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‘MOSQUITO!’
An open access teaching resource

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Advanced Workshop on Technology for Sustainable Development: Low-cost Tools to support Scientific Education
ICTP, Trieste, 18 September 2018

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Outline:

- The InterAcademy Partnership
- The IAP Science Education Programme
- A new Inquiry-Based (social) Science Education teaching module – ‘Mosquito!’

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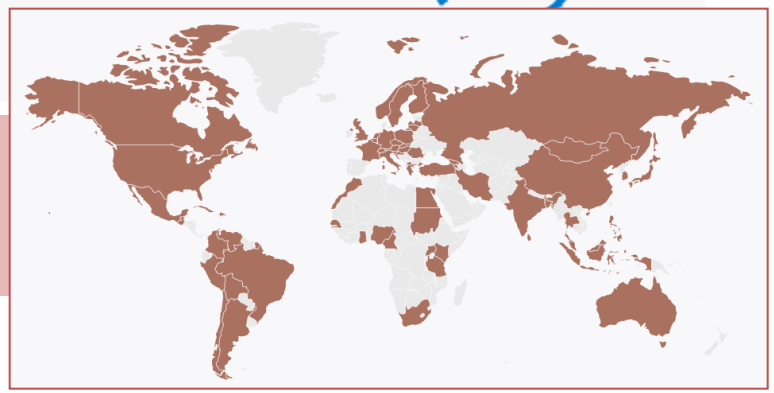
Membership

More than 130 national, regional and global academies

IAP for Health
78 members, of which
52 also belong to IAP for Science



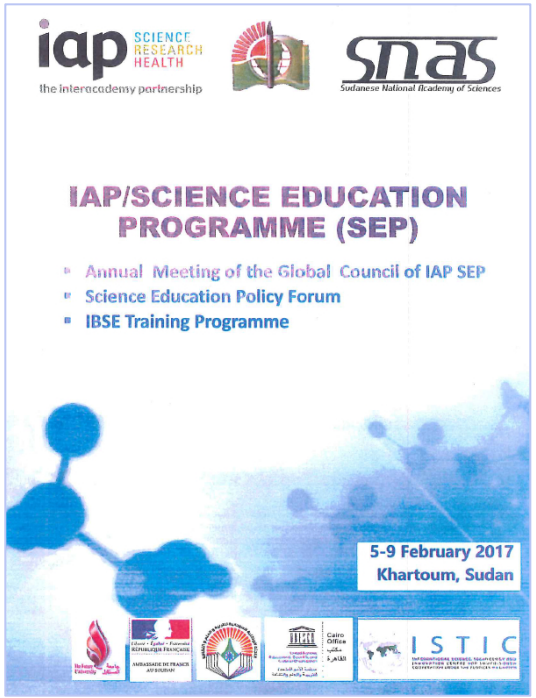
Strategic Priorities

- Build a scientifically literate global society.
- Provide evidence-based advice and perspectives on global issues.
- Strengthen the global scientific enterprise.
- Strengthen the global network, including supporting the creation of new academies in countries where they are not yet present.

Strategic Priority 1: Build a scientifically literate global society

Science Education Programme (IAP SEP)

Promoting IBSE – inquiry-based science education – since 2003.



Since 2013, IAP SEP is also tackling science literacy.

Strategic Priority 1: Build a scientifically literate global society

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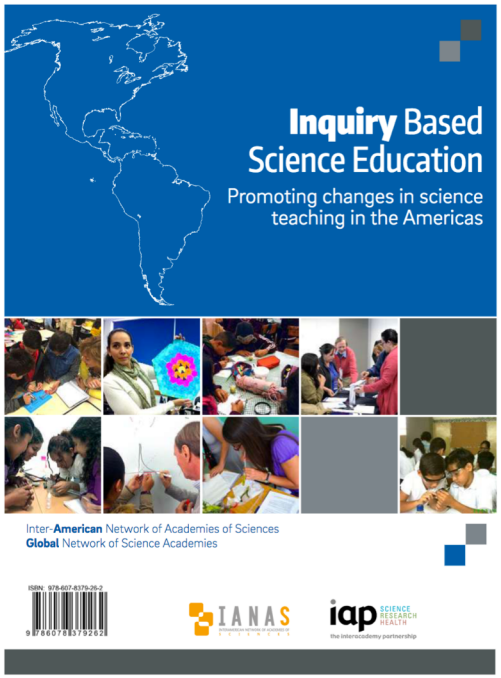


Climate Change Education Summer School
Erice, Sicily, September 2017.

