

LAND-OCEAN INTERACTIONS IN THE COASTAL ZONE (LOICZ)

Core Project of the International Geosphere-Biosphere Programme (IGBP) and International Human Dimensions Programme on Global Environmental Change (IHDP)



Science Communication in Theory and Practice

**First LOICZ-IHDP-START-SARCS Training Workshop on
Science Communication for Southeast Asia and South Asia**

Compiled and edited by

*B. Goh, A. Pomsagun, M. Le Tissier, W.C. Dennison,
H.H. Kremer and J. Weichselgartner*



LOICZ Reports and Studies No. 31

Science Communication in Theory and Practice

**First LOICZ-IHDP-START-SARCS Training Workshop on
Science Communication for Southeast Asia and South Asia**

by

*B. Goh, A. Pomsagun, M. Le Tissier, W.C. Dennison,
H.H. Kremer and J. Weichselgartner*

Published in Germany, 2008 by:
LOICZ International Project Office
GKSS-Research Center
LOICZ International Project Office
Institute for Coastal Research
Max-Planck-Strasse 1
D-21502 Geesthacht
Germany
E-Mail: loicz.ipo@loicz.org

The Land-Ocean Interactions in the Coastal Zone Project is a Core Project of the International Council of Scientific Unions “International Geosphere-Biosphere Programme” and the “International Human Dimensions Programme on Global Environmental Change”.

The LOICZ IPO is financially supported by the Institute for Coastal Research at GKSS in Geesthacht, Germany. GKSS is part of the Helmholtz Association of National Research Centers.

COPYRIGHT © 2008, Land-Ocean Interactions in the Coastal Zone, IGBP/IHDP Core Project.

Reproduction of this publication for educational or other, non-commercial purposes is authorized without prior permission from the copyright holder.

Reproduction for resale or other purposes is prohibited without the prior, written permission of the copyright holder.

Citation: Goh, B.; Pomsagun, A.; Le Tissier, M., Dennison, W.C., Kremer H.H. & Weichselgartner, J. (eds.) 2008. Science Communication in Theory and Practice. LOICZ Reports & Studies No. 31, 101 pages. LOICZ, Geesthacht, Germany.

ISSN: 1383 4304

Cover: The cover photograph shows participants of the workshop in an activity-based learning session on the use of conceptual diagrams in communicating science.

Disclaimer: *The designations employed and the presentation of the material contained in this report do not imply the expression of any opinion whatsoever on the part of LOICZ, IGBP or the IHDP concerning the legal status of any state, territory, city or area, or concerning the delimitation 's of their frontiers or boundaries. This report contains the views expressed by the authors and may not necessarily reflect the views of the IGBP or IHDP.*

The LOICZ Reports and Studies Series is published and distributed free of charge to scientists involved in global change research in coastal areas.

Table of Contents

1.	Preface	1
2.	Why is effective science communication important?	1
3.	What is effective science communication?	2
3.1	Providing synthesis, visualization and context	2
3.2	Simplifying terms, but not content	3
3.3	Assembling self-contained visual elements	3
3.4	Conceptual diagrams	3
3.5	Satellite photos and maps	4
3.6	Photographs and videos	4
3.7	Data	5
3.8	Eliminating jargon, defining your terms and minimizing acronym usage	5
3.9	Combining communication elements	5
4.	Conclusion	6
5.	Appendices	7
5.1	Workshop report	7
5.2	List of participants	10
5.3	Instructor presentations	14
5.4	Participant group presentations	56
5.5	Individual presentations	83

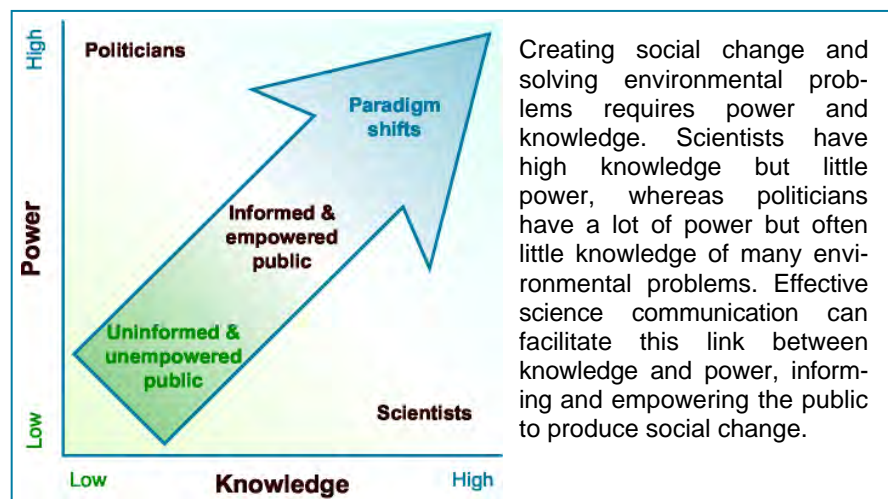
1. Preface

There is an increasing focus on science being linked to providing practical solutions to environmental problems. Although excellent science can be done, of itself this will not cause change mainly because channels to use this information and create change are poorly developed: This requires broader and more effective communication of the scientific insights being gained. Even where the solutions to environmental problems are clear, management, political, and ultimately public support are needed to institute the solutions. Therefore, utilizing current research effectively requires tools to facilitate effective communication, not only to scientific peers, but also managers, government, and the general public.

The LOICZ/IHDP Training Workshop on Science Communication, held 12-14 September, 2005, in Bangkok, Thailand, brought together 33 people from 10 countries ranging from scientists to environmental management practitioners to project managers (Appendix 1 & 2). The purpose of the workshop was to provide a forum to disseminate principles and practices developed by the Integration and Application Network (IAN) (<http://ian.umces.edu>). This report provides some background to science communication followed by appendices of a report from the workshop including the materials produced by the participants as part of this capacity building activities. The workshop was financially and logistically supported by LOICZ, IHDP, the Southeast Asia Regional Committee for START (SARCS), and the Global Change SysTEm for Analysis, Research and Training (START).

2. Why is effective science communication important?

The essence of effective science communication is the development of *content-rich, jargon-free, communication-based* materials. *Content-rich* refers to communication which is replete with data and ideas. *Jargon-free* refers to the elimination of shorthand notation that scientists use to communicate within their peer groups—this means removing acronyms and maintaining a common language basis for explanation of concepts. *Communication-based* refers to focusing on the intended audience and providing an even broader base of accessibility for a wider audience. Effective communication is an important part of doing science. There are several ways in which attention to the communication aspects of science can also improve science. *Completeness* envisions the ‘story’ that is being conveyed and can lead to a more comprehensive research program, in which each element of the story is addressed. Having conceptualized the ‘storyline’ for the science communication product, holes or gaps can be filled-in in order to make the story complete. *Context* is identifying linkages and developing comparisons that can lead to important insights. The search for explanations of temporal or spatial comparisons often leads to a fresh perspective on the data. *Visualization* is a powerful communication tool which can provide unique insights. For example, production



of a map using overlays of different elements can provide a linkage that may not otherwise be obvious. Aerial photographs combined with a conceptual diagram provide another example of individual visual elements that would not be as powerful individually as they are when combined. *Synthesis* is achieved by combining different data or approaches, which can lead to novel insights. For example, combining all the data on a topic and developing either a mathematical depiction or a correlation with another feature can create important benchmarks.

The essence of science communication

Effective science communication requires attention to the messages that are to be conveyed that depends on the “art” of communication, allowing adequate time to produce science communication products that includes time for feedback and revision. Good science communication requires attention to both the science and the presentation. In general practice, the vast majority of the effort by scientists is in the collection and analysis of data, with little time or resources devoted to the communication of science. Rather than science communication being an afterthought, factoring in the time and resources that are needed for developing a quality communication product is recommended.

3. What is effective science communication?

Effective science communication is the successful dissemination of knowledge to a wide range of audiences, from specialist scientists through managers and politicians to the public. Many scientists believe that doing excellent science is enough and that this knowledge will be found and used at the appropriate time. Unfortunately, the public, politicians, and even environmental managers rarely read journal articles or highly specialized books—so these media alone do not constitute effective science communication. Increasingly, scientists are called upon to comment on current environmental problems and search for solutions—however, they are often left lacking tools to communicate the knowledge that they have, especially in the face of the uncertainty inherent in the scientific process. A scientist usually cannot be 100% certain, which is problematic to those responsible for decision-making. However, with appropriate communication tools, it is possible for scientists to better explain their messages to a broader audience—creating greater understanding and demystifying both scientific knowledge and the scientific process. Only when this is achieved by effective science communication will the relevance of science increase to society in general.

3.1 Providing synthesis, visualization and context

The key elements of science communication are synthesis, visualization and context. Raw data do not provide much insight to anyone except perhaps the investigator collecting the data. Rather, data that have been analyzed, interpreted and synthesized are needed for meaningful science communication products. Visualization is key, as the audience must be able to see the *who, why, what, where, when, and how* of the data that is used to support the ideas. Making a point with data visualized is very powerful, but the audience needs to be able to see and interpret the data themselves. Context provides answers to the important questions “Why should we care?” or more simply, “So what?” and can include using comparative data so that specific examples can be characterized as ‘high’ or ‘low’ relative to regional or global extremes.

