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Fiction, Non-Fiction and Query to Engage Young Learners

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Introduction

Our goal as educators in the 21 st century is to empower students to become critical thinkers. True, committed efforts are being made to enhance pedagogic practices through the use of Common Core standards. Doing so, however, is a work in progress. Despite ongoing efforts to achieve this end, in accordance with school district and administrative mandates, teachers continue to find themselves having to teach to the test, placing primary emphasis on building up reading ability, reading stamina, and reading comprehension skills across genre. In this regards, achieving high test scores based on scripted curricula and teacher-directed instruction in many instances remains the focus of the hour. Because of the thrust to have instructors rigorously align mandated curriculum with District achievement goals, educators—beginning as early as Grade 2—today find themselves caught in the crossfire of prepping students for state-and-district-mandated exams, leaving limited room for creative, engaging classroom instruction across disciplines. As a result, many students lose out on being inspired to use their metacognitive know-how to its fullest capacity.

Such holds true regarding my experience as an elementary instructor at the Davis Street Arts & Academics Interdistrict Magnet School in New Haven, Connecticut. My third grade class—comprised of a culturally diverse group young learners with much academic potential—primarily hail from low-to-moderate income, single-parent households; a few come from two-parent, middle income homes. But for one or two exceptions, the majority enters third grade reading below grade level. During the initial weeks of the school year, I make it a point to carefully observe and evaluate their ability to socially interact, verbally communicate, and engagingly collaborate with one another. By doing so, I get a sense for where I need to take my young learners both academically and socio-developmentally. I find that during those first few weeks, when called upon to participate in Q&A and/or general small and whole-group discussions, most opt to withdraw from sharing their understanding of subject matter (or lack thereof) among classroom peers. Based on my 20-years of teaching across grade levels, I find that this trend often intensifies during middle through high school years.) How then can educators help students overcome this challenge? How do we assist them in fearlessly sharing their interests, understanding, and questions across subject areas before their peers? How do we motivate them to work together, to question and effectively argue viewpoints to spark discovery? How do we inspire blossoming thinkers to convey their understanding in written form across genre? I contend that we begin by providing opportunities that enable their voices be heard, to foster an engaging classroom community where students

feel safe to express themselves and query is the focal point of instruction. This, in part, serves as the rationale for my curriculum unit, "Fiction, Non-Fiction & Query to Engage Young Learners."

Targeted at students in Grade 3, but modifiable for students across abilities levels in Grades 2-5, "Fiction, Non-Fiction & Query" takes an up-close look at predacious insects and more using collaborative inquiry. Students will work in whole and small collaborative groups. They will brainstorm and create a K-W-L chart, perpetually revisiting "what you know-what you want to know, and what you've learned" regarding select arthropods. Through hands-on investigation, field trips, and related reading and research activities, they will conduct student-initiated research and make amazing discoveries. These "inquisitive explorers" will learn to identify and classify insects based on insect characteristics. They too will fine tune their area(s) of interest, zeroing in on a select predatory insect for in-depth study using a self-directed, inquiry, hands-on approach.

The Essential Question

An overarching question will be provided to keep students focused on our target subject: "What is entomology, and why should we learn about it?" Using this combined essential question as a query springboard, students will delve into underlying questions to learn more about the subject at hand. Observing the growth and development of select insects in the classroom setting, coupled with film presentations, nature hikes, and a culminating field trip to the Yale Peabody Museum of Natural History will help to bring query and exploratory study to life. Children's literature in informational, fiction, and poetic form will be used to complement and support hands-on learning experiences and to build and reinforce reading and reading comprehension skills.

Student inquiry will be enhanced through interactive, project-based learning experiences. These experiences include whole and small group brain storming sessions, a research study based on individual student interest, and a team informational research project (I-Search Project) regarding predacious insects and their ability to survive. The latter will serve as a major focus re: query and collaboration aligned with our children's book selection "Crickwing" by Janell Cannon. Through the implementation of this unit in its entirety, students' curiosity will be roused. Ultimately, through interactive engagement, they will build confidence in forming hypotheses, making careful and conscientious observations, uninhibitedly recording and sharing their findings—working together to problem solve. Equally important, students will embrace that formulating questions, speculating ideas, sharing viewpoints—regardless of exactitude or inaccuracy—collectively help us develop into critical thinkers and valued members in a productive learning community.

The Need Is Clear

According to a five-year study conducted by Louise Jennings and Heidi Mills, inquiry based instruction effectively and engagingly supports academic learning and proves effective in building supportive, collaborative learning communities. [1] Through its implementation, students embrace themselves as 'contributing learners' within the classroom community. They are actively involved in the decision making process, providing them with a vested interest in the classroom learning experience. Via asking questions, students are given the opportunity to help create the learning experience. Curiosity is roused; students begin to make text-to-world-to-self connections, once again sparking curiosity. Students become actively engaged and become more observant in the process. I concur, for I have embraced inquiry-based learning approaches in my classroom setting. I find that via its implementation, students become empowered because (1) their input is valued and (2) because they play an integral role in setting the tone for investigation and discovery. It is an empowering foundation proposed in my curriculum unit.

Additional Rationale

I too have chosen to develop this unit because in Grade 2, our young learners are introduced to the butterfly life cycle. They get a first-hand look at the metamorphic stages in the growth and development of Painted Lady butterflies. Unfortunately, the children do not always have an opportunity to observe that metamorphosis without mishap, e.g., larvae may be delivered to the school in a damaged state such that these specimens expire prematurely or emerge from the chrysalis in a malformed condition. Additionally, the second grade curriculum is somewhat limited in that students do not go beyond learning about Painted Lady butterflies. My unit goes a bit deeper, taking an extensive look at insect anatomy and physiology across different species, the overall importance of studying and knowing about insects, and how they fit in to the realm of biodiversity.

Before We Begin

Since query is the focal point of this unit to guide instruction, what better way to begin than to ask ourselves what we as educators need to know about our topic of study before we begin. In this regards, we must dig deep within our line of questioning, placing ourselves in the shoes of our young learners so that we access meaningful, relevant information that inspires our young learners to further immerse themselves in the topic at hand. To achieve this end, begin brainstorming on categorical questions from a self-to-world perspective. Among the proposed questions are:

*What is an insect?

