

What can ants teach us about ourselves? What can we learn from them?

LESSON 1 – Introduction			
What	How	Why	Learning objectives
THEME ANTS	<p>We watch a short video together. https://www.youtube.com/watch?v=mgCIKGIYJ1A</p> <p>The children write the story down as they perceived and understood it. They fill in the questions for themselves first.</p> <p>The children discuss the video in small groups, using some probing and clarifying questions: What do you think the video is about? Why do you think that? What did you see? Can you describe it? What did the ants look like? What were they doing? What happened next? How would you describe the problem? How did they solve the problem? How would you have solved this problem? What do you think about this video? How do you think ants behave normally? What can you conclude from this video? What is the moral of the story?</p> <p>If necessary, the children can watch the video a second time in the small groups, on their tablets.</p> <p>The children discuss and answer the questions. Every group selects a spokesperson. The spokesperson reports to the whole group.</p> <hr/> <p>I ask the children to come up with key words based on the answers (collaboration = behaviour / ants are strong/characteristics) and I write them down on large pieces of paper.</p> <p>Key words: Behaviour, characteristics, way of life, contribution to society, species...</p>	<p>I use a video from a motivational ¹point of view. I want to activate the children to actively engage in the lesson. I also want them to practice their observation and interpretation skills.</p> <p>I want the children to develop abilities for critical thinking² and communication skills: Asking and answering questions for clarification Interpreting and explaining what you see Asking probing questions Defining terms Generalising</p> <p>By doing this exercise, the children learn about probing and clarifying questions. This will help them come up with their own questions in the next assignment.</p>	<p>TOmn1: Een mondeling boodschap verwerken</p> <ul style="list-style-type: none"> • Informatie ordenen, verbinden of samenvatten • Informatie beoordelen <p>MZzo1: Gericht en intens waarnemen met de zintuigen</p> <ul style="list-style-type: none"> • Geconcentreerd kijken • Verslag uitbrengen van wat men heeft waargenomen en deze waarneming met elkaar vergelijken. <hr/> <p>TOmn2: Nadenken over belangrijke aspecten van het taalsysteem. Daarbij taalbeschouwelijke termen gebruiken.</p> <ul style="list-style-type: none"> • Beteknissen van woorden en woordgroepen
Learning goals/interests What do we want to learn? What are our little questions?	<p>Brainstorm session in groups where the children come up with all their questions and we supplement them with the teachers' questions</p> <p>Examples of questions:</p> <p>Why are ants insects? How do ants behave? To what species are ants related, what does their family look like?</p>	<p>I want the children to train their critical thinking skills:</p> <p>Asking probing questions Asking and answering questions for clarification (amongst each other) Interpreting and explaining what you mean</p>	<p>IVoc3: Onderzoeksvragen formuleren</p>

¹ Ryan and Deci (2000) Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. Contemporary Educational Psychology 25, 54–67

² Ennis, R. H. (1985). A logical basis for measuring critical thinking skills. Educational Leadership, 43 (2), 44-48. These are abilities relevant to critical thinking.

	<p>How hygienic are ants? Where do they poop? How can the ant be the strongest animal in the world? What does the ant look like? What does the ant do all day? How does the ant live? ...</p> <p>The children write their questions under the right key word. If the question is already there, they underline it in their group colour. If they don't understand a question from someone else, they interpret and clarify the question in their own group.</p> <p>I hang the large pieces of paper with the questions on the walls, spread over the classroom and hallway.</p>		
<p>Prior knowledge To what questions do we already know the answers?</p>	<p>The children walk around and read all the questions. If they know the answer to a question, they write their name behind the question.</p> <p>At the end of the lesson, I walk around and choose a question and name from each piece of paper. I let the children in question answer the question.</p>	<p>This should provide me with an overview of subjects that need deeper learning and subjects I can use as a knowledge base to build on. ³</p>	<p>IKid1: Basisvertrouwen ontwikkelen</p> <ul style="list-style-type: none"> • Zich onafhankelijk van anderen kunnen opstellen – een eigen mening uitdrukken.
<p>Assessment and reflection How did I do? What do I need to work on/improve?</p>	<p>The children return to their groups and reflect on their efforts.</p>	<p>I want the children to learn to reflect on their self-efficacies⁴. Children with higher self-efficacy tend to be more motivated and successful in their tasks I want the children to reflect on their ability to come up with probing and clarifying questions.</p>	

We work out a lesson block per keyword: Behaviour, characteristics, way of life, contribution to society, species...