3.2 Simplifying terms, but not content

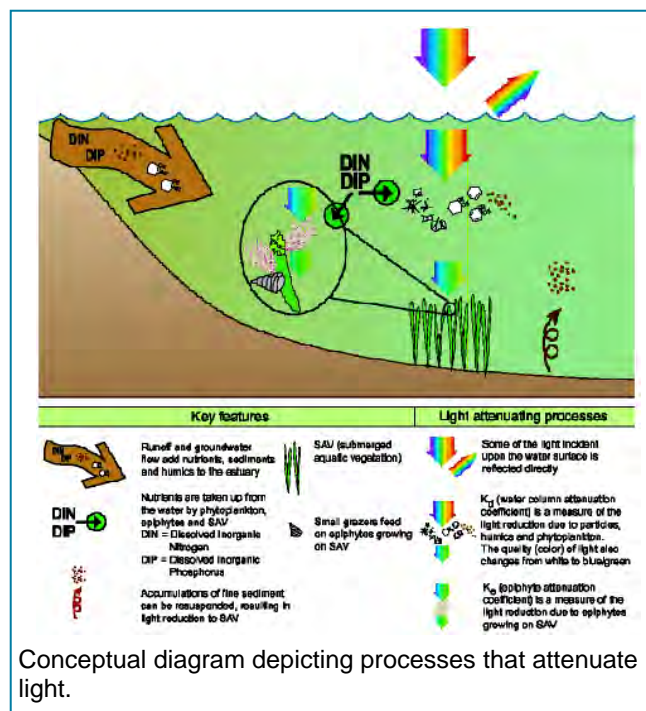
Don't dumb it down, but do raise the bar. Assume the audience has very little prior knowledge of the particular study, but also assume that they are intelligent and knowledgeable.

3.3 Assembling self-contained visual elements

Science communication relies on the use of images, maps, photos, tables and figures, video clips and conceptual diagrams. Science communication principles can be applied to proposals and papers published in peer-reviewed scientific journals, newsletters, books, videos, mass media, and effective communication at meetings and conferences. Creating effective graphics and illustrations is often time-consuming, but appropriate use of illustrations will dramatically improve the communication of your story – a picture is worth 1,000 words!

3.4 Conceptual diagrams

Conceptual diagrams are an effective tool to communicate complex messages in a simple and informative manner and help to clarify thinking. Words can be ambiguous but an image commits to the message being portrayed. Use of symbols in conceptual diagrams is an ancient communication technique to depict unequivocal messages. Conceptual diagrams facilitate communication, both one-way (the presentation of the idea) and two-way (idea development). They depict essential attributes of the system and depict processes at different scales as well as evolving to capture an increasing understanding of the system. They can be used to identify gaps in, priorities of, and essential elements of knowledge by communicating concepts, summarizing information, and indicating key processes.



3.5 Satellite photos and maps

These images provide geographic context and are information-rich. Satellite photos provide extra information by showing topography, land use, and clarity, depth, and movement of water. A series of images can be useful in accentuating differences and tracking temporal changes.

3.6 Photographs and videos

Photos provide unique information. Aerial photos can serve as site-scale ‘maps’. Experimental photos can depict methods and display visible impacts of experimental manipulation, especially when taken at different times during a study. Photos can also provide context, help verify conjecture and anecdotal evidence and ‘set the scene’ for research. Such photos are also useful in involving the community by making the public aware of changes in their environment, and can help to determine targets for restoration efforts.

Short video clips inserted into presentations can help to tell a story by capturing motion, perspective and sound. They can be effective to show an organism or habitat that may be unfamiliar to an audience.



What is effective science communication?



An example of using photographs to portray information. The aerial photo on the left provides the larger-scale context by showing the location of the study site, and even the algal bloom is visible as the darker-coloured areas. The photo on the right contains the detail of the algal bloom.

3.7 Data

Data are the backbone of research, and can be displayed in a variety of ways. Graphs and tables are the most common forms of data presentation. Graphs are the most common way of displaying data, and when formatted correctly, are a very effective way of communicating a message. Tables are an excellent way of presenting a lot of data, especially when you are making comparisons between many variables.

3.8 Eliminating jargon, defining your terms and minimizing acronym usage

Science is full of jargon, which Webster's Dictionary defines as *nonsensical, incoherent, or meaningless talk* and also as *the specialized or technical language of a trade, profession, or similar group*. These two definitions immediately illustrate why jargon can confuse or alienate members of an audience who are not familiar with the field of study. Instead of using jargon, translate it into terms that can be understood by somebody who has no background in your field.

An acronym is *a word formed from the initial letters of a name, such as **WAC** for **Women's Army Corps**, or by combining initial letters or parts of a series of words, such as **radar** for **radio detecting and ranging*** (Webster's Dictionary). Acronyms are very common in science writing and are used to communicate names of organizations, processes and concepts. Every field of science has its own acronyms which are often specific to that field, which can result in a lack of clear communication if an audience is not familiar with the field. The use of acronyms should be minimized to avoid confusion, and if they are used, they should always be defined the first time they are used.

A jargony sentence full of acronyms and unexplained terms might be:

In years of high precipitation, conductivity of Chesapeake reduces and loads of TP, TN and siliciclastic sediments increase. These changes result in HABs as well as reduced DO and Kd which result in reduced growth and spatial extent of SAV.

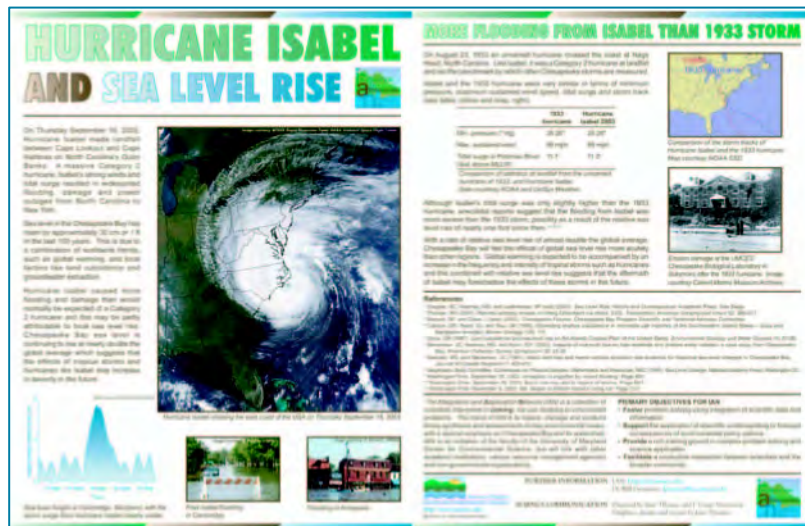
The translated version, although slightly longer, is much more understandable:

In high rainfall years, more freshwater enters Chesapeake Bay, bringing with it large amounts of nutrients (mainly nitrogen and phosphorus) and terrestrial sediments. This can lead to harmful algal blooms (HABs) in the water, as well as reduction or even of removal of oxygen in deeper water. Algae and sediment in the water reduce the ability of light to pass through the water, and absence of oxygen and light result in reduction or death of aquatic grasses.

3.9 Combining communication elements

Visual elements can be combined to provide unique information. For example, a combination of a photo and a conceptual diagram can effectively orient the audience to your study site, or explain methodology. Photos and graphs together can help with the visualization of your results. Results can be overlaid onto maps, helping the audience envisage the overall context of your results.

In the science newsletter shown below, all the visual elements discussed above—conceptual diagrams, satellite photos, maps, photos, graphs and tables—along with a judicious amount of text, are used to communicate the story about sea level rise and the flooding associated with Hurricane Isabel in September, 2003.

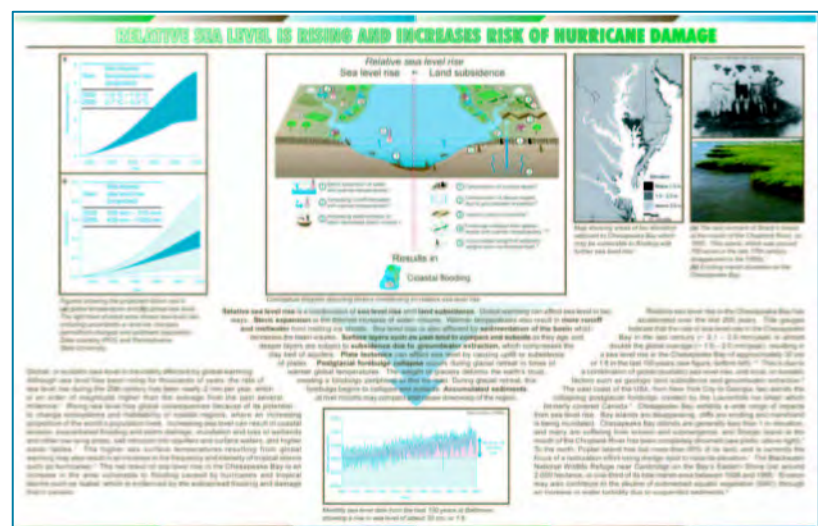


On the front page, the satellite photo gives the big-picture context of Hurricane Isabel over the east coast of the USA. The graph of the storm surge and the photos of flooding tell a more regional story.

On the back page, a comparison between Hurricane Isabel and a 1933 hurricane is given by a table of data comparing the two storms, a map showing the tracks of the hurricanes, and an historical photo showing erosion damage after the

1933 storm.

In the centre spread, sea level rise is addressed by graphs showing projected temperature, sea level rise, and long-term data from a tide gauge in Baltimore. A conceptual diagram with a self-contained legend depicts the processes leading to sea level rise. The local context to Chesapeake Bay is given by a map showing the elevation of the coastal plain surrounding the bay. A historical photo and a recent photo graphically depict the results of sea level rise and erosion in Chesapeake Bay.



4. Conclusion

If scientific knowledge is to be applied to help deal with environmental issues of the real world, then communicating the information effectively is an essential step in the solution. This workshop has highlighted that in addition to acquiring good scientific information, scientists should adopt the practice of using appropriate tools for disseminating the information, as this is also important in the communication process. These simple practices can be applied to make science relevant to a wide audience, from school-going children and the general public to the top decision makers of the country.