*How many insects exist in the world?

*Why is the insect grouping of species seemingly so diverse?

*Do insects have scientific names, and if so, how do we classify them?

*Is the physiological makeup of an insect complex or simple? Explain.

*Should we collect, observe, study, and release insects after examination? Because they are such pesky critters, should we simply eradicate them post observation?

*What are the ethical ramifications of taking either action?

*Are insects REALLY purposeful in our everyday lives? Why?

By examining such questions, we equip ourselves to provide support, model instruction, and establish the tone for student exploration. The works of such entomological professors/entomologists as Penny Gullan, Peter Cranston, Charles Borror, Gilbert Waldbauer, and others reveal fascinating facts regarding these initial queries as noted below.

Background Info - Supportive Details

The study of insects known as entomology encompasses the collection, observation, rearing, experimentation with, and up-close examination of insects. Entomologists investigate and scrutinize facets of insect life, ranging from insect behavior, anatomy and physiology to insect evolution and more.

Research findings reveal that insects are found in every corner of the world—from the Arctic to torrid desert areas to our planet's dense tropical regions. Their short life cycles—coupled with their small size and overall physiological make-up as compared to other members of the kingdom animalia—render them quite adaptable. Although people throughout the world experience that myriad insects reside on planet Earth (approximately more than one million), because of the enormity and diversity of the species, the exact number of insects that exist on our planet is unknown. [2]

Insects can be aquatic, aerial, terrestrial—living in or on land, on or beneath water, and/or on or beneath the soil throughout their entire existence. Insects may be loners, communal, and/or socially interactive. They can be beneficial or deleterious to other living things: this particularly holds true in the areas of agriculture and human health. Regarding their physical characteristics, their body parts are more intricately designed than meets the general "head-thorax-abdomen-six legs-and-exoskeleton" description.

Insects Defined

An insect is an arthropod. Its segmented body parts are fused forming its three major regions: the head located at the forefront of the body; the thorax, found in the insect's midsection; and the abdomen, found at its lower extremity. Insects too have a strong, external skeleton. The paragraphs that follow expand on the aforementioned, simplified descriptions.

The Head

One pair of compound eyes, antennae, mouthparts, and a brain comprise the basic components of an insect's head. The head, however, consists of numerous additional sensory organs. These organs allow the insect to masterfully experience its surrounding. The head is actually a rigid cranial capsule divided into symmetrical, segmented regions that are indistinguishable with the naked eye; microscopic observation reveals that its divvied sections are evidenced in the way its facial body parts are situated.

The Brain . This body part constitutes an integral part of an insect's nervous system. Its size varies within different insect species. Insects that engage in complex behaviors tend to have larger brains. The nervous system is additionally composed of sensory, internuncial, and motor nerve cells. Sensory nerve cells tend to lie close to the insects body surface. Internuncial cells are association cells. Nerve impulses are channeled through this region to motor cells via synapses. This suggests that similarly to the brain and nervous system found in humans, these neurological components serve as an information highway within the insect's body.

Compound Eyes. Insects view the world through a mosaic of hexagonal portals known as ommatadia. Each

ommatadium provides the insect with a narrow field of vision in the form of a dot of light shining on each lens. The dots collectively help an insect form an image or picture. That image, however, is unlike the view we experience with our eyes. They see the world through colored images and are capable of detecting motion. [3] Speaking of which, have you ever wondered why a fly seems to escape so swiftly when you try to swat it? That's because in addition to its compound eyes, it has three simple eyes arranged in triangular fashion on the front of its head between the compound eyes. That insect can see what's coming towards it in multiple directions! Bottom line: an insect's eyes can be considered to be extraordinary ocular apparatus.

Antennae. Feelers, as they are alternately called, generally serve as a sensory tool. Their form and usage vary from insect to insect. Some antennae, like those found in butterflies, are capitate in structure, that is they have a club-and knob-tipped appearance. Some are filiform; they are thread-like in structure like antennae found on a cockroach. Some are setaceous or bristle-like, similar to antennae found in the order odonata. Some antennae are plumose or feather-like, as found noted in moths and remarkably mosquitoes. Some are comb-like and are referred to as pectinate in form. Others are serrate in composition; they are notched and angled on specific sides, somewhat like the blades on a saw. Both of these characteristics are evidenced in myriad types of beetles. Entomologists believe antennae are sensitive to odors, taste, touch, heat, moisture, and wind currents. [4]

Mouthparts. Like the teeth, mouth, and tongue found in humans, the mouthparts of an insect are used to ingest food. Insect mouthparts vary from one insect species to the next: some are used for masticating, sucking, siphoning, or rasping. Some insects have mouthparts that are not fully developed, suggesting that they undergo change during their growth stages. Whatever its use, insect mouthparts are quite complex. Five basic components constitute this portion of an insect's body: the labrum and labium constituting the upper and lower lip (yes, insects have lips!); the hypopharynx—a tongue-like structure connected with the insect's salivary glands and/or salivary ducts to help spark digestion; and a jaw-like apparatus referred to mandibles. Mandibles tend to be found in omnivorous insect species like cockroaches and crickets; they are used for capturing, snipping and cutting prey into smaller pieces, and for masticating food. A pair of secondary jaws, called maxillae, is located behind the mandible. They serve as sensory organs that move masticated food into the insect's pre-oral cavity, like humans about to swallow a hamburger post chewing it into smaller pieces. Connecting muscles help these mouthparts to work together as an operational masterpiece.

Insects that have sucking mouthparts draw in liquid food similar to humans taking in liquid sustenance by sipping liquid food through a straw. Insects that have this type of mouth structure also have salivary pumps. This is used to inject saliva into the pre-oral cavity and is used to begin the process of digestion. For example, the curling mouthparts found in lepidoptera are referred to as proboscis; butterflies and moths use their proboscis to siphon nectar from flowers. Diptera, e.g., houseflies and blowflies, have tube-like sucking mouthparts that lap and suck up liquids. This type of lapping-sucking apparatus is also found honey bees. Arthropods like fleas, thrips, and sucking lice have stylets—needle-type mouthparts that pierce animal or plant tissue through which it feeds. [5]

Remarkably, unlike humans, the teeth-like components of an insect are found outside of the mouth opening. Insects like locusts, grasshoppers, beetles, and caterpillars have mandibles that snip and masticate food. Others use their hypopharnyx to digest and ingest liquid food. Ultimately, the basic design of the mouthpiece depends upon the insect and the food sources that sustain it.