International Forum on Science Education
Beijing, July 2017.

Strategic Priority 1: Build a scientifically literate global society

Science Education Programme (IAP SEP)

Africa-Mediterranean-European Academies for Science Education (AEMASE)
- with ALLEA.

Zika! Teaching resources for 'Mosquito-borne diseases' – being developed Smithsonian Science Education Centre in partnership with IAP.

AEMASE III conference
Paris - October 2017

Agreement to work towards establishing 'Centres for Education in Science in the Africa-Mediterranean-European' region (CESAME).
Proposals from 6 African countries plus ICTP, Italy.

Strategic Priority 2: Provide evidence-based advice and perspectives on global issues.

Statements – Short (4-page) documents that provide a synthesis the latest research findings on topical issues and provide advice and recommendations to policy-makers. **Endorsed** by majority of member academies.

Dec. 2017

Released at the '*One Planet Summit*' held under the auspices of the President of France, Emmanuel Macron in Paris, France.

Office for Climate Education:

- Founded March 2018
- Spin-off of *La main à la pâte* (LAMAP)
- Headquarters in Paris

www.oce.global

Sharks kill approximately how many people per year?

less than 10 people per year.

Snakes?

~50,000 people every year

Humans?

~475,000 people every year.

Mosquitoes?

over 725,000 people every year.

Quick Survey

Raise your hand if you think all mosquitoes are more or less the same.

There are over 3,500 species of mosquitoes.

Only ~10% of these can transmit diseases to humans.

Raise your hand if you think both male and female mosquitoes can transmit diseases to humans?

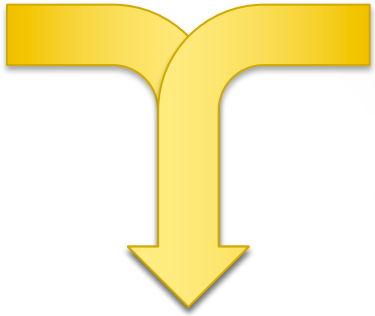
Only female mosquitoes suck human blood to make eggs and transmit diseases. Males and females feed on nectar and sugars from plants, such as flowers, and are pollinators.

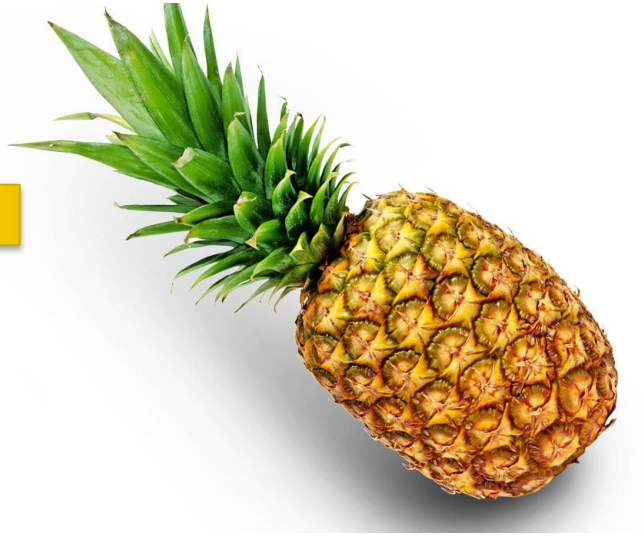
Annex 1. Global burden of major vector-borne diseases, as of March 2017

Some vector-borne diseases of specific local importance are included, as indicated by grey shading.