Further Reading: JE Thomas, TA Saxby, AB Jones, TJB Carruthers, EG Abal, WC Dennison (2006): Communicating Science Effectively: A Practical Handbook for Integrating Visual Elements. IWA Publishing, London, 132 pages.

5. Appendices

5.1 Workshop report

September 12, 2005

1. Formal Welcome and Opening Session

Prof. Bill Dennison, Vice-president of the Center for Environmental Science, University of Maryland, introduced himself, his team, and the agenda of the workshop.

Participants, representing a good mix of members from both Southeast Asian and South Asian countries, gave short introductions about themselves and their work (Appendix 2).

2. Introduction Science Communication and Principles of Effective Science Communication

Prof. Bill Dennison introduced the objectives of the science communication workshop (Appendix 3). He highlighted that the workshop aimed to:

- Inspire participants to develop and enhance their science communication skills
- Provide some overarching science communication principles
- Introduce participants to conceptual diagrams and resources to help them create effective diagrams
- Review PowerPoint as a science communication tool and provide participants with tips and pointers for presentations.

Ms. Jane Thomas, Science Communicator, Center for Environmental Science, University of Maryland, presented the principles of effective science communication (Appendix 3). The following points were highlighted about effective science communication:

- Provide synthesis, visualization and context
- Reality
- Simplify terms but not content
- Assemble self-contained visual elements
- Consistent *style* and *format*
- No jargon
- Define all terms
- Minimize AU (acronym use)
- Engage audience
- Use colour judiciously.

3. Conceptual Diagrams

Dr. Tim Carruthers, University of Maryland, showed tools for effective science communication (Appendix 3). He gave various reasons for using conceptual diagrams, namely, to help clarify thinking, and for effective communication of scientific understanding. He also

gave examples of how conceptual diagrams could be presented in PowerPoint or incorporated into various publications. Participants then worked in groups in an exercise using conceptual diagrams to communicate various scientific themes.

4. Adobe Illustrator Demonstration

Ms. Jane Thomas presented a lecture in the use of Adobe Illustrator.

September 13, 2005

1. Review Group Conceptual Diagrams

Participants presented their group outputs of hand-drawn conceptual diagrams (Appendix 4). These diagrams illustrated various environmental issues pertinent to the Southeast Asian and South Asian regions. Ms Jane Thomas later converted the hand-drawn diagrams into computerized diagrams using the Adobe Illustrator software (Appendix 4).

2. The Art of Science Communication: Giving Effective Presentations

Prof. Bill Dennison gave a lecture on the preparation of presentation materials to communicate science effectively (Appendix 3). Participants then worked in groups to design PowerPoint presentations on computers and presented their group outputs (Appendix 4).

3. Effective Communication Using Posters

Ms. Jane Thomas guided participants on using posters for effective communication (Appendix 3). Participants joined in a group activity to design posters to communicate the findings from a published report entitled: “State of Maryland Coastal Bays, 2004”. In a “role-play” exercise, participants presented their posters before the ‘Governor’ of Maryland, and provided recommendations on the most effective way to utilize funds from the government for the sustainable utilization of the coastal bays of Maryland (Appendix 4).

4. Dumplings in a Teapot

Invited speaker Dr. Pitiwong Tantichodok, Walailak University, presented a lecture on communicating science (Appendix 3). The following examples were highlighted:

- Science communication to the public
- Knowledge and communication
- Communication in integrated coastal zone management
- Setting up a coastal information center
- Nemo project.

5. Individual Projects

Participants were then tasked to design individual presentations to communicate science issues pertinent to their home countries in the form of an oral presentation, written presentation or using conceptual diagrams.

September 14, 2005

1. A Case Study of Effective Science Communication

Dr. Ben Longstaff, Science Integrator, Center for Environmental Science, University of Maryland, presented a case study of effective science communication entitled: "Healthy Waterways Partnership" (Appendix 3).

2. Scientific Documents in Magazines and Handbooks in Thailand

Invited Speaker Dr. Thon Thamrongnawasawat, Kasetsart University, gave a talk on his experience in science communication through magazines and handbooks in Thailand.

3. Individual Presentations

Participants presented their individual projects (Appendix 5).

4. Wrap Up

Prof. Bill Dennison concluded the workshop by presenting a summary of activities and products from the three day workshop.

Participants were invited to provide feedback to the resource team and the workshop organizers on the science communication workshop. It was agreed that the products from this workshop (conceptual diagrams, hand-drawings, posters and PowerPoint presentations) be put up onto the IAMS website for participants to download freely, for their own use and for various reporting mechanisms in their home countries.

It was unanimously agreed that these products would serve as good resource materials not only for the participants, but also for the network of scientists in LOICZ and IHDP. The staff members of IAMS, Center for Marine Science, University of Maryland, would provide a mechanism through which these resources would be made available to LOICZ and IHDP.

Participants thanked the resource team from the Center for Marine Science, University of Maryland, the local organizing team from the SEA START Regional Centre, Thailand, the LOICZ Southeast Asia and South Asia Nodes, LOICZ and IHDP for the delivery of a very relevant, effective and successful workshop.

5.2 List of participants

	Country	Name	Address	E-mail
1	Cambodia	Mr. Pich Sereywath	Coastal and Fisheries Management and Conservation, SEAFDEC, UNEP/GEF Project Department of Fisheries: #186, Norodom Blvd, Phnom Penh, CAMBODIA	sereywath_pich@yahoo.com
2	Cambodia	Mr. Va Longdy	N ^o 810G, Street Lum, Sangkat Tek Thlar, Khan Dangkor, Phnom Penh, CAMBODIA	longdy@scientist.com
3	Indonesia	Dr. Agus Supangat	Head of Non Living Resources and Marine Archeology Division Research Center for Maritime Territory and Non Living Resources Agency For Marine Affairs and Fisheries Research Ministry of Marine Affairs and Fisheries, Jl.MT.Haryono Kav.52-53, Jakarta-12770, INDONESIA	agussup@dkp.go.id, supbrkp@yahoo.com
4	Indonesia	Dr. Susanna Nurdjaman	Department of Geophysics and Meteorology Faculty of Earth Science and Mineral Technology Institute Technology Bandung Ganesha 10 Bandung 40132, INDONESIA	susanna@geoph.itb.ac.id, susanna_nurdjaman@yahoo.com
5	Malaysia	Mr. Kennedy Aaron Agul	Borneo Marine Research Institute, University Malaysia Sabah, Locked Bag No. 2073, 88999 Kota Kinabalu, Sabah, MALAYSIA	kennedy1@ums.edu.my, aladinworks9@yahoo.com
6	Malaysia	Ms. Zarinah Waheed	Borneo Marine Research Institute, Universiti Malaysia Sabah, Locked Bag No. 2073, 88999 Kota Kinabalu, Sabah , MALAYSIA	zarinah@ums.edu.my
7	Philippines	Ms. Evangeline L. Alcantara	School of Environmental Science and Management (SESAM), University of the Philippines, Los Baños College, Laguna 4031, PHILIPPINES	ela1018@yahoo.com
8	Philippines	Ms. Roselle Ty Borja	Marine Science Institute, University of the Philippines, Diliman, Quezon City, PHILIPPINES	Roselle.borja@upmsi.ph, Roselle_borja@yahoo.com

	Country	Name	Address	E-mail
9	Singapore	Ms. Tan Aik Ling	Research Associate, Centre for Research in Pedagogy and Practice, National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, SINGAPORE 637616	aikling.tan@nie.edu.sg
10	Singapore	Dr. Beverly Goh	LOICZ II Southeast Asia Regional Node, c/o Natural Sciences and Science Education National Institute of Education Nanyang Technological University 1Nanyang Walk, SINGAPORE 637616	beverly.goh@nie.edu.sg
11	Thailand	Dr. Richard Cooper	Southeast Asia Start Regional Centre, Old SWU Pathumwan 5 Building, 5 th floor, Chulalongkorn University, Henri Dunant Rd. Bangkok, THAILAND	rcooper@iwsea.org
12	Thailand	Mr. Chatchai Phunamkang	The Office of Natural Resources and Environment Policy and Planning, 60/1 Soi Phiboonwattana 7, Rama 6 Rd., Bangkok, THAILAND	Chatchai_ao@yahoo.com
13	Thailand	Ms. Suratthar Surachetkhomson	Coastal Habitats And Resources Management Project (CHARM), 141 Moo 6, Tambon Saithai, Muang, Krabi, THAILAND 81000	surattasu@yahoo.com
14	Thailand	Ms. Sukanya Sukhsuwan	Coastal Habitats And Resources Management Project (CHARM), Department of Fisheries, Plodprasop Tower, 4 th Floor Jatujak, Bangkok 10900, THAILAND	sukhsy@yahoo.com
15	Thailand	Punnee Sinsuphan	Coastal Habitats And Resources Management Project (CHARM), Department of Fisheries, Plodprasop Tower, 4 th Floor, Jatujak, Bangkok 10900, THAILAND	spunnee@yahoo.com
16	Thailand	Siraruj Kittivarachet	Coastal Habitats And Resources Management Project (CHARM), Department of Fisheries, Plodprasop Tower, 4 th Floor, Jatujak, Bangkok 10900, THAILAND	sirarujk@yahoo.com
17	Thailand	Bamroongsak Chatananthawej	Department of Marine and Coastal Resources, 92 Soi Phahonyotin 7, Samsennai, Phayathai, Bangkok, 10400 THAILAND	bamroonc@yahoo.com