The Thorax

The thorax is the central structure of an insect, analogous to the torso found in human beings. To it are affixed the legs and where applicable, one or two sets of wings. Depending upon the insect species, the thorax is divided into three additional sections: the prothorax, the mesothorax, and the metathorax. Spiracles—part of the insect's respiratory system used to help it breathe and exchange gases—and the insect's first pair of legs are present on the prothorax. The larger mesothorax bears the second pair of legs, the forewings where applicable, and an additional set of spiracles. The last set of legs and, where applicable, an additional pair of wings is situated on the metathorax.

Wings . The forewings and hind wings of many insects are coupled together. This helps to improve its aerodynamic ability, permitting them to fly swiftly oftentimes in multiple directions. All winged insects have the same basic wing structure.

Wings are each comprised of a major vein that runs longitudinally from the segmented thorax to the wing-tip; other veins branch out from them. The major veins contain blood vessels, nerve fibers, and trachea. They too are affixed to powerful muscles, attached between the wing and the thoracic segments. The thoracic walls to which the wings are affixed can move at different speeds in key directions. The movement of those muscles controls the movement and attitude of the wing in flight.

Insect wings are divided into grouped cells. Some wings—as found in butterflies—are multi-colored; others—as found in houseflies—are membranous and somewhat transparent. Still others—as found in white cabbage moths—are dull in color. Some insects, like beetles, appear to have lost a set of wings. The truth is their outer wings are hard and armor-like, suggesting an adaptation for survival. Diptera have but two wings. Affixed to their hind wings are a body part known as halteres. These body parts vibrate upward and downward in a synchronized way with the wings and act as gyroscopes in flight. If the fly deviates from a straight course, flying in a zig-zag motion, rolls, or pitches during flight, the insect's halteres help the insect maintain its balance. [6]

Legs . Insect legs are generally used for walking or running and are divided into segmented parts to help facilitate those functions. They include the femur, tibia, tarsus, and other components. The femur, connected to the thoracic region, can be equated to the human thigh bone connected to the lower torso. The tibia can be equated to what constitutes the shin bone in humans; in adult insects, it is the fourth leg segment from the body following the femur. The tarsus comprises what would be considered feet. Insect "feet", however, can have specialized endings in the form of claws (called ungues) or sticky, adhesive- type pads that help to facilitate clinging and climbing.

Based on shape and size, an insect's leg functions can vary. Some insects, like crickets and grasshoppers, have strong hind legs used for leaping. These animals are able to jump great distances when attempting to escape from danger. Some insects have legs that help them balance and/or perch, as holds true with dragonflies and damselflies. These odonata additionally use their legs to form a basket-type stance, used to overtake and trap small flying insects when in flight. Many insects that live in ponds or rippling streams have paddle-like legs that help them navigate effortlessly across the water. Some insects, like camel crickets, have forelegs that look like miniature shovels; they use them to dig burrows. Insects, like mantids, have front legs that are designed for grasping and tenaciously holding their prey.

Remarkably, insect legs differ during the larval stage in that in addition to developing legs, prolegs are often affixed to their abdomen. Prolegs are actually unsegmented legs used by larvae to adhere to and/or navigate

through its environment.

Spiracles. Like humans, insects breathe in oxygen. Unlike humans, they do so via a complex pattern of air-filled openings and accompanying tubes found along the sides of the thorax. Those openings are called spiracles. Insects have can have as many as eight pairs of spiracles on its thorax. Spiracles connect with the insect's tracheal system, similarly to how our trachea connects with the opening in our mouth and nose. Equipped with valves that open and close according to the insects' need for oxygen, spiracles help to move oxygen to the cells. Inhaling and exhaling is a bit dissimilar from the breathing process experienced in humans. Versus making use of lungs, insects use flexible air sacs that expand and contract, working in synch with the insect's spiracles.

The Abdomen

The abdominal area of an insect is also a segmented structure. Found on its lower extremity, the abdomen is primarily used for reproduction. It additionally assists in several other bodily functions, i.e., the insect's digestion, respiratory, and circulatory processes. The abdomen generally consists of 11 segmented sections. The number of segments varies between differing insect orders. The size and shape of an insect's abdomen also varies by species. Some are elongated; others are narrow.

Multiple Functions . Many adult insects have functioning spiracles along this section of the body; some, however, have spiracles that are permanently closed and no longer in use. On the anterior portion of the abdomen is the anus through which waste is excreted. In some insects, such as earwigs, a pair of sensory organs known as the cerci, is located on the anterior section as well. Similar to humans, the insect's genitalia lie a bit beneath the anus. In females, at about the eighth or ninth abdominal segment, is the ovipositor, an appendix through which eggs are laid. The ovipositor is comprised of valvulae, a tube-like opening through which eggs traverse. It too consists of appendages that are used for reproduction. Ovipositors that are no longer in use for reproductive purposes evolve into stingers, suggesting that insects that sting are probably female. [7]

The Exoskeleton

The exoskeleton is more than an outer skeletal framework. It is comprised of intricate layers that include a tough, outer layer called the cuticle, internal supports, and muscle attachments. This body structure is similar to bones, ligaments, and muscle attachments found in humans. Chitin, a chemical element, gives the exoskeleton its hard quality. Like human skin and bone, the exoskeleton covers, holds in place, and protects the insects' internal organs. Its strong cuticle additionally helps to protect insects from predatory attacks. The composition of the exoskeleton can range from armor-like and rigid (as found in the exoskeleton of a dung beetle) to pliable and thin (as observed on Painted Lady butterflies when they undergo the molting stage). Microscopic observation further reveals that the exoskeleton consists of additional layers: an epidermis, a single layer of cells that lies beneath the cuticle; an inner and outer epicuticle, i.e., a waxy, waterproof-type covering that helps to keep water **within** its body. Amazingly, the epicuticle is found primarily in insects that have limited access to water, suggesting that this is an adaptation to help them survive. [8]