Vector	Disease	Estimated or reported annual number of cases	Estimated annual number of deaths	Estimated annual disability-adjusted life years
Mosquitoes	Malaria[1]	212 000 000 (148 000 000–304 000 000) [1]	429 000 (235 000–639 000) [1]	NA
	Dengue	96 000 000 (67 000 000–136 000 000) [2]	9 110 (5630–10 842) [3]	1 892 200 (1 266 700–2 925 500) [5]
	Lymphatic filariasis	38 464 000 (31 328 000–46 783 000) [6]	NA	2 075 000 (1 120 500–3 311 500) [5]
	Chikungunya (Americas)	693 000 [7] suspected, 2015	NA	NA
	Zika virus disease (Americas)	500 000 [8] suspected, 2016	NA	NA
	Yellow fever (Africa)	130 000 (84 000–170 000) [9]	500* (400–600) [3]	31 000* (25 000–37 000) [3]
	Japanese encephalitis	42 500* (35 000–50 000) [10]	9 250* (3500–15 000) [10]	431 552* (107 435–755 670) [10]

Amadou Kone, Centre d'Infectiologie Charles Mérieux (CICM), Mali






MALARIA

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MOSQUITO!

COMMUNITY RESEARCH GUIDE

HOW CAN WE
ENSURE HEALTH FOR ALL
FROM MOSQUITO-BORNE DISEASES?

developed by
Smithsonian
Science Education Center

in collaboration with
iap SCIENCE RESEARCH HEALTH
the interacademy partnership

Origins

- IAP SEP Global Council met in Chile, March 2016;
- The WHO had just declared Zika a Global Health Emergency;
- Secured funding from Moore Foundation;
- Module development stated by SSEC professionals.

Development

- SSEC identifies partners and experts, develops and test modules 'internally' (2016-2017);
- 'Beta' version tested by teachers with pupils in USA, Indonesia and Australia;
- Modules refined based on teacher feedback;
- Translation also into Spanish;
- Released in May 2018;
- June 2018: >50 teachers trained in Panama.

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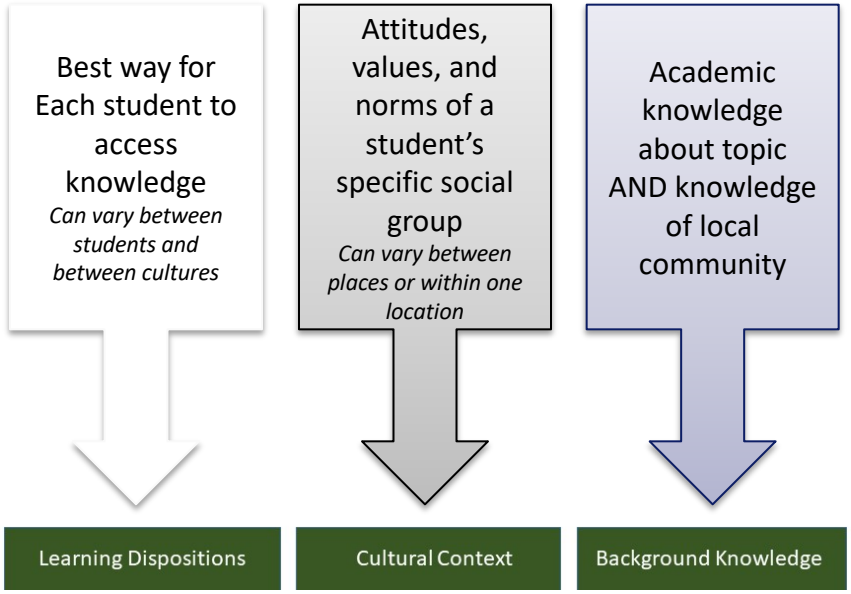
Create a global curriculum that is locally relevant

Building the Pyramid: Entry points

Global Goals Action Progression



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Create a global curriculum that is locally relevant

Building the Pyramid: Questioning

Global Goals Action Progression

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Create a global curriculum that is locally relevant

Building the Pyramid: Investigating

Global Goals Action Progression

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Make learning accessible without diminishing real-world complexity

Building the Pyramid: Critical Reasoning

Global Goals Action Progression

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Make learning accessible without diminishing real-world complexity