	Country	Name	Address	E-mail
18	Thailand	Yukio Tanaka	Southeast Asia Start Regional Centre, Old SWU Pathumwan 5 Building, 5 th floor, Chulalongkorn University, Henri Dunant Rd. Bangkok, THAILAND	tanaka@start.or.th
19	Vietnam	Kim Anh Thi Nguyen	Economics Faculty, University of Nha Trang Khanh Hoa, 02- Nguyen Dinh Chieu, Nha Trang , VIETNAM	sonanhcc@yahoo.com
20	Bangladesh	Sayedur Rahman Chowdhury	Institute of Marine Sciences, University of Chittagong, Chittagong 4331, BANGLADESH	sayedurrchy@yahoo.com, sayed@imscu.ac.bd
21	Bangladesh	Abu M. Kamal Uddin	Saimon Centre, House 4/A, Road 22, Saimon Centre 6 th Floor, Gulshan-1, Dhaka-1212, BANGLADESH	kamal@iczmpbd.org
22	Bangladesh	Aysa Akhtar	Institute of Marine Sciences, University of Chittagong, 6, Kazim Ali Road, Chittagong 4000, BANGLADESH	aysha235@yahoo.com
23	India	Ramasamy Krishnamoorthy	Department of Applied Geology, School of Earth and Atmospheric Sciences, University of Madras, Guindy Campus, Post Bag No: 5327, Chennai 600025, INDIA	rrkrishnamurthy@gmail.com
24	India	Baban Shravan Ingole	Biological Oceanography Division, National Institute of Oceanography, Dona Paula, Goa; Pin – 403004 INDIA	baban@darya.nio.org
25	India	Suraj Kumar Patnaik	National Institute Of Oceanography, Regional Centre, Mumbai Lokhandwala Road, Fourbungalows Andheri(W), Mumbai - 400 053, INDIA	patnaik_suraj@rediffmail.com, surajp@darya.nio.org
26	India	Rayadurga Anantha Sreepada	Aquaculture Laboratory, National Institute of Oceanography (NIO) Dona Paula, GOA- 403 004, INDIA	sreepada@darya.nio.org, sreepada63@yahoo.com
27	India	A. Nirmal Rajkumar	Research Scholar, Institute for Ocean Management, Anna University, Guindy, Chennai-600025. Tamilnadu, INDIA	nirmalrajkumar@hotmail.com
28	Pakistan	Samina Kidwai	National Institute of Oceanography, ST 47, Block 1, Clifton, Karachi-75600, PAKISTAN	niopk@cubexs.net.pk,

	Country	Name	Address	E-mail
29	Sri Lanka	Liyanage Don Chaminda Bhathiya Kekulandala	IUCN Sri Lanka Office, No.53, Horton Place, Colombo 07 , SRI LANKA	cbk@iucnsl.org
30	Sri Lanka	Anouckchika Darini Ilangakoon	215 Grandburg Place, Maharagama, SRI LANKA	anouki@zeynet.com
31	Sri Lanka	K.G.J. Karunasena	National Science Foundation, 47/5, Maitland Place, Colombo 07, SRI LANKA	janak@nsf.ac.lk
32	Sri Lanka	L.M. Wickramadara	National Science Foundation, Sri Lanka, 47/5, Maitland Place, Colombo 07, SRI LANKA	lakshi@nsf.ac.lk
33	Netherlands	Martin Le Tissier	CHARM FMO, 141 Moo 6, Saithai, Muang, Krabi, THAILAND	m.le-tissier@envision.uk.com

List of Instructors and Invited Speakers


	Country	Name	Address	E-mail
1	USA	Bill Dennison	University of Maryland, Center for Environmental Science, PO Box 775 Cambridge MD 21613 USA	dennison@umces.edu
2	USA	Jane Thomas	Integration & Application Network, University of Maryland, Center for Environmental Science, PO Box 775 Cambridge MD 21613 USA	jthomas@umces.edu
3	USA	Tim Carruthers	University of Maryland Center for Environmental Science, PO Box 775 Cambridge MD 21613 USA	tcarruth@umces.edu
4	USA	Ben Longstaff	University of Maryland, Center for Environmental Science, PO Box 775 Cambridge MD 21613 USA	ben.longstaff@noaa.gov
5	Thailand	Pitiwong Tantuchidok	Division of Biology, The Institute of Science, Walailak University, 222 Amphoe Tasala, Nakorn Si Thammarat 80160, THAILAND	tpitiwon@wu.ac.th
6	Thailand	Thon Thamrongnawasawat	Department of Marine Science, Faculty of Fisheries, Kasetsart University, 50 Phonyothin Road, Ladyaw , Jatujuk Bangkok 10900, THAILAND	thon@talaythai.com

5.3 Instructor presentations

An Introduction to Science Communication

An Introduction to Science Communication


Bill Dennison
Workshop on Science Communication for
Southeast Asia and South Asia
12-14 September, 2005
Bangkok, Thailand



integration application network

Objectives

- *Inspire* you to develop/enhance your science communication skills
- *Provide* some overarching science communication principles
- *Introduce* you to conceptual diagrams and resources to aid you in creating effective diagrams
- *Review* powerpoint as a science communication tool and provide you with tips and pointers




integration application network

The great scientists are/were also great communicators

"Finally when ... barrier-reefs ... atolls ... and fringing-reefs ... are laid down on map, they offer a grand and harmonious picture of the movements which the crust of the earth has undergone within a late period. We there see vast areas rising, with volcanic outbursts; and we may feel sure that the movement has been so slow as to have allowed the corals to grow up to the surface, and so widely extended as to have buried over the broad face of the ocean every one of these mountains, above which the atolls now stand like monuments, marking the place of their burial."

Charles Darwin
119 published books & papers



The Structure and Distribution of Coral Reefs
Charles Darwin, 1874 2nd Edition, revised 1842 1st Edition

"Make everything as simple as possible, but not simpler." A. Einstein

Albert Einstein
248 published books & papers

integration application network

Paradigm shifts occur when scientific discovery is effectively communicated to society

1500-1550	1550-1600	1600-1650	1650-1700	1700-1750
Greeks	Astronomy	Physics	Astronomy	Physics
	Galileo	Kepler	Newton	Linnaeus

1750-1800	1800-1850	1850-1900	1900-1950	1950-2000	2000-2050
Lavoisier	Lyell	Darwin	Einstein	Watson & Crick	Sustainability
Chemistry	Geology	Evolution	Physics	Biology	

integration application network

Good science communication can make you a better scientist

Completeness
Envisioning the 'story' can lead to comprehensive research program

Context
Identifying the linkages and developing comparisons can provide important insights

Visualizations
Combining visual elements can lead to new insights

Synthesis
Combining and comparing different data sets or approaches can lead to insights



integration application network

Good science communication requires attention to both the science and the presentation

High Communication quality

Most modern philosophers and orators

Renaissance thinkers

Effective science communication


Most modern scientists

Low Science quality

Low High

"What you've got here, really, are two realities, one of immediate artistic appearance and one of underlying scientific explanation, and they don't match and they don't fit and they don't really have much of anything to do with one another. That's quite a situation. You might say there's a little problem here."


Robert Pirsig, 1974



integration application network

Principles of Analytical Design; E. Tufte


- "Don't get it original, get it right"
- Integrate word, image, numbers
- Include documentation (data sources)
- Content-driven; presentation enables thinking
- Put important comparisons adjacent in space
- Use small multiples (maximize content variation; minimize style variation)
- Audiences are precious (know your content; respect your audience)
- Use humor, memorable hyperbole
- Preparation: Practice, practice, practice; develop better content



integration application network

There are differences between science writing & science communication

<ul style="list-style-type: none"> • Getting it right • Providing scientific context (references) • Text > graphics • Peer audience • Mostly black and white • Authorship exclusive • Focus on results and interpretation 	<ul style="list-style-type: none"> • Getting it done • Providing societal context (examples) • Text ≈ graphics • Broader audience • Full color • Authorship inclusive • Focus on conclusions and recommendations
---	---



integration application network

Principles of science communication

1. Provide synthesis, visualization & context
2. Get real; relate to audience – big picture to local relevance
3. Simplify terms but not content (don't *dumb it down*, do *raise the bar*)
4. Assemble self-contained visual elements
5. Consistent style and format
6. Lose the jargon, dude
7. Define all terms, e.g. SE = Standard Error
8. Minimize AU (Acronym Use)
9. Engage audience: prepare for and invite questions
10. Use color, but use it judiciously

integration application network

The 'zen' of science communication


- *Enthusiasm* counts: get excited
- Give yourself adequate *quality time*
- *Feedback & revision* essential: seek it out



integration application network




The art of science communication

- Conceptual diagrams: context and synthesis
- Maps: geographic context and information-rich
- Photos: describe methods, study site description, processes and relevance
- Video clips: capture system dynamics
- Tables and figures: scientific data



integration application network

Synthesis, visualization & context are key elements of science communication

Synthesis	Visualization	Context
 <p>Provide analyzed, interpreted & synthesized data</p>	 <p>Show them: who, what, where, when, how & so that you can tell them why</p>	 <p>Provide answers for: "Why should I care?" & "So what?"</p>

integration application network

Good science communication is no JOKE

JOKE = Jargon-filled, Obtuse language that Keeps audience Entirely ignorant

Science communication that relies extensively on JOKEs is a self-indulgent representation of simple ideas, obfuscated with technospeak to make the scientist appear astute, yet serves to be obtuse and belittles the audience.



integration

application

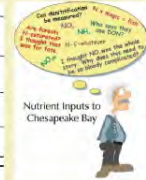
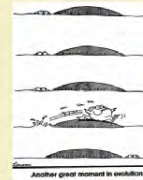
network

Topical humor can be effective

Seagrasses 'reinvaded' the sea from terrestrial ancestors

Walt Boynton's caricature

'Cultivation grazing' by dugongs structures seagrass communities



Acknowledgements
Thanks to all the people in the Chesapeake Bay watershed who contributed their nutrients to this study.

integration

application

network

Effective communication is two-way

How do you elicit two-way communication?