An Added Note

Insects have an open circulatory system. This differs significantly from the circulatory system found in humans in that a dorsal vessel—a tube-like structure—serves as the insect's heart. Divided into segmented chambers that run longitudinally through the thorax and abdomen, the dorsal vessel helps hemolymph (insect blood)

flow throughout the insect's body cavities from the head to its dorsal body parts. Hemolymph—comprised primarily of plasma—is a clear, watery, greenish or yellowy fluid. Pulsated through the dorsal vessel, capillaries, veins, and arteries, this fluid also serves as an insect's water reserve. The circulatory system carries out additional functions: it transports nutrients throughout the insect's body, assists as a defense mechanism, sealing off wounds with a clotting reaction, and in some insects, serves as a source of thermoregulation, helping to strategically cool off or warm the insect's body. [9]

Classified Characteristics

Approximately 30 orders of insects are recognized in the 21 st century. They are scientifically named and categorized based on their physical features. Insects to be studied within this unit belong to the following orders:

Order	Characteristics
odonata	medium to large winged insects that include dragonflies, damselflies, and their nymphs; the prefix "odon" refers to the insect's toothed mandibles
mantodea	insects with mobile, triangular shaped heads with large, separated compound eyes as found in praying mantids; "manta" meaning prophet refers to these insects prayer-like stance
coleoptera	sturdy, "armored," and compact beetles with two hard forewings, with membranous wings tucked beneath them; "coleo" meaning sheath and "ptera" meaning wing refers to the hardened wings that serve as a protective covering
diptera	two-winged insects with biting and/or sucking mouthpiece like flies, gnats, midges, and their relative the mosquito; "di" meaning two and "tera" meaning wings refers to their having only one pair
hymenoptera	miniscule to large sized insects with chewing or sucking-type mouthparts that include wasps, bees, and sawflies; "hymen" meaning membrane and "ptera" meaning wings refers to these insects having membranous wings
siphonaptera	minute-sized insects with piercing and sucking mouthparts without mandibles like flea; "siphon" meaning tube "aptera" meaning without wings refers to the insect having
blattodea	small to large, flattened insects that include roaches and cockroaches
homoptera	small to large insects with sucking mouthparts like leafhoppers, aphids, spittle bugs, and cicadas
orthoptera	sturdy, long-legged insects like grasshoppers, locusts, and their relatives; "ortho" meaning straight and "ptera" meaning wings refers to these insects' long, straight wings

Weeks 1 and 2: Establishing Community - Setting the Tone

Our initial weeks of school encompass establishing a classroom community where children and their viewpoints are valued. From day one, behavioral guidelines are laid. Students play an integral role in developing classroom rules, highlighting expected behaviors to be embraced by each individual therein. This includes being respectful to one another, putting one's best foot forward even during challenging moments, following through with completing and submitting all assignments, and lending a helping hand to others who may need our support. Candid discussions and collaboration are encouraged.

Read aloud sessions—through which multicultural children's literature that emphasizes positive social interaction and problem solving are shared—are incorporated into the daily routine. The children soon embrace that they comprise a classroom community, and each member is there to support one another. Our focus is to explore the world around us, to share our views candidly, to brainstorm together, to experiment with and learn subject matter across discipline, to err, to evaluate our mistakes, and ultimately learn from them. We establish early on that we will be permitted to passionately share our views—to argue our viewpoints with conviction as long as we substantiate the basis of our reasoning, doing so with finesse—not fists. With consistency and positive reinforcement, children internalize that they have a voice, that their voice and viewpoints are valued. Implementing this approach helps to set a tone for respect and accountability among classroom peers: in time, the children internalize that each student is a valued member and contributor to the community, that the way we carry ourselves, the way we speak to one another, constitute skills that will help us navigate life.

Safe Space. The physical classroom layout too is established to reinforce our community philosophy. Depending on class size, tables are situated together in groups of 4 or 5; seats are labeled in accordance with the number of students per table. Students, by seating arrangement, are assigned a designated number. When engaged in classroom team discussions, students by seat-number designation will be provided rotating roles. For example, during a team/small group session, children at each table situated in Seat #1 may be called upon to serve as a recorder for the group; children in Seat #2 may serve as timekeeper, keeping peers abreast of the allotted time to complete an assignment; students in Seat #3 may serve as task master, ensuring that conversations are in accordance with the topic at hand for the group, and so on. (At those tables where more than four students are situated, roles can be shared.) Expectations are established; the foundation for collaborative interaction during strategic moments throughout the course of the school year has been laid.

An Extra Touch. As we move into our query-based adventure, be prepared to be flexible, noting that lessons may overlap as the unit study progresses. Additionally, note that all writing sessions referred to herein constitutes a writing block. To create a soothing atmosphere during these sessions, have students to vote on whether they would like to listen to background music when they delve into the writing activity. (My students herald a unanimous "yes".) I find that classical music, elevator music, and/or mellow, vintage, and contemporary jazz serve as a pleasant, unifying writing accompaniment.

Weeks 2 and 3: Initiating Our Course of Study

Before introducing this entomological unit, whet your students' whistle by sharing that they are about to undergo an adventure that will require them to explore everything from back yard gardens and sidewalks to grass-laden playgrounds and leaves on trees. Advise that they must look closely. If they do, they will discover "a well-organized world that consists of diligent community members that look nothing like humans, but are similar to us in ways unimaginable." Curiosity roused, have the children conjecture what the topic of study will be. Responses will vary, but one or more students will provide an accurate conjecture.

Additionally highlight that for an approximate 10 to 12 week period, we will dive into a unit study on select arthropods. This marks the beginning of our first day of instruction. Thereafter, introduce the overarching question. Canvass your students' background knowledge base by creating a K-W-L, beginning with K—what the children believe they already know. Record their responses on chart paper. (My third graders provided me with a wealth of basic info ranging from "some insects fly, walk and are wingless to some like mosquitoes bite and feed on blood.")

