and relevant evidence. |
| W.7.9b | Draw evidence from literary or informational texts to support analysis, reflection, and research. b. Apply *grade 7 Reading standards* to literary nonfiction. |
| W.7.10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| SL.7.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly. |

Grade 8

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|---|---|
| W.8.1 | Write arguments to support claims with clear reasons and relevant evidence. |
| W.8.9b | Draw evidence from literary or informational texts to support analysis, reflection, and research. b. Apply *grade 8 Reading standards* to literary nonfiction. |
| W.8.10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| SL.8.1 | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly. |

Grades 9-10

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| W.9-10.1 | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. |
| W.9-10.9b | Draw evidence from literary or informational texts to support analysis, reflection, and research. b. Apply *grades 9–10 Reading standards* to literary nonfiction. |
| W.9-10.10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. |
| SL.9-10.1 | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. |

Grades 11-12

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|---|---|
| W.11-12.1 | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. |
| W.11-12.9b | Draw evidence from literary or informational texts to support analysis, reflection, and research. b. Apply *grades 11–12 Reading standards* to literary nonfiction. |
| W.11-12.10 | Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. |
| SL.11-12.1 | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11-* |

*12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively.

Common Core State Standards for Literacy in Science and Technical Subjects:

Grades 6-8

WHST.6-8.1 Write arguments focused on *discipline-specific content*.

WHST.6-8.9 Draw evidence from informational texts to support analysis reflection, and research.

WHST.6-8.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Grades 9-10

WHST.9-10.1 Write arguments focused on *discipline-specific content*.

WHST.9-10.9 Draw evidence from informational texts to support analysis reflection, and research.

WHST.9-10.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Grades 11-12

WHST.11-12.1 Write arguments focused on *discipline-specific content*.

WHST.11-12.9 Draw evidence from informational texts to support analysis reflection, and research.

WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

National Science Content Standards

K-4

- B. Science as Inquiry
  - Abilities Necessary to do Scientific Inquiry
- C. Life Science
  - Characteristics of Organisms
  - Life Cycles of Organisms
  - Organisms and Their Environments

5-8

- B. Science as Inquiry
  - Abilities Necessary to do Scientific Inquiry
  - Understandings About Scientific Inquiry
- C. Life Science
  - Regulation and Behavior
  - Population and Ecosystems
  - Diversity and Adaptations of Organisms
- F. Science in Personal and Social Perspectives
  - Populations, Resources and Environments

9-12

- C. Science as Inquiry
  - Abilities Necessary to do Scientific Inquiry

- Understandings About Scientific Inquiry

D. Life Science
   - Biological Evolution
   - The Interdependence of Organisms
   - Matter, Energy and Organization in Living Systems
   - The Behavior of Organisms

G. Science in Personal and Social Perspectives
   - Population Growth
   - Natural Resources
   - Science and Technology in Local, National and Global Challenges

<u>Michigan Science Grade Level & High School Content Expectations</u>

Kindergarten

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|---|---|
| S.IP.00.11 | Make purposeful observation of the natural world using the appropriate senses. |
| S.IA.00.12 | Share ideas about science through purposeful conversation. |
| S.RS.00.11 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.OL.00.11 | Identify that living things have basic needs. |
| E.SE.00.12 | Describe how Earth materials contribute to the growth of plant and animal life. |
| S.IP.00.14 | Manipulate simple tools (for example: hand lens, pencils, balances, non-standard objects for measurement) that aid observation and data collection. |

Grade 1

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|---|---|
| S.IP.01.11 | Make purposeful observation of the natural world using the appropriate senses. |
| S.IA.01.12 | Share ideas about science through purposeful conversation. |
| S.RS.01.11 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.OL.01.13 | Identify the needs of animals. |
| L.OL.01.21 | Describe the life cycle of animals including the following stages: egg, young, adult; egg, larva, pupa, adult. |
| L.HE.01.11 | Identify characteristics (for example: body coverings, beak shape, number of legs, body parts) that are passed on from parents to young. |

Grade 2

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|---|---|
| S.IP.02.11 | Make purposeful observation of the natural world using the appropriate senses. |
| S.IP.02.14 | Manipulate simple tools (ruler, meter stick, measuring cups, hand lens, thermometer, balance) that aid observation and data collection. |
| S.IA.02.12 | Share ideas about science through purposeful conversation. |
| S.RS.02.11 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.OL.02.14 | Identify the needs of plants. |

Grade 3

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|---|---|
| S.IP.03.11 | Make purposeful observation of the natural world using the appropriate senses. |
| S.IP.03.13 | Plan and conduct simple and fair investigations. |