- Provide feedback opportunities: complete the presentation within allotted time (or even shorter); have evaluation sections on science communication products
- Solicit: At the end of your talk offer to answer questions; ask for evaluation of science communication products

How do you prepare for questions?

- Anticipate: think about what questions you would ask; use practice sessions to solicit and answer questions; develop FAQ (Frequently Asked Questions) section
- Prepare: have extra material which can be used in the event of questions
- Don't be afraid: it is legitimate to say a) "I don't know"; b) what you do know that is relevant to the question

integration

application

network

Organizing scientific workshops

- Simple logistics: location, location, location (food, transportation, etc.); allow time for breaks (work often accomplished in breaks)
- Focused: pose reviewed questions, set a realistic agenda
- Good communication: phone calls and emails with reminders
- Pre-workshop materials: provide as much as possible BEFORE workshop to save time
- Select group: not too big, chosen for diversity and skills; getting the right people into the room is half the battle; get invitees to recommend alternatives if they cannot attend
- Good facilitation: pre-workshop planning session(s), use naivete to diffuse potential problems, let facts rather than opinions drive agenda
- Ground rules: reduce jargon, respect for diverse opinions (non-confrontational), equal time and equal voice
- Clear, pre-determined outputs: time lines and products identified prior to workshop; clear agenda of who does what at end of workshop
- With strong differences of opinion, formalize presentations: Spurious arguments are often best dealt with in front of peer audience

integration

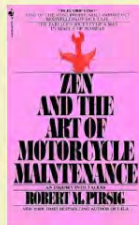
application

network

Conclusion:

replaced "motorcycle maintenance" with "science communication"

"Not everyone understands what a completely rational process this is, this science communication. They think it's some kind of a 'knack' or some kind of 'affinity for machines' in operation. They are right, but the knack is almost purely a process of reason, and most of the troubles are caused by what old time radio men called a 'short between the earphones,' failures to use the head properly. Science functions entirely in accordance with the laws of reason, and a study of the art of science communication is really a miniature study of the art of rationality itself."



Robert Pirsig, 1974

integration

application

network

Science communication resources

www.ian.umces.edu



Powerpoints

On line tutorial

Demonstration video

Newsletter

Handbook

Courses



IAN Staff

integration

application

network

The Art of Science Communication: Giving Effective Presentations

The art of science communication: Giving effective presentations

Bill Dennison
Workshop on Science Communication for
Southeast Asia and South Asia
12-14 September, 2005
Bangkok, Thailand



<http://ian.umces.edu>

integration application network

Outline

- Presenting your talk
 - Communicating your message effectively
- Using PowerPoint effectively
 - Hints and tips to maximize PowerPoint's usefulness
- Components of a good PowerPoint presentation



integration application network


Presenting your talk

- Number of slides = number of minutes
 - Leave time for questions
- Preparation is the key
 - Slides are your cues
- Arrive early to check equipment and greet audience
- Provide appropriate background
 - Assume naiveté, not ignorance
- Show data within five minutes
- Orient the audience to each slide
 - Explain graph axes, photos, diagrams
- "Tell 'em what you're going to tell them, tell 'em, then tell them what you told 'em" – George Bernard Shaw
- Every slide should have visual elements

integration application network

You are giving a talk, NOT reading a speech

- Text can be used to:
 - Remind** speakers of the key points of the talk
 - Provide** the audience with enough information to interpret graphics
- Text should NOT be used to:
 - Distract** audience from the speaker's words (people will read a new slide before listening to the speaker)
 - Replace** the need for the speaker to talk by having a complete text provided on the slides



integration application network

Font size and visibility is important

- 36 pt for titles
- 20 pt for bullet points (at least)
- 12 pt for citations
- 8 pt for notes
- Use color judiciously, especially red and green
- Contrast between your background, and text/graphics is important
- Use system fonts, or embed fonts in your presentation
- Sans serif fonts: Arial, Verdana, Comic Sans
- Serif fonts: Times New Roman, Garamond, Palatino

This is a serif font.
Which of these fonts is easier to read?

This is a sans serif font.
Which of these fonts is easier to read?

- Sans serif fonts are more readable from a distance

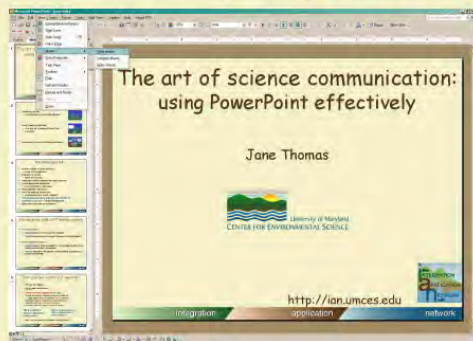
integration application network

Some color combinations are hard to read

- Some people find red and green hard to distinguish
- Dark backgrounds are harder on the eyes

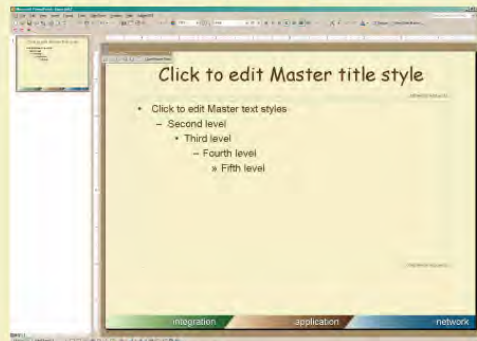
integration application network

Consistency is important



integration application network

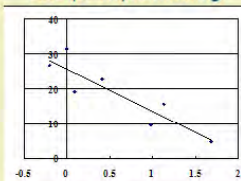
Consistency is important



integration application network

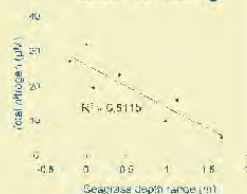
Graph formatting makes all the difference

Bad (or no) formatting



- Boxes, gridlines and white background are distracting
- Axes not labelled, y-axis obscuring data
- Boring black and white

Good formatting

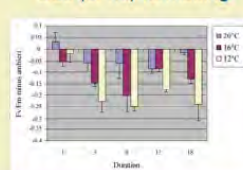


- Transparent background, no boxes or gridlines
- Large labelled axes
- Contrasting colors

integration application network

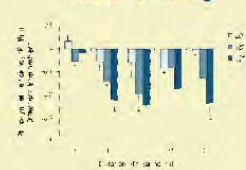
Graph formatting makes all the difference

Bad (or no) formatting



- Boxes, gridlines and white background distracting
- Axes not clearly labeled, too many tick marks on y axis
- Excel default colors

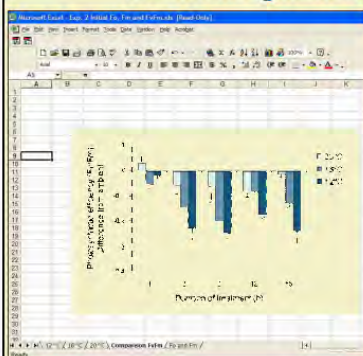
Good formatting



- Transparent background, no boxes or gridlines
- Large labelled axes
- Contrasting colors

integration application network

Get them right in Excel first



- Use colored background box to facilitate color matching
- Remove grid background
- Remove grid lines, borders & unnecessary legends (i.e. if only one data series)
- Clean up extra tick marks and increase intervals between marks
- Label axis with title and units
- Select text and right click to format (subscript, etc)
- Delete colored background
- Copy from Excel
- Switch to PowerPoint
- Paste Special
 - Picture (Enhanced Metafile)

integration application network

Try to avoid tables ...

Region	TPH	Region area (km ²)	% area region	DO	Secchi	Chl a	TP	TN	6°N
Upper Potomac	0.21	21	13	0.66	0.00	0.34	0.00	0.09	0.12
Middle Potomac	0.32	61	37	0.91	0.00	0.26	0.28	0.67	0.80
Lower Potomac	0.48	33	32	0.99	0.00	0.37	0.18	0.47	0.83
Mouth Potomac	0.28	30	18	1.00	0.00	0.38	0.93	0.33	0.62
Potomac Overall	0.45	145	100	0.92	0.00	0.33	0.33	0.38	0.70
Upper Choptank	0.20	16	4	0.26	0.00	0.24	0.00	0.06	0.71
Middle Choptank	0.28	83	24	0.92	0.00	0.04	0.08	0.06	0.42
Lower Choptank	0.44	160	43	1.00	0.00	0.24	0.59	0.39	0.40
Mouth Choptank	0.49	109	29	1.00	0.00	0.62	0.33	0.38	0.42
Choptank Overall	0.40	373	100	0.96	0.00	0.30	0.42	0.30	0.43
Cape Charles Bay	0.73	N/A	N/A	nd	0.73	0.73	0.63	1.00	0.63

integration application network

... or format them right

Region	EH1	Region area (km ²)	% area region	DO	Secchi	Chl a	TP	TN	δ ¹⁵ N
Upper Patuxent	0.21	21	13	0.86	0.00	0.34	0.00	0.09	0.15
Middle Patuxent	0.52	61	37	0.91	0.00	0.26	0.28	0.37	0.80
Lower Patuxent	0.48	53	32	0.96	0.00	0.37	0.18	0.47	0.85
Mouth Patuxent	0.58	30	18	1.00	0.00	0.38	0.93	0.53	0.62
Patuxent Overall	0.48	165	100	0.92	0.00	0.33	0.33	0.58	0.70
Upper Choptank	0.20	16	4	0.20	0.00	0.24	0.00	0.00	0.71
Middle Choptank	0.26	88	24	0.95	0.00	0.04	0.06	0.08	0.42
Lower Choptank	0.44	180	43	1.00	0.00	0.24	0.59	0.39	0.40
Mouth Choptank	0.49	108	29	1.00	0.00	0.62	0.53	0.38	0.42
Choptank Overall	0.40	373	100	0.98	0.00	0.30	0.42	0.30	0.43
Cape Charles City	0.75	N/A	N/A	nd	0.75	0.75	0.63	1.00	0.63