³ Hattie, J., Yates G. (2014). Visible learning and the science of how we learn. New York: Routledge. Learning proceeds when what is new can be built upon what is already known.

⁴ Bandura A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28 (2), 117-148. Efficacy is the major determinant of effort, persistence, and goal setting.

LESSONBLOCK - BEHAVIOUR			
What	How	Why	Learning objectives
<p>What if ants had human characteristics?</p> <p>What if humans had ant characteristics?</p> <p>philosophy</p>	<p>I show the students an image of a traffic jam on the motorway https://www.youtube.com/watch?v=Oy2pTbPvrP8 and an image of a row of ants https://www.youtube.com/watch?v=-N1igAf93RE.</p> <p>The students discuss in small groups what they see. With their group they have to find out how ants and people deal with traffic jams and with obstacles on their way.</p> <p>Then they think about the questions and consult to arrive at a group answer.</p> <p>My contribution to the discussion is the insights of an article from De Morgen: Ants are never in a traffic jam⁵.</p> <p>We philosophize on the topic: What if... We discuss possible consequences.</p>	<p>Inquiry ⁶approaches to learning require students to take an active role in knowledge construction to solve a problem or probe a question.</p> <p>By philosophising ⁷about the 'What' questions, I want to help the children to become more thoughtful, more reflective and more reasonable about behaviour and about how we deal with frustrations and obstacles. It stimulates them to think critically and collaboratively.</p>	<p>IVzv3 Doelgericht en efficiënt handelen door taken te plannen, uit te voeren, erop te reflecteren en waar nodig bij te sturen in functie van zelfredzaam en zelfstandig functioneren</p> <ul style="list-style-type: none"> Een activiteit, taak, opdracht individueel of in kleine groep plannen en organiseren in functie van een vooropgesteld doel <p>IVoc4 Alleen en met anderen kritisch reflecteren op ervaringen en bevindingen en daaruit leren</p> <ul style="list-style-type: none"> de eigen werkstijl aanpassen waar nodig op basis van de aan de taak gestelde eisen van uitvoering - inschatten wat nodig is aan kennis, vaardigheden en inzichten om een taak uit te voeren - met anderen bespreken hoe men iets heeft aangepakt en samen suggesties formuleren voor inhoudelijke en procesmatige aanpassingen <p>IVoz2 Creatief denken en daarbij nieuwe paden durven bewandelen</p> <ul style="list-style-type: none"> Enthousiast zijn om nieuwe dingen uit te proberen alleen en samen met anderen - durven, ook wanneer men niet goed weet waar men uitkomt - durven improviseren en afwijken van vertrouwde paden - al doende (intuïtief) een werkwijze bedenken <p>MZlb7 Bewegingen gelijktijdig, opeenvolgend en afwisselend uitvoeren</p> <ul style="list-style-type: none"> Een bewegingspatroon zoals hinken, huppen, huppelen, galopperen, klappen ononderbroken uitvoeren <p>OWna5 Ervaren, onderzoeken, vaststellen en uitdrukken hoe levende organismen door een specifieke (lichaams)bouw, houding of handeling aangepast zijn om in hun omgeving te functioneren en te overleven</p>
<p>Can we think as a group to solve a problem?</p>	<p>I challenge the students to complete an obstacle course in groups as quickly as possible. They have to use their hive intelligence to complete the task: bring a flag from point A to point B.</p> <p>I divide the children in groups based on gender. I want to check if the students know why I have divided the group in this way. (the working ants are females)</p> <p>I assign none the role of leader. They have to decide on a plan themselves.</p>	<p>This activity is in line with the ideas of Howard Gardner's ⁸multiple intelligence.</p>	<p>TOtg1 Plezier beleven aan taal en het spelen met taal</p> <p>WDlw3 Wiskundige problemen oplossen in betekenisvolle situaties binnen en buiten de klas en de redeneringen daarbij onderbouwen, vergelijken, bijsturen, weergeven en beoordelen</p> <ul style="list-style-type: none"> Problemen zoals rekenraadsels, breinbrekers en andere wiskundige problemen met betrekking tot getallen, meten en meetkunde oplossen, oplossingen onderzoeken, vergelijken, bijsturen, beargumenteren, bespreken en daarbij wiskundige heuristieken ontdekken, kennen en gebruiken zoals
<p>The ants go marching one by one...</p> <p>Can we learn to sing an English song together?</p> <p>Can we drill ourselves in such a way that we can run a military parade flawlessly?</p>	<p>Can the children organise a military parade?</p> <p>First we discover what a military parade is. We watch a video of the parade on the Belgian National Day (21/7)</p> <p>https://www.youtube.com/watch?v=cCHAr0ifB2Y (minute 52 +)</p> <p>The children must think of a way to organize a uniform rhythmic procession. They must meet a few criteria:</p> <ul style="list-style-type: none"> - All children participate in the marching - 1 child per class takes the lead 	<p>This activity is in line with the ideas of Howard Gardner's ⁹multiple intelligence.</p> <p>I want to make the children aware of the English language.</p> <p>I want the children to experience the importance of communication ¹⁰in this assignment.</p>	