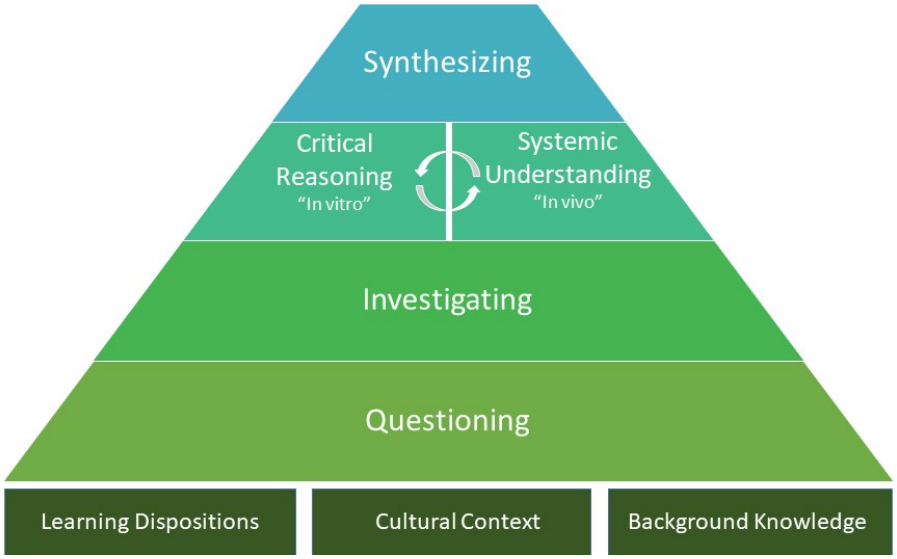
Building the Pyramid: Systemic Understanding

Global Goals Action Progression

Make learning accessible without diminishing real-world complexity

Building the Pyramid: Synthesizing

Global Goals Action Progression



Build a habit of taking action

Building the Pyramid: Acting

Global Goals Action Progression

Increase science literacy

Using the Pyramid: Science Literacy

"to enable the citizen to become more aware of science and science related issues so that he and his [sic] representatives would bring common sense to bear upon such issues and thus participate more fully in the democratic process of an increasingly technological society."
(Shen, 1975 as cited by NAS)

"ability to engage with science-related issues" and undertake "reasoned discourse about science and technology."
(OECD PISA, 2012 as cited by NAS)

"Democracy functions by majority decision on major issues which, because of their complexity, require an increasing amount of background knowledge. … Clearly this does not mean turning everyone into a scientific expert, but enabling them to fulfill an enlightened role in making choices which affect their environment and to understand in broad terms the social implications of debates between experts."
(European Commission, 1995, p. 28, as cited by NAS)

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SSEC Learning Lab

English: https://ssec.si.edu/mosquito Spanish: https://ssec.si.edu/mosquito-espanol

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Mosquito! Community Research Guide Storyline

The community research guide has seven customizable parts.

1

Part 1: Problem
In this part, the team will begin defining the research problem and setting up your local research plans. To do this the team will need to learn more about the team members, different perspectives, and questions you will work to answer during your research.

2

Part 2: Community
In this part, the team will focus on collecting evidence about what the local community thinks and knows about mosquitoes. The team will also establish their research sites and begin identifying local partners they could potentially work with throughout their research.

3

Part 3: Life
In this part, the team will focus on learning about the life of the mosquito. Research will include collecting and comparing mosquitoes within research sites while studying the life cycle and global distribution of different mosquitoes.

4

Part 4: Transmission
In this part, the team will focus on understanding factors that affect how mosquito-borne diseases are transmitted. Research includes identifying potential host animals, local histories, and changes in the local environment that could affect how diseases may be transmitted through your research site now and in the future.

5

Part 5: Habitats
In this part, the team will focus on researching where mosquitoes live and breed in the community. Research of man-made and natural habitats will be conducted.

6

Part 6: Management
In this part, the team will focus on exploring a diversity of ways to manage mosquitoes. The team will then begin to develop integrated management plans for the local community concerning mosquitoes and mosquito-borne diseases.

7

Part 7: Action Plan
In this part, the team will focus on developing a local community action plan. This plan will outline the research that was conducted, the actions the team thinks people need to take in the community, and a communication plan to share the plan with local community members.

Notes:

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PART ONE. PROBLEM TASK LIST

This is the list of tasks for Part One. Problem

Check them off as you complete them.