- Use PowerPoint's *Insert* → *Table* function

integration

application

network

Format maps to include more information

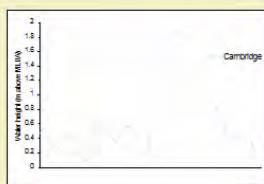


integration

application

network

Isabel surge height



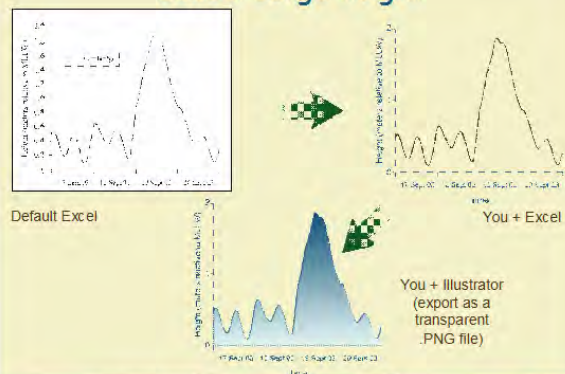
- PowerPoint is all about the visual – there is no excuse for your graphics to not be seen

integration

application

network

Isabel surge height

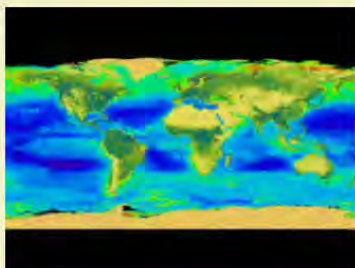


integration

application

network

Video clips can be effective

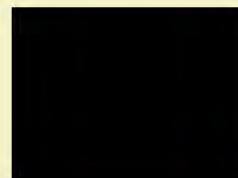


integration

application

network

Video clips can be effective



integration

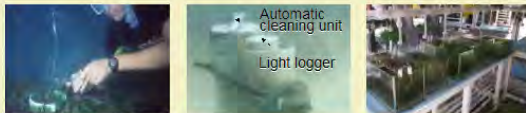
application


network

Cropping and annotation of photos can be very informative



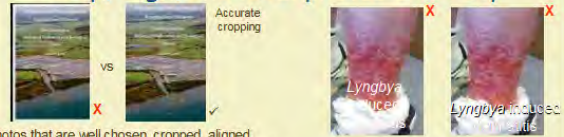
Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance



Use the crop tool , resize with the mouse, and then use the automatic align and distribute tool in PowerPoint to keep your slides clear and legible

integration application network

Crop, align, and label photos carefully



Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance




Pay attention to alignment & overlapping



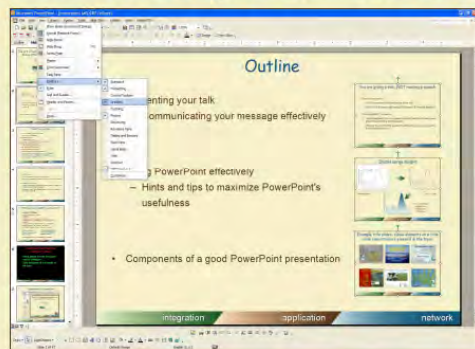
integration



Use the crop tool , resize with the mouse, and then use PowerPoint's align or distribute tool to keep your slides clear and legible

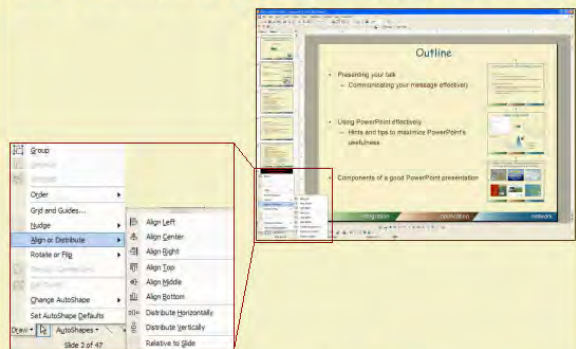
application network

Use PowerPoint's Align or Distribute function



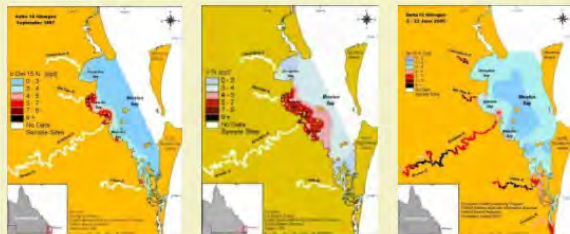
integration application network

Use PowerPoint's Align or Distribute function



integration application network

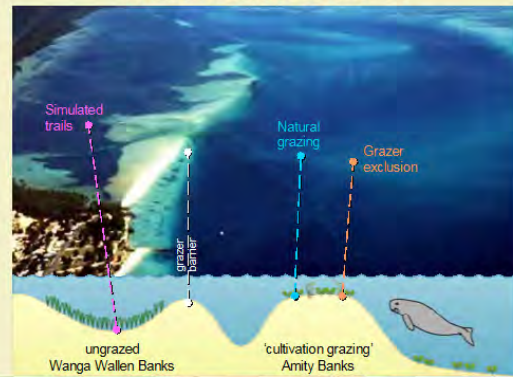
A map sequence can show temporal changes



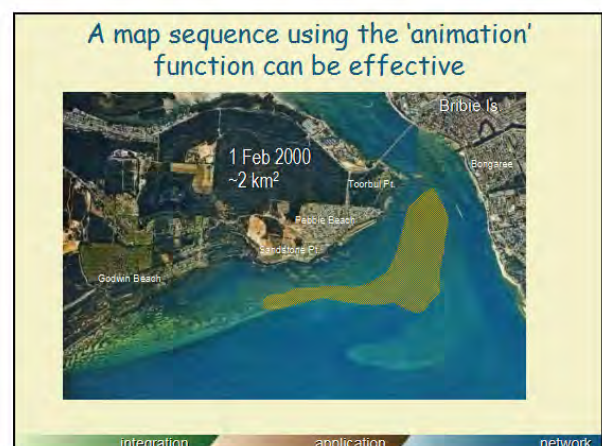
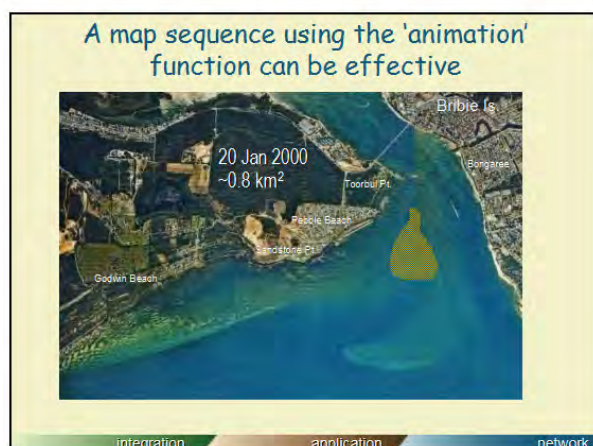
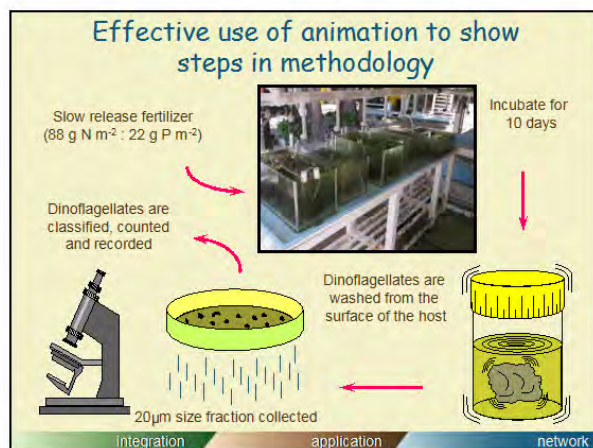
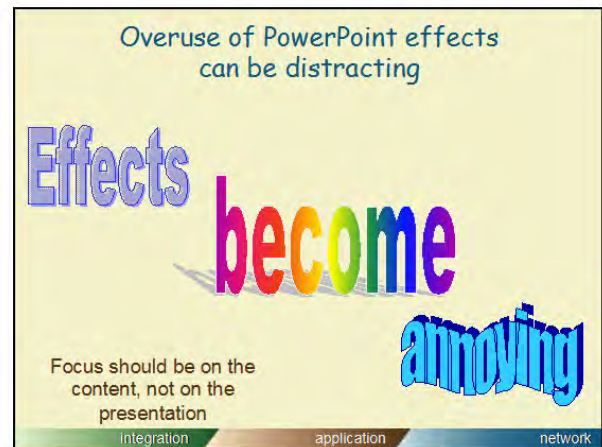
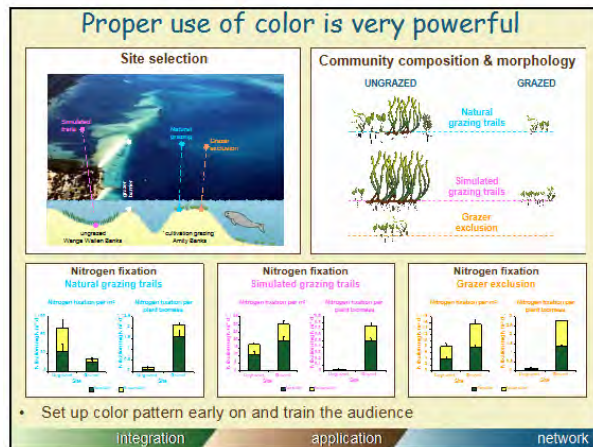
- Improvements or degradation over time can be highlighted by a series of maps
- Consistent layout allows comparisons
- Maps should have scale and compass direction
- Maps should have a legend that is self contained & legible