⁵ Dirk Helbing and Christiane Hönicke De morgen 27/02/2016. According to mathematician Dirk Helbing, ants think as a group. They do not react capriciously and with self-interest to situations.

⁶ Linda Darling-Hammond, Lisa Flook, Channa Cook-Harvey, Brigid Barron & David Osher (2019): Implications for educational practice of the science of learning and development, Applied Developmental Science, DOI: 10.1080/10888691.2018.1537791 inquiry provokes active learning and student agency through questioning, consideration of possibilities and alternatives, and applications of knowledge

⁷ White, J. (2012). *Philosophy in Primary Schools?* *Journal of Philosophy of Education*, 46(3), 449–460. doi:10.1111/j.1467-9752.2012.00860.x

⁸ Gardner, H. (1993). *Frames of Minds: The Theory of Multiple Intelligences*. New York: Harper and Row. 2nd ed.

⁹ Gardner, H. (1993). *Frames of Minds: The Theory of Multiple Intelligences*. New York: Harper and Row. 2nd ed.

¹⁰ Van den Branden, K. (2015). *Sustainable Education: Exploiting Students' Energy for Learning as a Renewable Resource*. Faculty of Arts, Katholieke Universiteit Leuven, Blijde-Inkomststraat 21, B-3000 Leuven, Belgium. Rather than absorbing information provided by a teacher or a handbook, young people need to learn how to find, critically evaluate, organize and use information for a wide variety of purposes. In addition, young people need to learn how to communicate in clear and coherent ways, to report and summarize findings (both orally and written), to share thoughts, to deliberate and join discussions in a civilized and rational way and to engage in open-minded and constructive dialogue.

	<p>- The distance between successive people and the distance between adjacent people is one arm's length - During the march all children have to sing the song 'The ants go marching one by one'. One child per 5 children may use a drum to indicate the rhythm.</p> <p>https://www.youtube.com/watch?v=Pjw2A3QU8Qg&list=PLS6f8DG67KannL_qc2OY-syZzMapF3LdY&index=6</p> <p>The children make up a planning for this assignment. First they decide on who gets what role. Than they go to work. They get one week to complete this task.</p>		
<p>What have we learned? Reflection</p>	<p>The children think about what they have learned in this lesson block. Self-reflection (workbook) After writing their reflections in their workbook, they have to think of/choose one word to describe the process towards the end result and one word describing the end result itself. Everyone takes turns saying the two words aloud.</p>	<p>Involving children in assessment ¹¹is crucial if assessment is to be meaningful to them.</p>	<p>IKid2 Een positief, realistisch zelfbeeld opbouwen</p> <ul style="list-style-type: none"> • Zich bewust worden van de eigen mogelijkheden en talenten en die verder verkennen en ontwikkelen - genieten van de eigen groei en ontwikkeling - ervaren hoe men door a/Andere(n) gedragen wordt • Zich een genuanceerd beeld vormen van de eigen persoonlijke sterkte, mogelijkheden en kenmerken • Reflecteren op eigen mogelijkheden en beperkingen en daaruit leren over zichzelf - over eigen mogelijkheden en beperkingen communiceren • Weerbaar omgaan met factoren die het zelfbeeld beïnvloeden - beïnvloeding door anderen herkennen en er weerbaar mee omgaan