TASKS

- [ ] 1-1 Mapping Your Identity
- [ ] 1-2 Thinking About Decisions
- [ ] 1-3 Pre-Surveying Team
- [ ] 1-4 Introducing Mosquitoes
- [ ] 1-5 Building Team Identity
- [ ] 1-6 Defining the Research Problem
- [ ] 1-7 Understanding Community Action Plan
- [ ] 1-8 Exploring Research Perspectives
- [ ] 1-9 Building Claims from Evidence
- [ ] 1-10 Mapping Questions

2-3 Surveying Community

In Task 2-2, you learned more about what the team thinks about mosquitoes. Now it is time to survey other people in your community to see what they know. This will help the team understand what people think about these various parts of the mosquito problem. This survey will also provide evidence that will be useful to understand what things people might not understand about mosquitoes.

Objective

In this task, the team will be focusing on the following questions from the question map in Task 1-10: What do people in our local community think and know about mosquitoes and mosquito-borne diseases? How can we effectively share and communicate mosquito-borne disease evidence with the community?

Go to the Task 2-3 folder and get the Survey and Meet the Team reading. Use the same version (A or B) of the survey the team used for the team survey in Task 1-3.

3-5 Analyzing Collected Eggs + Larva

In Task 3-1 the team started collecting mosquito eggs and larvae in your research site. If your team has been successful in collecting mosquito eggs and larvae then the next step is to analyze them. If you have not collected any eggs and larvae at this point in your research, do not worry. Continue to monitor your collection cups in your research site. Then return to this task if and when you collect eggs or larvae.

Objective

In this task, the team will learn how to analyze live mosquito eggs and larvae. If live egg or larva samples are available to the team, analysis methods are suggested. The team will use this analysis to think about fac effect the life cycle and problem question.

In this task, the team will be focusing on the following ques question map: How do different mosquitoes compare? How distribution of mosquitoes?

1. Go to the Task 3-5 folder and get the Analyzing Collected Eggs and Larvae instructions. There is only one version of task. If you have not collected eggs or larvae move on to next task. If you collect eggs or larvae in the future, come back to this task.

2. Use this resource to learn about the different parts of

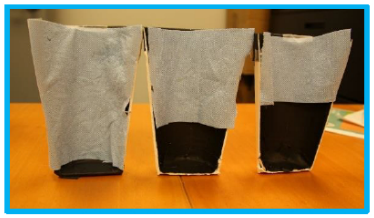
Citizen Science Tip

Consider participating in the Invasive Mosquito Citizen Science Project from Task 3-1. Also, do research to see if there are other citizen science projects in your location you can participate in using the samples you collected.

Mosquito! Part 1. Problem: Task 1- 4

Variables– Conducting additional Experiments

You can test different *variables* of the egg collector to see which features make for the most effective design.



Suggestion 1:
Change the coverage of the germination paper in the cup. But, keep the amount of water, size of cup, and color inside all constant.

Suggestion 2:
Change the color of the inside of the cup. But, keep the amount of water, size of cup, and color inside all constant.

Suggestion 3:
Change the size of the cup. But, keep the amount of water, the color inside, and the coverage of the germination paper all constant.

These are a few suggestions, but feel free to get creative and think about what other variables can be changed. Remember to only change one variable at a time when conducting more tests. Keep all other variables constant. This way you can determine what variables are making certain traps more effective in collecting eggs.

- Cup material
- Cup Opacity
- Water color (add food coloring or organic matter)
- Hole placement
- Interior material composition (paper/cotton/polyester/plastic)
- Amount of cup that is covered or open

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6-3

Creating Local Integrated Management Plan

In Task 6-2, the team created integrated management plans for simulated cities. These plans outlined ways for a community to manage mosquitoes and mosquito-borne diseases. It is important to create a management plan that is specific to your location. It is also important to create a management plan that combines a variety of methods. Combining together multiple methods helps address all the different perspectives of the problem (social, economic, environmental, ethical). A plan that combines many different methods is called an integrated management plan (IMP).

Task 6 - 3

Objective

6-4

Analyzing Community Surveys (Management)

In Task 2-3, the team surveyed people in your local community about mosquitoes.

Objective

In this task, you will do the same analysis you did during Tasks 2-4 and 3-6, and 4-6, and 5-4. Now you will focus on the community survey results only for Part Six: Management. The team will analyze the other parts of the survey in future tasks, so keep the survey results in a safe place.

In this task, the team will be focusing on the following questions from the question map in Task 1-10.