Sparking Student Inquiry

To activate the "what-you-want-to-know" query pool, initiate a fun-filled, mystery game to introduce the overarching question. The activity is called "What Lies Within The Container?" Administering the previously noted "numeric-seating-rotating-roles" approach, divvy students into teams of six with four students in each group. Delegate responsibilities for each group, e.g., a task master to keep the group focused on the topic at hand *and* to be in charge of the unidentified mystery specimen in the container; a recorder to make note of key responses shared within the group; a reporter, who will share the team's agreed upon questions and conjectures with fellow classmates on behalf of the group; and timekeeper to ensure that info is provided within the allotted time frame. Again, where groups exceed a four-student count, reinforce that group members take turns sharing a responsibility.

Provide each team with a sealed, opaque plastic cup that includes a replica of a select winged or wingless arthropod. (These specimen models, known as "Bugs in A Bag," come in an assorted package of 15 and are purchasable via Amazon.com.) Do not reveal the content of the container: do share that its content *could be* alive. An air of suspense will be established. Upon removing the mystery object from the covered container, the children will chuckle, recognizing that they have been duped. After the laughter and sigh of relief have subsided, have students closely examine the life-like object. Ask that each team propose 3 to 5 questions on behalf of the group. Based on this preliminary activity and comparative observations, my students asked:

(1) Do all insects have wings, and does wing size affect an insect's ability to fly? How?

(2) Are most insects herbivores? Carnivores? Insectivores? Omnivores?

(3) Insect mouthparts look seem to differ: do their mouthparts determine what and how

they will eat?

(4) Do insect antennae have multiple uses?

(5) Insect body parts look like they are divided into different sections: what role does

each body part play, and are those parts similar to those founds in humans?

(6) In what parts of our community/the country/the world can these animals be found?

(7) Are they harmful or helpful to our environment?

(8) Can insects survive in extremely cold temperatures—do they hibernate like bears?

(9) What makes an insect an insect?

(10) Why does the bottom part of an insect seem larger than the mid-section and head?

(11) Insect eyes seem extremely large when compared to humans? Why?

(12) Do insects see the surroundings the same way humans do?

(13) What are the life stages of an insect?

(14) Do all insects hatch from eggs, or do they come out looking like

smaller versions of their parents?

(15) Do insects have a brain? A heart? A skeleton? Where are they located?

(16) Do insects bleed? What does there blood look like?

(17) Insects are too small to have lungs: how do they breathe?

(18) Are insects and bugs the same? If not, how do they differ?

(19) How do insects protect themselves from predators?

(20) How do insects-like mosquitoes--spread disease?

These represent but a sampling of wonderment and inquisitiveness expressed by my young learners: such line of questioning will serve as springboard for whole and small group discussion. They will too serve as a framework regarding what they want to discover when working on independent and team research projects.

Keep This in Mind. Note that our goal is not only to have children simply produce myriad questions. In time, based on ongoing observations, text-to-self, and text-to-world connections, they will come to substantiate the rationale behind their line of questioning. Starting from this point onward, that rationale is to be recorded in Science journals on an ongoing basis: at the end of their 10-week research and discovery adventure, students will revisit their initial rationale affirm its validity based on researched discoveries.) To kick off this effort, provide students with journals (colorful composition notebooks will do; have students decorate them, and place them in an accessible area for ongoing use).

Weeks 4 and 5: "Live" Foundation

Mid-September through October is a terrific time to go insect hunting. Cicada exoskeletons, molting wooly bears, swallowtail butterflies, praying mantids, katydids, crickets, fireflies, and more are abundant in Connecticut during this time of year. Bring in a few insect specimens from diverse species for up-close observation. Additionally, purchase insect larvae from such suppliers as Insect Lore (see "Internet Resources"). Establish an "Observation Station" in your classroom: on a rotating basis, have groups of students visit the station to observe the live specimens. Have your "blossoming entomologists" record their observations in a Science journal, illustrating and jotting down key facts regarding what they visually experience. Schedule the viewings so that students can record their observations on an ongoing basis. By administering this procedure, students can experience the social interaction and overall life cycle of the viewed specimens. As they make their observations, have them list additional questions they might have regarding observed growth and development. Have a rich supply of general resources on hand that accommodate all reading levels and student-inquiry based interest. Urge students to make use of these non-fiction resources to acquire additional background knowledge and supportive detail.

Further Investigation & Classification Revisited

Introduce students to scientific names used to classify specific insect types. Reinforce that (as previously noted under the "Insects Defined" section of this report) insects belong to a family or phylum of living things known as arthropods. Bugs too can be classified as arthropods; however, all insects are not classified as bugs. In non-scientific terms, "bugs" are defined as an animal having segmented body parts, but with no less or more than six legs. Spiders, for example, are classified as arachnids. They have only two segmented body parts—a head and a thorax referred to as the cephalothorax. Centipedes and millipedes, classified as myriopoda, are extremely fast-moving critters, each have sets of multiple legs. Nightcrawlers—segmented, legless, earthbound creatures that squirm beneath garden soil or squiggle on along sidewalks on rainy days—have mobility based on manipulating their segmented sections. Each has at one time or another been referred to as "a bug," although nightcrawlers are not arthropods (they are classified under the order "haplotaxida"). [10]

There are instances where bugs are classified as insects: known as "true bugs" these arthropods have one **pair** of antenna, three pair of legs, three segmented body parts, an exoskeleton, and one pair of wings. They too have stylets used for piercing and/or sucking; they can also use these mouthparts to bite.

Extension Activity. DVD Viewing. *Insects* by Dorling-Kindersley for Children

Weeks 5 - 8 Individual I-Search/Diorama Project

This activity reinforces non-fictional writing and artistic creativity. Students have the option of conducting research on an insect *or* bug they deem most intriguing. Depending upon student abilities level, they are to establish 8 to a maximum of 15 key questions to investigate.

Duration: Beginning in mid-September through month-end October. This time frame affords students time to

visit the library and to conduct on-line research. Estimate that this writing effort will run for 3 ½ to 4 weeks, three days per week, 55 minutes per writing session. Allow room for possible deadline extensions.