<p>The ants go marching one by one Hurrah, hurrah The ants go marching one by one Hurrah, hurrah The ants go marching one by one The little one stops to suck his thumb And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching three by three Hurrah, hurrah The ants go marching three by three Hurrah, hurrah The ants go marching three by three The little one stops to climb a tree And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching five by five Hurrah, hurrah The ants go marching five by five Hurrah, hurrah The ants go marching five The little one stops to take a dive And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching seven by seven Hurrah, hurrah The ants go marching seven by seven Hurrah, hurrah The ants go marching seven by seven The little one stops to pray to heaven And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching nine by nine Hurrah, hurrah The ants go marching nine by nine Hurrah, hurrah The ants go marching nine by nine The little one stops to check the time And they all go marching down to the ground to get out of the rain Boom boom boom</p>
<p>The ants go marching two by two Hurrah, hurrah The ants go marching two by two Hurrah, hurrah The ants go marching two by two The little one stops to tie his shoe And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching four by four Hurrah, hurrah The ants go marching four by four Hurrah, hurrah The ants go marching four by four The little one stops to shut the door And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching six by six Hurrah, hurrah The ants go marching six by six Hurrah, hurrah The ants go marching six by six The little one stops to pick up sticks And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching eight by eight Hurrah, hurrah The ants go marching eight by eight Hurrah, hurrah The ants go marching eight by eight The little one stops to roller skate And they all go marching down to the ground to get out of the rain Boom boom boom</p>	<p>The ants go marching ten by ten Hurrah, hurrah The ants go marching ten by ten Hurrah, hurrah The ants go marching ten by ten The little one stops to shout The End</p> <p>Bron: LyricFind</p>

¹¹ Kerry, T. (2015) Cross-Curricular Teaching in the Primary School. Assessment for cross-curricular learning and teaching.p.190-191. New York: Routledge

LESSONBLOCK – Characteristics			
What	How	Why	Learning objectives
<p>We are going to learn/discover things about the characteristics of ants.</p> <p>investigate Experiment Research</p>	<p>Step1: observations The children go outside and observe ant in the forest or garden. They can also observe the ants in our ant farm (formicarium). They write down three observations that catch their attention. <i>(you can also use video)</i></p> <p>Step2: wondering The children write down a question concerning their observations. What do they wonder about? What do you want to know? Examples: I noticed that the ants can carry big items from nature such as acorns. I wonder how much weight they can carry. I noticed that the ant farm was very clean. I wonder if and where the ants poop. I noticed that the ants constantly follow each other in a line. I wonder why they do that.</p> <p>Step3: Asking good questions The children turn their wonderings into a relatively small specific question they can answer by doing research or by performing an experiment. Examples: How much weight can a single ant lift up and move around? Where in the ant farm does an ant poop? Why do ants follow each other in a line?</p> <p>Step4: Hypothesis and predictions The children think about potential answers to their questions. What might be an answer to your question? Can you think of a way to test this somehow to see if the answer is correct? What outcome do you expect to see if the hypothesis is correct? What do you predict will happen?</p> <p>Step5: experiment – test the hypothesis The children design and perform an experiment to test their hypothesis.</p> <p>Step6: evaluate and iterate The children reflect on the experiment. What was the result? How do your findings answer your question? How does the result support your hypothesis? What will you do next?</p> <p>Step7: report</p>	<p>I follow the process and provide feedback. I want the children to work on their metacognitive strategies.¹³</p> <p>I believe that children learn by doing and by thinking about what they do. (constructivism - Piaget, Dewey)</p> <p>Inquiry-based science education ¹⁴(IBSE) has been promoted as an inspiring way of learning science by engaging pupils in designing and conducting their own scientific investigations.</p>	<p>IVzv5 Op een constructieve manier met feedback omgaan</p> <ul style="list-style-type: none"> • 4-12j Op basis van waardevolle feedback van anderen het eigen handelen bijsturen - gepast reageren op aanwijzingen, correcties en kritiek • 8-12j Gepast reageren op feedback - op basis van waardevolle feedback het eigen handelen evalueren en (pro-actief) bijsturen <p>IVoc3 Onderzoeksvragen formuleren, naar een antwoord zoeken en bevindingen formuleren</p> <ul style="list-style-type: none"> • 7-12j Onderzoekend leren : zich laten inpalmen door nieuwe dingen uit de omgeving - onderzoeksvragen stellen - een onderzoeksuitkomst voorspellen - een onderzoeksstrategie bedenken en uitvoeren - experimenteren en exploreren - onderzoeksresultaten en bevindingen bundelen - verslag uitbrengen en een conclusie formuleren, een antwoord op de onderzoeksvraag geven - over het onderzoek en de resultaten en bevindingen ervan met anderen communiceren - met de resultaten en bevindingen aan de slag gaan <p>IVoc4 Alleen en met anderen kritisch reflecteren op ervaringen en bevindingen en daaruit leren</p> <ul style="list-style-type: none"> • 10-12j Een vooropgestelde planning of aanpak bijsturen waar nodig - voorbereiding en prioritering van taken beoordelen en eruit leren voor de volgende keer - de eigen werkstijl aanpassen waar nodig op basis van de aan de taak gestelde eisen van uitvoering - inschatten wat nodig is aan kennis, vaardigheden en inzichten om een taak uit te voeren - met anderen bespreken hoe men iets heeft aangepakt en samen suggesties formuleren voor inhoudelijke en procesmatige aanpassingen <p>OWna2 In verschillende biotopen vaak voorkomende organismen waarnemen, onderzoeken, benoemen en ordenen</p> <ul style="list-style-type: none"> • 7-12j In een beperkte verzameling van organismen gelijkenissen en verschillen onderzoeken:

¹³ John Hattie, Klaus Zierer, (2018) 10 Mindframes for Visible Learning. P.78-99. Routledge: London

¹⁴ Martina S. J. van Uum, Roald P. Verhoeff and Marieke Peeters (2016) Inquiry-based science education: towards a pedagogical framework for primary school teachers. INTERNATIONAL JOURNAL OF SCIENCE EDUCATION, 2016 VOL. 38, NO. 3, 450–469
<http://dx.doi.org/10.1080/09500693.2016.1147660>

<p style="text-align: center;">Reflection</p>	<p>The children write down their findings (conclusions) and report them to their classmates. The children ask each other questions and give constructive feedback on the process and results.</p> <p>Broadening knowledge What does research say? Did someone do the same experiments before you? The children look for answers in books, on the internet and by talking to experts. They compare their own work with that of researchers in the research field.</p> <p>Experiment info: The incredible Physics of Ants The new York Times Exoskeletal ¹²structure</p> <p>What have you learned about the way you handled this assignment? What would you do different next time?</p>		<p>lichaamsbouw van mensen en dieren, uiterlijk en gedrag van organismen, verschillende organismen van dezelfde soort ...</p>
<p style="text-align: center;">Art and science</p>	<p>The children observe the ants again, using a magnifying glass, and look for characteristics specific to the ant.</p> <p>They either draw a detailed picture of a part of the ant (a specific detail on a scale of 100:1) or they make a 3 dimensional model of an ant with clay (scale of 50:1).</p>	<p><i>Eisner, Elliot W., The Arts and the Creation of Mind. New Haven, Conn.: Yale University Press, 2002.</i></p> <p><i>Gardner, Howard. Frames of Mind: The Theory of Multiple Intelligence. New York: BasicBooks, 1983.</i></p> <p><i>Marshall, Julia. "Connecting Art, Learning, and Creativity: a Case for Curriculum Integration." Studies in Art Education: a Journal of Issues and Research in Art Education 46.3 (2005): 227–241.</i></p>	<p>MUge2 De muzische bouwstenen beleven, herkennen, onderzoeken en hanteren</p> <ul style="list-style-type: none"> • Beeld > Vorm > 10-12j Bewust beleven, herkennen, beschrijven, uitvoeren en creatief gebruik maken van: <ul style="list-style-type: none"> • de gevoelswaarde van een vorm • samengestelde driedimensionale vormen • karakteristieke houdingen van mensen en dieren • stileren en abstracte vormgeving <p>WDmk1 Inzicht verwerven in ruimtelijke oriëntatie en ruimtelijke relaties</p> <ul style="list-style-type: none"> • 8-12j Ruimtelijke wiskundige problemen oplossen gebruikmakend van • de relatie tussen de aanzichten (voor-, zij-, bovenaanzicht) en het hoogteplan van een driedimensionale constructie en omgekeerd • kijklijnen en standpunten • schaduwbeelden • ruimtelijke patronen en het verderzetten van patronen in één of meerdere richtingen en/of volgens opgegeven voorschriften • inzicht in meetkundige objecten en meetkundige relaties

¹² The exoskeletal structure and tensile loading behaviour of an ant neck joint. Vienny Nguyen, Blaine Lilly, Carlos Castro – Journal of Biomechanics volume 47, issue 2, January 2014, pages 497-504 Ants, in particular, can lift and carry heavy loads relative to their body mass. Loads are lifted with the mouthparts, transferred through the neck joint to the thorax, and distributed over six legs and tarsi (feet) that anchor to the supporting surface. While previous research has explored attachment mechanisms of the tarsi, little is known about the relation between the mechanical function and the structural design and material properties of the ant. This study focuses on the neck – the single joint that withstands the full load capacity.