- What do people in our local community think and know about mosquitoes and mosquito-borne diseases?
- How can we effectively share and communicate mosquito-borne disease evidence with the community?

1. Go to the Task 6-4 folder and get the survey analysis instructions and questions. Choose the Mosquito A or Mosquito B task from the task folder.
2. As a team, determine how to compile the community survey results for Part Six from all team members. You will want to analyze the compiled data from the entire team. Develop your own method for compiling the data for Part Six, or use one of the methods in the instructions.

Research Tip

As you may have noticed, the survey is broken into the same parts as this research guide. Analyze only the results from that part of the survey while working

PART SEVEN. ACTION PLAN TASK LIST

This is the list of tasks for Part Seven. Action Plan

Check them off as you complete them.

TASKS

- 7-1 ☐ Assembling Part 1 of Plan: Research Area Background
- 7-2 ☐ Developing Part 2 of Plan: Action Goals
- 7-3 ☐ Creating Part 3 of Plan: Communication Strategy
- 7-4 ☐ Post-Surveying Team
- 7-5 ☐ Thinking about your Future Actions

Tentative Topics

Mosquito: How can we ensure health for all from mosquito-borne diseases? (published May 2018)

Nutrition! How do we ensure good diets for all?
SDG target alignment: 2.2, 3.4 , 12.3

Biotechnology and Humans! How do we balance technology, actions and ethics?
SDG target alignment: 2.3, 2.5, 3.2, 3.3, 3.4, 3.7, 10.3

Water! How do we balance fair water use for all?
SDG target alignment: 6.1, 6.3, 6.4, 6.5, 6.6, 6.A, 6.B

Biodiversity! How do we balance protecting the earth's diverse resources with human needs?
SDG target alignment: 2.5, 2.A, 14.2, 15.1, 15.2, 15.5, 15.6, 15.7, 15.8, 15.9

Energy! How do we balance access to energy and environmental concerns?
SDG target alignment: 1.4, 7.1, 7.A, 7.B

Agriculture! How do we balance production, economics and the environment?
SDG target alignment: 2.3, 2.4, 2.A, 2.C, 12.3

Healthy Ecosystems! Balancing local ecosystem needs with global impacts?
SDG target alignment: 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9

Pandemic! How do we prepare for pandemic?
SDG target alignment: 3.3, 3.D

Sustainable cities! How can we create healthier, happier cities?
SDG target alignment: 9.1, 9.4, 11.1, 11.2, 11.3, 11.6, 11.7, 11.A

Consumption and Production! How do we balance economic and environmental needs?
SDG target alignment: 12.4, 12.2, 12.5, 12.8, 12.A

Humans and the Atmosphere! How can we balance the needs of humans with atmospheric impacts?
SDG target alignment: 13.1, 13.2, 13.3, 13.8, 14.3, 15.2, 15.3

Cultural practices, equity and health! How do we balance self-determination, health and human rights?
SDG target alignment: 4.5, 5.3, 5.4, 5.A, 10.2, 10.3, 16.1

Pollution, Environment and Health! How should we protect human health and ecosystems?
SDG target alignment: 3.9, 6.2, 6.3, 6.6, 8.4, 11.6, 12.4, 12.5, 14.1

Access! How do we balance supports for individuals with different needs?
SDG target alignment: 4.5, 4.A, 8.5, 10.2, 10.3

Weather and people! How do we balance economics and preparation?
SDG target alignment: 1.5, 2.4, 11.B, 11.C, 13.1, 13.3, 13.8, 15.3

Development and the Oceans! How do we balance today's needs with tomorrow's goals?
SDG target alignment: 14.1, 14.2, 14.3, 14.4, 14.5, 14.A