Expository Writing Prelude. Grade 3 marks the beginning of young learners not only learning how to write engaging, non-fictional pieces, but how to take notes. Explain and model how to use non-fiction text features to find research info. Demonstrate how to record key words, facts, and brief descriptive phrases using Post Its. Show students how to keep a running list of newly-discovered, decipher word meaning using reading context clues, and how to use a dictionary to look up the definitions. Additionally, model and encourage students to make use of an outline. Within the allotted time frame, students should have acquired enough basic info to begin composing their first report draft. (The finalized report should be completed by Week 8; where required, extend the completion date, providing additional support to those students who need it).

Building Scientific Vocabulary

Throughout the implementation of this unit, I introduce my students to key, scientific vocabulary, emphasizing that they are learning "sophisticated, collegiate" terminology often used by entomologists. I routinely incorporate the lingo into daily classroom discussions. As a result, my students begin to embrace and make accurate use of the language. When creating their reports, encourage students to make use of scientific terminology. The following vocabulary represents a good starting point, to be expanded upon and included on a Science word wall as the unit progresses.

abdomen	antennae	arthropod	cerci	chrysalis	cocoon
compound eye	digestion	egg case	epicuticle	excretion	exoskeleton
filiform	halteres	hypophranyx	instar	mandible	membranous
metamorphosis	naiad	nymph	ommatidium	oviparous	ovipositor
pedicle	proboscis	pupae	reproduction	respiration	spiracle
stinger	stylets	tarsus	trachea	viviparous	wings

A Hands-On Complement . Have students use their artistic a savvy to create a 3-D replica of their select insect in its habitat. A child's or woman's size shoebox, magic markers, acrylic and/or tempera paints, crayons, glue guns, recycled materials, and arts and crafts supplies can use to create the select insect and its habitat. (My students came up with ingenious insect creations that I proudly displayed during first quarter Parent/Teacher conferences.) Students are required to read their reports before the class, reading their work with demonstrated understanding, prosody, and poise.

Weeks 8 - 10. Team I-Search Project

Reading Selection: "Crickwing" by Janelle Cannon

Focus: Predacious Insects

This literary work, which can additionally serve as a social-development resource to address bullying, will be used as a writing springboard, beginning with a collaborative team expository writing project, followed by the

creation of individual narratives written from the prey or predacious insect's point of view.

Background Info. Crickwing is a fantasy-and-fact tale about an artistic cockroach that sculpts his masterpieces using fruits and veggies. Often bullied by predatory animals, one day, he barely escapes the clutches of a hungry toad, leaving him with a damaged wing. Soon thereafter, Crickwing has had enough of being bullied. Frustrated, the blattodea begins to lash out by playing pranks on a more vulnerable insect species—herbivorous leafcutter ants. These tiny creatures soon have enough of Crickwing's tomfoolery. They collectively decide to retaliate and eventually serve their captor up as a peace offering to their predators, a colony of voracious army ants. They come to his rescue; during the liberation mission, Crickwing's wing is "miraculousy repaired." To reciprocate the two helpful ants' act of kindness, Crickwing ingeniously sculpts a life-like anteater that drastically frightens and wards off the colony of army ants. Deemed a hero, Crickwing is permitted to reside with the leafcutter ants, serving as their permanent chef specializing in herbaceous cuisine.

Extension Activities. Film Viewings: National Geographic's Cockroach Infestation

http://www.youtube.com/watch?v=CcpRfsLlI2M

Ants: Natures Secret Power http://www.youtube.com/watch?v=Z-gIx7LXcQM

Excursions: Yale University's Peabody Museum of Natural History

Insect Hunt at the East Rock or Edgework Park Nature Center

The above-noted activities serve as engaging vehicles to draw students into the learning experience. Equally effective is coordinating school visits with adept park rangers. (As we near the autumn months, arrange a classroom visit with Wray Williams, an extremely knowledgeable park ranger in charge of the East Rock Nature Center. Ranger Wray visits the classroom equipped with living and mounted specimens, among them cicada wasp killers, Madagascan hissing cockroaches, grasshoppers, crickets, and more. Because we will be zeroing in on predatory insects, he touches base on the topic. The excursions, coupled with ongoing independent reading on behalf of students, familiarize them with predacious insect selection possibilities.

Ready!... Set!... Go!

Students are subsequently equipped to knowledgably select from 10 insects. Our predacious insect choices include dragonflies, damselflies, praying mantids, ladybird beetles (ladybugs), locusts, stinkbugs, lacewings, mosquitoes, fireflies, and a cicada killer wasp. Students are informed that individual teams will not be permitted to study the same insect. Upon teacher-approval, teams may select to research predator-prey specimens not included in the original listing.

Parent Buy-In/Student Follow Through . For the non-fiction, collaborative team research project effort, students will work both within and outside of the classroom setting. In this regards, I provide parents with advanced notification, indicating that phone numbers and E-mail addresses will be exchanged among students who constitute a team. I request that they make themselves available to coordinate weekend team library visits and at-home study sessions. I provide opportunities for students to conduct research within our classroom and school Library Media Center during classroom center time. I too set aside two evenings a week, remaining after school to make myself available to students in need of additional support. That way, children who do not have technological and/or literary resources or parent support at their fingertips are accommodated. Through

this interaction, students embrace being committed to the task at hand. I expect them to be experts in their field of study; they once again buy in.

After each team has identified and confirmed two specimen selections, introduce another overarching, essential springboard question: "Is your predatory insect beneficial or harmful, and why is it deemed to be predacious? Elaborate." As held true for their independent I-Search Project creation, the team should establish 8 to 12 key questions that correlate with the essential question. Students too must create one of three engaging, visual presentation options to accompany the written work: a 3-D insect diorama; a poster-sized diagram; or power-point presentation regarding their insect choice.

Upon completing their project, team members will present their reports and showcase their artistic creations before classmates. Team members will collaborate with one another to determine who will lead key portions of their presentation. Students will be graded on informational content and accurate background knowledge (in both oral and written form); collective and individual research effort; oral expression, and overall presentation.

Weeks 10 and 11: Zany Narrative Snapshot from An Insect's Perspective

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Literary Resource: Crickwing (Revisited Read-Aloud)

Via this writing exercise, students will embrace author's craft, experiencing how author's can use non-fictional info to create an engaging, fiction narrative.