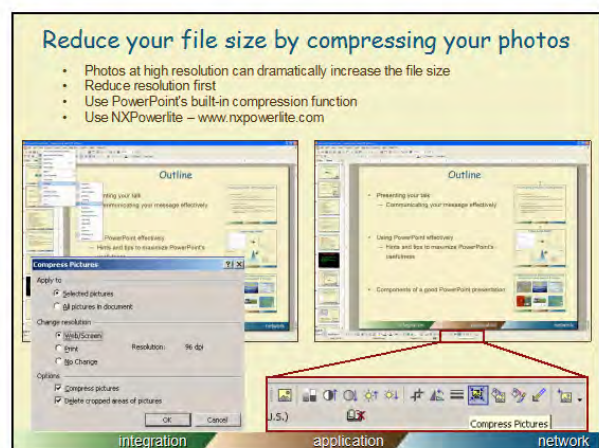
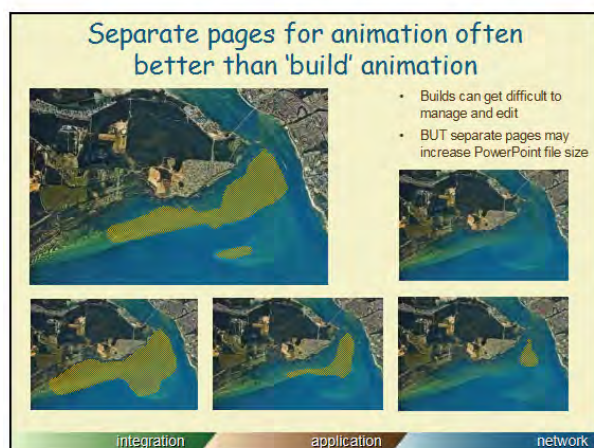
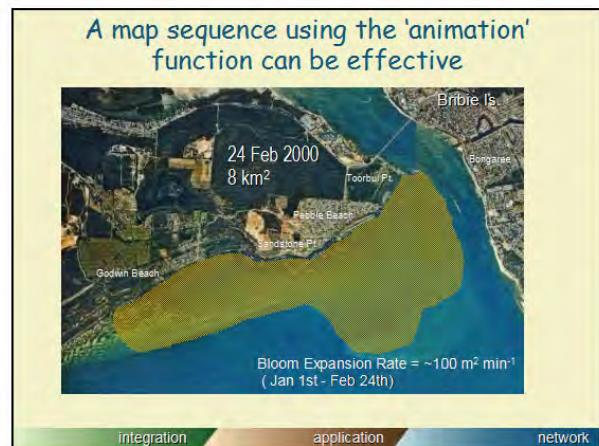
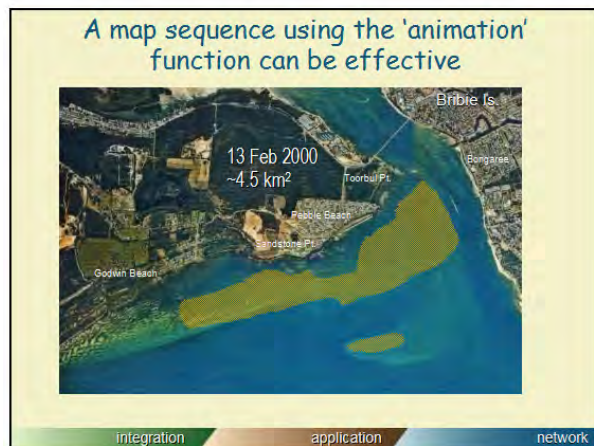
integration application network

Combine visual elements



integration application network



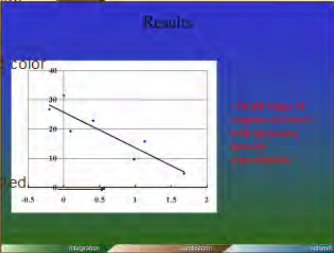


PowerPoint presentations can be poorly organized

Boring title gives no clue to slide contents

Bad font and color choice

Poorly formatted graph



Text box with poor left alignment; bad font and color

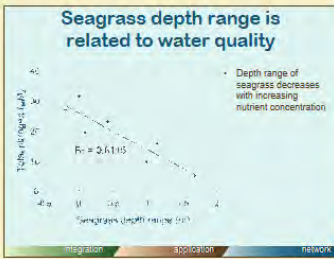
integration application network

PowerPoint presentations can be poorly organized

Active title sets the scene

Good color and font choice

Data is well formatted and legible



Text box aligned properly; good color and font choice

integration application network

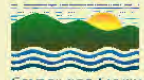
Designing a good scientific PowerPoint presentation

- Title slide – title, authors, affiliations
- Outline of talk – explain organization & preview conclusions
- Body of talk – format consistency, on-going summaries (e.g. 'active' titles)
- Conclusions – take-home messages, stimulate questions
- Acknowledgements – specify roles
- Extra slides for questions

integration application network

The title contains the most important words of a scientific presentation

Author's name




University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Author's affiliation can be represented with a logo
Multiple authors common: each can be noted with affiliations


integration application network

Title slides: Visual elements can introduce yourself & the topic



integration application network

Outline slides: An outline can be a guide to the talk and can provide conclusions



integration application network

Methods slides: Visual elements can describe the experimental approach

Zostera capricorni and light: Laboratory experiments

Light measured: 100%, 50%, 20%, 10%, 5%
Duration: 24 h
Parameters: Growth, biomass, pigments, tissue nutrient content, SVC

Simulated sediment production

Subs. Soil, Add water, Benthic, Sediment, Burrowing
Sewer simulates clay sediments

Methods - *C. fasciata* distribution

- Repeated benthic surveys from 1986 throughout Moreton Bay
- Bioreactors track estimated benthic cover and species composition

Sewage plume mapping

Map showing plume extent and sampling locations

Seagrass depth range monitoring

Photograph of seagrass beds at different depths

Vine accelerometer method

Diagram showing accelerometer on seagrass vine

integration application network

Results slides: Data-rich figures can provide both detail and the big picture

Nutrients can increase photosynthesis

Graphs showing photosynthesis rate vs. nutrient concentration

Vertical distribution in sediments

Graphs showing nutrient profiles in sediments

Distribution of plant material along the turtle digestive tract

Diagram showing plant material distribution in a turtle's digestive tract

Phytoplankton composition

Graphs showing phytoplankton community structure

Total water column iron

Graphs showing iron concentrations in the water column

Increasing seagrass area

Map showing seagrass distribution and area increase

integration application network

Data summary slides: Conceptual diagrams can be used to synthesize data

Folio issues: Climate change

Conceptual diagram of climate change impacts

Nutrient inputs to the west Yucatan Peninsula

Map showing nutrient inputs and flow

Coral reef responses to added nutrients

Diagram showing coral reef responses to nutrient addition

Shrimp farm - conceptual diagram

Diagram showing the relationship between shrimp farming and the environment

Zostera community

Map showing Zostera community distribution

integration application network

Conclusions slides: Dot points link to your questions; background photos can be used

Conclusions

- Determined that seagrass responses to light reduction (partial and strong) are similar
- Identified positive physiological characteristics of increasing seagrass loss (water column, chlorophyll, etc.)
- Seagrass beds of high water column light requirements are, overall, during light deprivation

Light levels (measured) affect depth of light of different seagrass species (e.g., *Thalassia*)

Summary

- Repeat light curves in terrestrial and marine plants can be used to assess a range of ecosystem responses
- Ability to generate repeatable results, non-destructive to seagrass, water column, and sediment
- Comprehensive, repeatable, non-destructive, and non-invasive
- Repeatable, non-destructive, and non-invasive

Conclusions

- Thalassia as an effective bioindicator for the Caribbean
- Use of repeatable, non-destructive, and non-invasive methods to assess seagrass health and community structure
- Repeatable, non-destructive, and non-invasive methods to assess seagrass health and community structure

Summary

- The *Thalassia* blooms
- Have a significant impact on both seagrass and benthic invertebrates
- Can cause competition with both seagrass and benthic invertebrates
- Increases in *Thalassia* blooms may be related to OTC reduction
- Direct implications for seagrass food webs

Conclusions

- A wide range of morphological and physiological responses to light and nutrients can be used to assess seagrass health and community structure
- Repeatable, non-destructive, and non-invasive methods to assess seagrass health and community structure

Conclusions

- Seagrass health indicators, based on management objectives, can be monitored, measured and compared
- Repeatable, non-destructive, and non-invasive methods to assess seagrass health and community structure

integration application network

Acknowledgements slides: List participants by category or institution

Acknowledgements

List of participants and institutions

Acknowledgements

List of participants and institutions

Ecosystem health

Logo and information for Ecosystem Health

Acknowledgements

List of participants and institutions

Acknowledgements

List of participants and institutions

Acknowledgements

List of participants and institutions

integration application network

Principles of effective Science Communication

Principles of effective science communication

Jane Thomas

Workshop on Science Communication for Southeast Asia and South Asia
12-14 September, 2005
Bangkok, Thailand

 jthomas@umces.edu
<http://ian.umces.edu> 

integration application network


Principles of science communication

1. Provide synthesis, visualization & context
2. Get real; relate to audience – big picture to local relevance
3. Simplify terms but not content
(don't *dumb it down*, do *raise the bar*)
4. Assemble self-contained visual elements
5. Consistent *style and format*
6. Lose the jargon, dude
7. Define all terms, e.g. SE = Standard Error
8. Minimize AU (Acronym Use)
9. Engage audience: prepare for and invite questions
10. Use *color*, but use it judiciously

integration application network

Develop a consistent style and format

- Within products, and also between products
 - Newsletters, presentations, websites, books
- Train your audience
- Use *Master Slide* or *Master Page* functions to ensure consistency



Newsletter Book Presentation Website

integration application network

Typography is the art of words

- Spelling and grammar
- There are two types of fonts – serif, and sans serif

Serif Sans serif

Serif fonts have small decorative strokes at the ends of characters. *Sans serif fonts lack these strokes.*

Serif fonts	Sans serif fonts
Times New Roman	Arial
Garamond	Century Gothic
Palatino	Helvetica

This is a serif font. Which of these fonts is easier to read?