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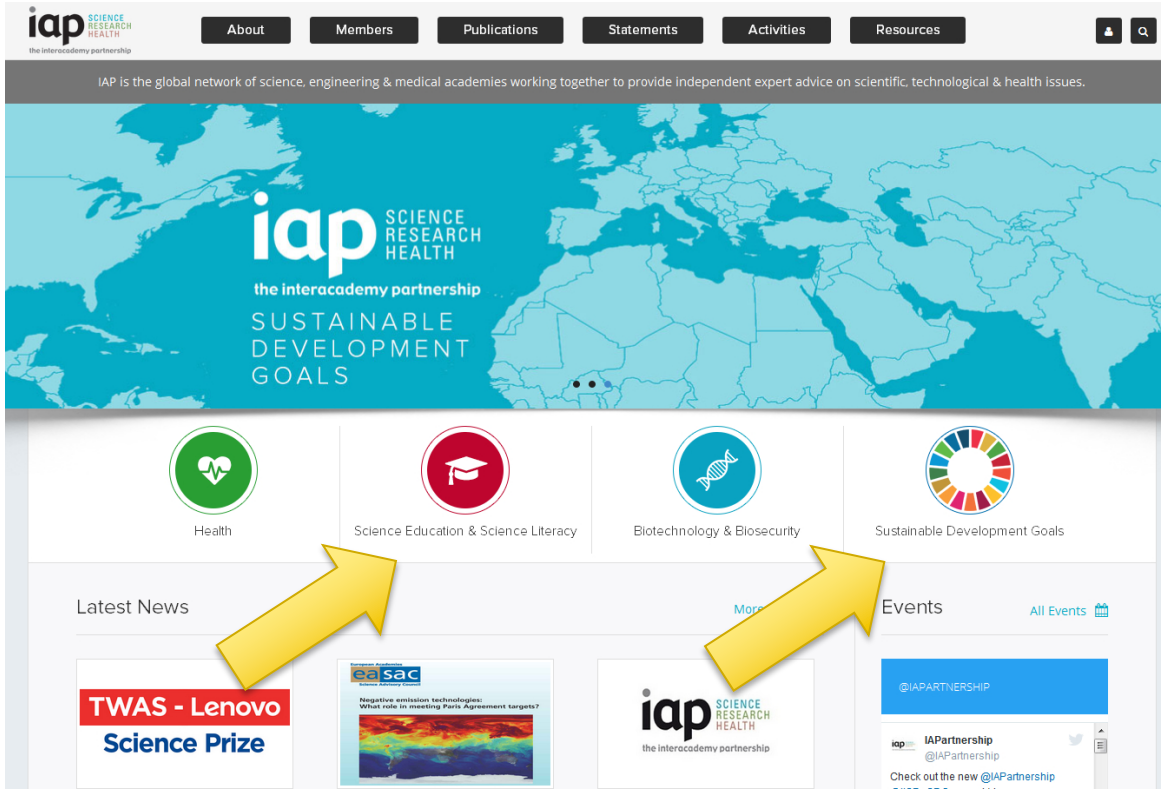

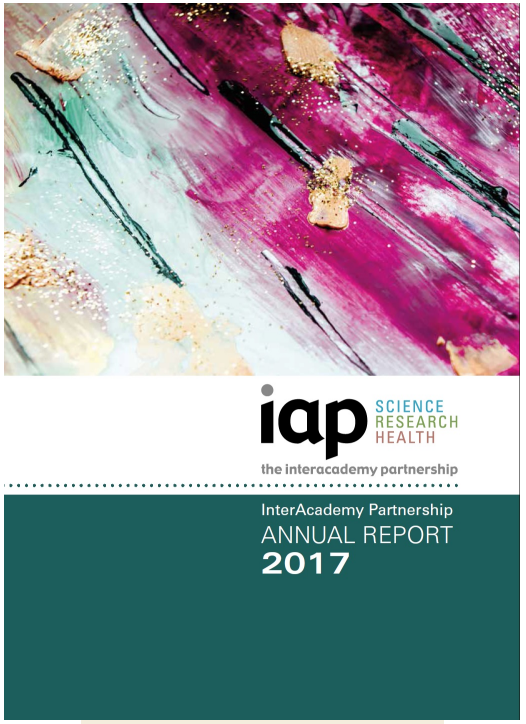

InterAcademy Partnership annual report.

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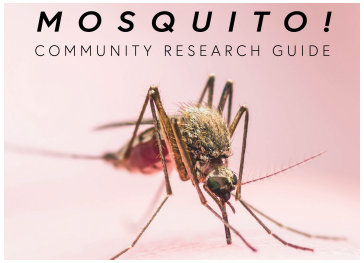

English: https://ssec.si.edu/mosquito
Spanish: https://ssec.si.edu/mosquito-espanol

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