Duration. This writing effort will run for approximately 1 ½ to 2 weeks, three days per week's duration, 55 minutes per writing session. Extend the time period for project completion where necessary.

Being able to write narratives that include engaging language (both literal and figurative), structure, and organizational patterns is a major component of the third grade Language Arts curriculum. This writing activity supports this requirement, empowering young learners in the areas of verbal and written expression.

Preliminary Activity . Randomly call on students to provide a verbal summary of the fictional portion of the Janell Cannon's story creation. Record their responses on chart paper. Then ask, "Why might the author have written this narrative." Conjectures provided, share that the book has an additional, non-fictional component that you will share. Read the previously unread portion of the story aloud. Thereafter, call on students to provide key facts they learned about roaches, leafcutter and army ants. Compare and contrast the facts with the initial narrative storyline. Students soon recognize that the author used factual information to craft an engaging fictitious tale.

And So We Begin

At the onset of this two-week, independent writing session, inform students that they will be held accountable for completing this project. One-on-one feedback and whole group constructive will serve as ongoing support. Students are encouraged to share their need for assistance should it be required; soliciting help from classroom peers and/or the instructor is welcomed. Should they encounter writer's block or face some other challenge, students are urged to express the need for support. By so doing, they reveal that they are able to advocate for themselves like students on route to college. My students buy into this notion, and are eager to participate in the writing activity. Using much imagination, each student goes on to create a zany narrative based on the facts they have researched regarding their insect specimens of study. Students are advised that their story should include an engaging beginning, a well-defined setting, and character with transitional consistency throughout.

Storyframes to the Rescue . To assist in preliminary planning, have students complete a Snapshot Story Shirt outline (see Exhibit 1). This framework will help students zero in on key story elements. Students are expected to create an engaging beginning, middle and story ending, making use of the elements highlighted in the outline. The story will be crafted both in class and at home for an approximate two-week period, with deadline extensions granted upon request. Within that allotted time frame, students will craft, draft, edit, and finalize their zany story creation. Completed stories will be shared in class during a special Authors' Tea: parents will be invited to join in the read aloud celebration. Final grades will be allocated based on the following:

Scores/Rubric

Scores of 6, 5, 4, 3, 2, or 1 will be applied based on the following criteria:

6 = exemplary: student has included an engaging beginning, sentences are extremely constructed, organization, elaboration, and fluency are well-developed; overall storyline is exceptionally well defined

5 = very good: student has included an engaging beginning; sentences are very well constructed; organization, elaboration, and fluency are evident; overall storyline is well defined.

4 = good: student has included a descriptive beginning; sentences are generally descriptive but inconsistent throughout; organization, elaboration, and fluency are conveyed.

3 = satisfactory: student has included a simple beginning, middle, and end; sentences are minimally descriptive but are generally well-constructed; some organization and fluency are evident

2 = revisit this effort: student has not included the beginning, middle, and/or end; sentences are minimally descriptive and are unorganized; fluency is minimally evident; storyline is vague

1 = revisit this effort: no basic storyline is conveyed

Evaluation

Provide each student with a copy of the rubric and together review the criteria. Individually confer with students on an ongoing basis throughout the entire writing process. Urge students to proofread their work, referring back to the rubric to gain additional clarity. Offer constructive critique to help blossoming writers probe deeper, ask questions, and problem solve re: editing and/or enhancing their literary effort. Urge them to collaborate with peers to assess their writing development. Have students re-edit the story where required. The final product can be formally typed or carefully handwritten and illustrated by the student. Final story creations will be read aloud in class and subsequently collected for classroom display. Retain original writing samples in student folders for future self-evaluation, and to generally monitor student progress.

Weeks 11 and 12: Extension Activity - Predacious Insect Diamante

During this two-week session, students will be introduced to a new poetic genre through which they will learn to make use of concise descriptive language to convey a concept or pictorial image. Questions concerning the characteristics of select predaceous insects and their prey will be used to develop descriptive words for use in the poetic creation.

Literary Resource. "Hey There Stink Bug" by Leslie Bulion

Duration. Writing sessions will span a two-week, three days per week's duration, at 55 minutes per writing session. Extend the time period for project completion if required.

Diamante Defined. According to my students, a diamante is "a special type of poem that's like Math and Writing combined." A diamante consists of a tightly knit 1-2-3-4-3-2-1 syllabic word pattern. The first line includes one noun. The second includes two adjectives that describe the first noun. The third line includes three verbs that each end in "ing," with each of the three verbs complementing the first noun. Line four includes four nouns, with the first two correlating with the initial noun; the remaining two words mark the beginning of an antonym word pattern. Continue using opposing descriptions until the 3-2-1 pattern is completed. The final word represents the antonym for the noun used in the onset of the poem. Creating a diamante entails much thinking. Before crafting our poem, my students came up with a listing of words to best describe our two select insects:

Ladybug.

Spotted. Symmetrical,

Fluttering. Stalking. Munching.

Coleoptera.. Mandibles, Stylets. Homoptera.

Crawling. Piercing. Hiding,

Herbivorous. Destructive

Aphid.

Notice how this poetic work concisely portrays the relationship between predator and prey. Based on insect observations, discovered answers to student-initiated inquiry, research, and learned vocabulary, my students collectively came up with this descriptive example. They went on to create diamantes of their own. Poetic works varied across student ability levels; however, my budding writers across the board demonstrated that they grasped and had fun tackling this challenging language arts concept.

The Finishing Touch. Upon completing our whole group diamante creation, I provided my students with an 8 ½" x 11" print out of the above poetry creation. My students decided to add a finishing touch by tracing a border around the shape of the poem. "It looks like a rhombus!" one student exclaimed. "No, it looks like a diamond," clamored another. The children collectively deduced that the geometric shape revealed how this poetic form got its name. They went on to illustrate each respective corner that pertained to insect and its attributes. As a follow-up homework and supplemental in class assignment, they went on to create impressive diamantes using this illustration technique.