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| S.IP.03.14 | Manipulate simple tools that aid observation and data collection (for example: hand lens, balance, ruler, meter stick, measuring cup, thermometer, spring scale, stop watch/timer). |
| S.IP.03.15 | Make accurate measurements with appropriate units (centimeters, meters, Celsius, grams, seconds, minutes) for the measurement tool. |
| S.IP.03.16 | Construct simple charts and graphs from data and observations. |
| S.IA.03.12 | Share ideas about science through purposeful conversation in collaborative groups. |
| S.RS.03.11 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.OL.03.32 | Identify and compare structures in animals used for controlling body temperature, support, movement, food-getting, and protection (for example: fur, wings, teeth, scales). |
| L.OL.03.42 | Classify animals on the basis of observable physical characteristics (backbone, body coverings, limbs). |
| L.EV.03.12 | Relate characteristics and functions of observable body parts to the ability of animals to live in their environment (sharp teeth, claws, color, body coverings). |

Grade 4

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|---|---|
| S.IP.04.11 | Make purposeful observation of the natural world using the appropriate senses. |
| S.IP.04.13 | Plan and conduct simple and fair investigations. |
| S.IP.04.14 | Manipulate simple tools that aid observation and data collection (for example: hand lens, balance, ruler, meter stick, measuring cup, thermometer, spring scale, stop watch/timer, graduated cylinder/beaker). |
| S.IP.04.15 | Make accurate measurements with appropriate units (millimeters centimeters, meters, milliliters, liters, Celsius, grams, seconds, minutes) for the measurement tool. |
| S.IP.04.16 | Construct simple charts and graphs from data and observations. |
| S.IA.04.12 | Share ideas about science through purposeful conversation in collaborative groups. |
| S.RS.04.11 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.OL.04.16 | Determine that animals require air, water, and a source of energy and building material for growth and repair. |
| L.EV.04.22 | Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction. |
| L.EC.04.11 | Identify organisms as part of a food chain or food web. |

Grade 5

| | |
|---|---|
| S.IP.05.11 | Generate scientific questions based on observations, investigations, and research. |
| S.IP.05.12 | Design and conduct scientific investigations. |
| S.IP.05.13 | Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens) appropriate to scientific investigations. |
| S.IP.05.14 | Use metric measurement devices in an investigation. |
| S.IP.05.15 | Construct charts and graphs from data and observations. |
| S.IA.05.12 | Evaluate data, claims, and personal knowledge through collaborative science discourse. |

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| S.IA.05.14 | Draw conclusions from sets of data from multiple trials of a scientific investigation. |
| S.RS.05.15 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| L.EV.05.11 | Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in their environment. |
| L.EV.05.12 | Describe the physical characteristics (traits) of organisms that help them survive in their environment. |

Grade 6

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|---|---|
| S.IA.06.12 | Evaluate data, claims, and personal knowledge through collaborative science discourse. |
| S.RS.06.15 | Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities. |
| S.IA.06.14 | Draw conclusions from sets of data from multiple trials of a scientific investigation. |

Grade 7

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|---|---|
| S.IP.07.11 | Generate scientific questions based on observations, investigations, and research. |
| S.IP.07.12 | Design and conduct scientific investigations. |
| S.IP.07.13 | Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens, thermometer, models, sieves, microscopes, hot plates, pH meters) appropriate to scientific investigations. |
| S.IP.07.14 | Use metric measurement devices in an investigation. |
| S.IP.07.15 | Construct charts and graphs from data and observations. |
| S.IP.07.16 | Identify patterns in data. |
| S.IA.07.11 | Analyze information from data tables and graphs to answer scientific questions. |
| S.IA.07.12 | Evaluate data, claims, and personal knowledge through collaborative science discourse. |
| S.IA.17.13 | Communicate and defend findings of observations and investigations. |
| S.RS.07.17 | Describe the effect humans and other organisms have on the balance of the natural world. |
| E.ES.07.41 | Explain how human activities (surface mining, deforestation, overpopulation, construction and urban development, farming, dams, landfills, and restoring natural areas) change the surface of the Earth and affect the survival of organisms. |
| E.ES.07.71 | Compare and contrast the difference and relationship between climate and weather. |

Grade 9-12 Earth Science

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| E1.1A | Generate new questions that can be investigated in the laboratory or field. |
| E1.1C | Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision). |
| E1.1D | Identify patterns in data and relate them to theoretical models. |
| E1.1h | Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables. |
| E4.p2B | Describe the difference between weather and climate. |

Grade 9-12 Biology

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|---|---|
| B1.1C | Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision). |
| B1.2k | Analyze how science and society interact from a historical, political, economic, or social perspective. |
| L3.p3A | Identify the factors in an ecosystem that influence fluctuations in population size. |
| L3.p4A | Recognize that, and describe how, human beings are part of Earth's ecosystems. Note that human activities can deliberately or inadvertently alter the equilibrium in ecosystems. |
| B3.1A | Describe how organisms acquire energy directly or indirectly from sunlight. |
| B3.4C | Examine the negative impact of human activities. |
| B3.5d | Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages. |
| B3.5e | Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems. |
| B3.5f | Graph an example of exponential growth. Then show the population leveling off at the carrying capacity of the environment. |
| L5.p1A | Define a species and give examples. |