Conclusion

Student engagement through query and collaborative interaction, increased classroom participation during whole and small group instruction, coupled with completed classroom assignments and related projects indicate that inquiry-based instruction reaps positive results. Implementing this mode of instruction takes much time, planning, and patience. However, through its implementation, students are actively involved in the decision making process, providing them with a vested interest in the classroom learning experience. Most important, young learners embrace themselves as contributing members and avid learners within the classroom community.

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Appendix – Implementing District Standards

The following Common Core Standards are addressed in this curriculum unit:

SCIENCE - BINQ.1, BINQ.2, BINQ.5. BINQ.6, BINQ.8 - Scientific Inquiry: Students will ask probing questions using inquiry as a basis for discovery regarding organisms (in this instance the phylum arthropoda) and their environment; will use query on a collaborative, ongoing basis to spark discovery; will seek relevant information using informational resources, magazines, and electronic media; will use data to construct reasonable explanations; will search the web to access relevant scientific support data pertaining to their topic of study.

LITERACY - RR1.4, ERL2.1, ERL2.4, CWO3.1 - Reading and Responding, Exploring and Responding to Literature, Communicating with Others: Students will communicate with others to create interpretations of

written, oral, and visual texts, explore and respond to literature, recognize how literary devices and conventions engage the reader; recognize that readers and authors are influenced by individual, social, cultural, and scientific context; use oral language with clarity, voice and fluency to communicate a message, and will use the appropriate features of narrative, expository or poetic writing.

SOCIAL STUDIES - SS2.4 - Critical Thinking & Problem Solving, Information Literacy and Communication: Students will participate in collaborative conversations with diverse partners; respond to questions based on discovered and provided information; present information gathered on a collaborative group or independent basis regarding a select topic using clarity, voice, and fluency.

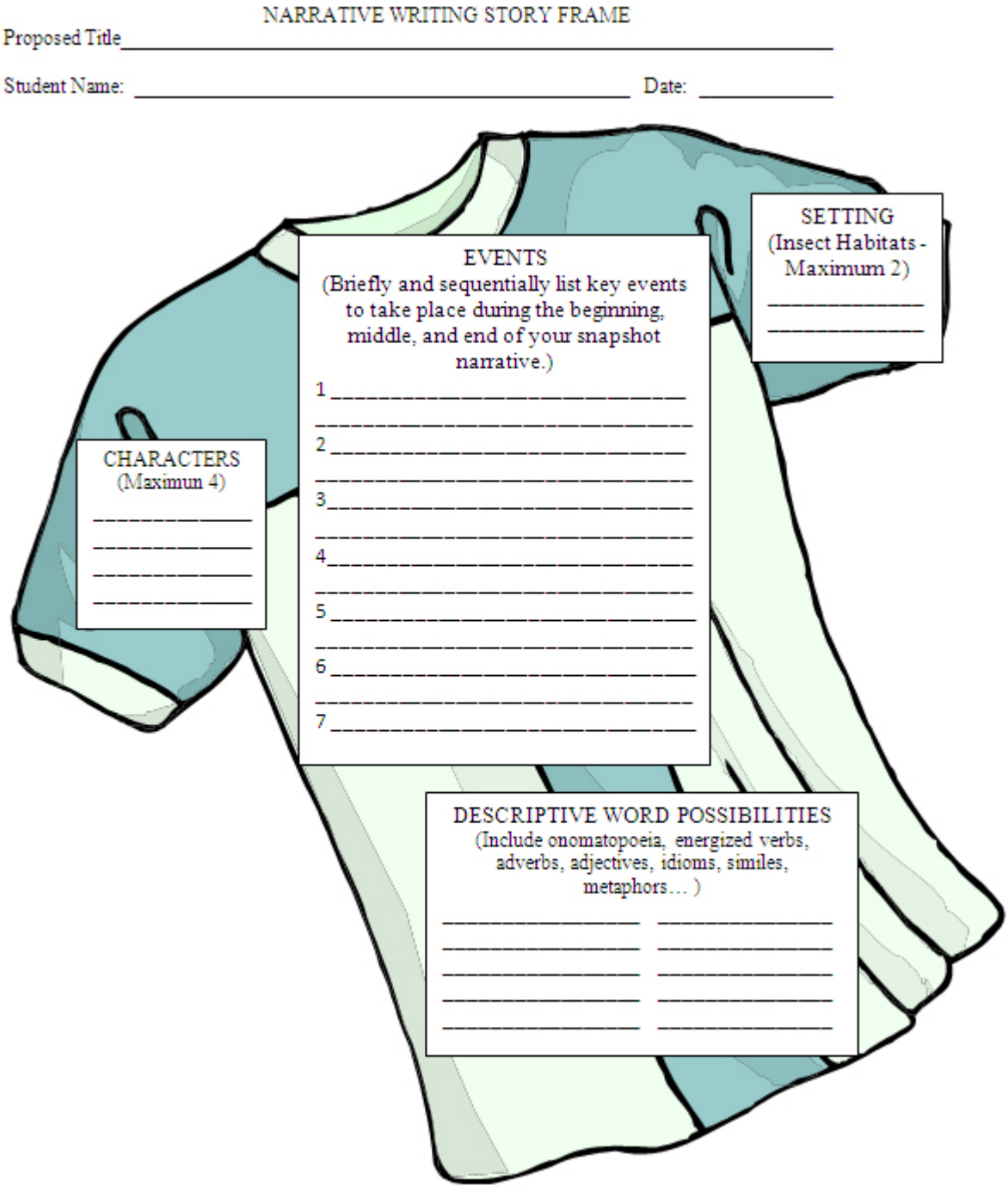

Exhibit 1

Exhibit 1

Notes

1. Louise B. Jennings, *Constructing a Discourse of Inquiry: Findings from A Five Year*

Ethnography from One Elementary School, 12-33.

2. Penny J. Gullan and Peter S. Cranston, *The Insects: An Outline of Entomology* , 7-8

3. Gilbert Waldbauer, The Handy Bug Answer Book, 41

4. Ibid., 45

5. Gullan and Cranston, *The Insects: An Outline of Entomology* , 38-39

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8. Ibid., 24-25

9. Donald J.Borror, Dwight M. DeLong, and Charles Triplehorn, *An Introduction to the*

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10. Ibid, 281-283