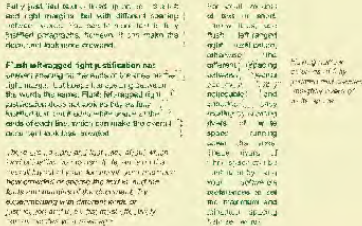
This is a sans serif font. Which of these fonts is easier to read?

- Sans serif fonts are more readable from a distance

integration application network

Typography is the art of words

- Text justification depends on layout, how much text you have, and medium (presentation, book, etc)



integration application network

Use color, but use it judiciously

- Use color judiciously, especially *red* and *green*
- Contrast between your background, and text/graphics is important
- Improper use of color can alienate your audience



integration application network

Some color combinations are hard to read

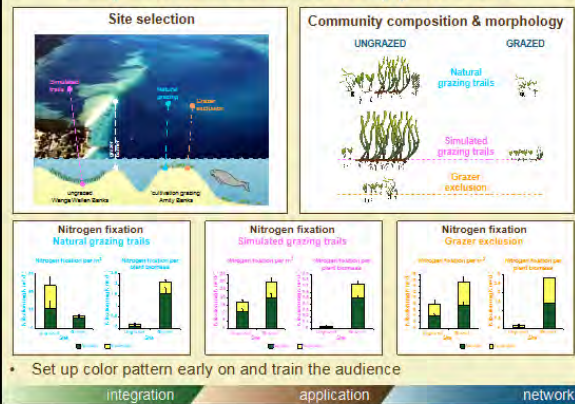
- Some people find green and red hard to distinguish
- Green and red are often associated with a subjective value (good or bad), and so are very powerful colors

integration

application

network

Proper use of color is very powerful

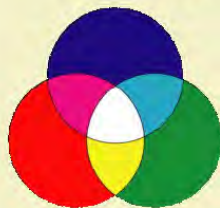


integration

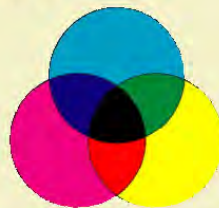
application

network

RGB vs. CMYK



- Red, Green, Blue
- Transmitted light (presentations, websites)
- Mixing the colors results in white light
- Absence of color results in black



- Cyan, Magenta, Yellow, black
- Printed ink (posters, newsletters)
- Mixing the colors results in black ink
- Absence of color results in white (or the background color)

integration

application

network

Use the right resolution



- Resolution differs between different media
 - Printed products need 300 DPI
 - Presentations and websites need 96 DPI
- Using the right resolution for your communication will ensure your graphics are clear, and will also help with managing file size

integration

application

network

Image types and formats

- **Raster/bitmap graphics** (photos, scans; resolution-dependent)
 - TIFF CMYK or RGB; large file size due to lossless compression
 - JPEG CMYK or RGB; small file size due to lossy compression
 - GIF RGB; small file size due to less colors; use on websites; transparency
 - PNG RGB; relatively new format; transparency
 - EPS CMYK or RGB; usually just for spot color images
- **Vector graphics** (created using software; resolution-independent)
 - EPS CMYK or RGB; maintains resolution independence

Bitmap images Vector images JPEG, TIFF or EPS bitmap images GIF or PNG-RS bitmap images PNG-24 bitmap images



integration

application

network

Image types and formats

Destination	Resolution	Color format	Image format
Print	300 DPI	CMYK	EPS, TIFF, JPG
Screen	96 DPI	RGB	PNG, GIF, JPG

- It is worth the time and effort to create graphics for both printing and presentations
 - Optimize file size
 - Once you have the different formats, you can use them over and over again

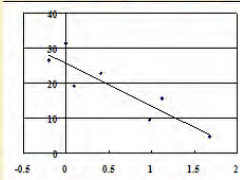
integration

application

network

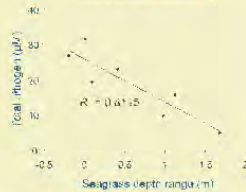
Graph formatting makes all the difference

Bad (or no) formatting



- Boxes, gridlines and white background are distracting
- Axes not labelled, y-axis obscuring data
- Boring black and white

Good formatting



- Transparent background, no boxes or gridlines
- Large labelled axes
- Contrasting colors

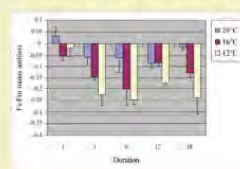
integration

application

network

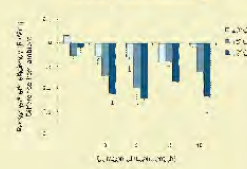
Graph formatting makes all the difference

Bad (or no) formatting



- Boxes, gridlines and white background are distracting
- Axes not clearly labelled, too many tick marks on y axis
- Excel default colors

Good formatting



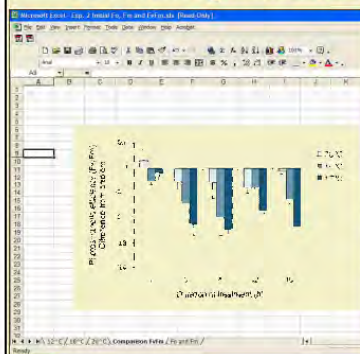
- Transparent background, no boxes or gridlines
- Large labelled axes
- Contrasting colors

integration

application

network

Get them right in data software first



- Use colored background box to facilitate color matching
- Remove graph background
- Remove grid lines, borders & unnecessary legends (i.e. if only one data series)
- Clean up extra tick marks and increase intervals between marks
- Label axis with title and units
- Select text and right click to format (subscript, etc)
- Delete colored background

integration

application

network

Try to avoid tables ...

Region	EHI	Region area (km ²)	% area region	DO	Secchi	Chl a	TP	TN	g ¹⁶ N
Upper Patuxent	0.21	21	13	0.66	0.00	0.34	0.00	0.09	0.15
Middle Patuxent	0.52	61	37	0.91	0.00	0.26	0.28	0.87	0.80
Lower Patuxent	0.46	53	32	0.99	0.00	0.37	0.18	0.47	0.63
Mouth Patuxent	0.58	30	18	1.00	0.00	0.38	0.95	0.53	0.62
Patuxent Overall	0.48	165	100	0.92	0.00	0.33	0.33	0.58	0.70
Upper Choptank	0.20	16	4	0.26	0.00	0.24	0.00	0.00	0.71
Middle Choptank	0.26	88	24	0.95	0.00	0.04	0.06	0.06	0.42
Lower Choptank	0.44	160	43	1.00	0.00	0.24	0.59	0.39	0.40
Mouth Choptank	0.49	109	29	1.00	0.00	0.62	0.53	0.38	0.42
Choptank Overall	0.40	373	100	0.96	0.00	0.30	0.42	0.30	0.43
Cape Charles City	0.75	N/A	N/A	nd	0.75	0.75	0.63	1.00	0.63

integration

application

network

... or format them right

Region	EHI	Region area (km ²)	% area region	DO	Secchi	Chl a	TP	TN	g ¹⁶ N
Upper Patuxent	0.21	21	13	0.66	0.00	0.34	0.00	0.09	0.15
Middle Patuxent	0.52	61	37	0.91	0.00	0.26	0.28	0.87	0.80
Lower Patuxent	0.46	53	32	0.99	0.00	0.37	0.18	0.47	0.63
Mouth Patuxent	0.58	30	18	1.00	0.00	0.38	0.95	0.53	0.62
Patuxent Overall	0.48	165	100	0.92	0.00	0.33	0.33	0.58	0.70
Upper Choptank	0.20	16	4	0.26	0.00	0.24	0.00	0.00	0.71
Middle Choptank	0.26	88	24	0.95	0.00	0.04	0.06	0.06	0.42
Lower Choptank	0.44	160	43	1.00	0.00	0.24	0.59	0.39	0.40
Mouth Choptank	0.49	109	29	1.00	0.00	0.62	0.53	0.38	0.42
Choptank Overall	0.40	373	100	0.96	0.00	0.30	0.42	0.30	0.43
Cape Charles City	0.75	N/A	N/A	nd	0.75	0.75	0.63	1.00	0.63

- No vertical lines, minimize horizontal lines, use color and fonts to emphasize data

integration

application

network

Format maps to include more information

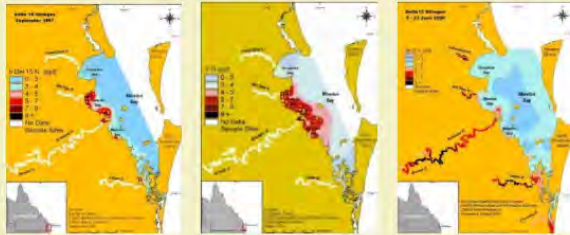


integration

application

network

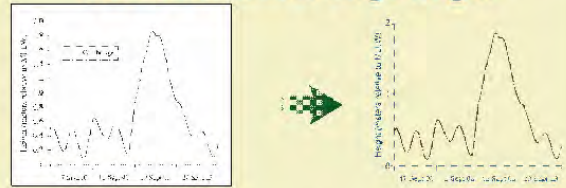
A map sequence can show temporal changes



- Improvements or degradation over time can be highlighted by a series of maps
- Consistent layout allows comparisons
- Maps should have scale and compass direction
- Maps should have a legend that is self contained & legible

integration application network

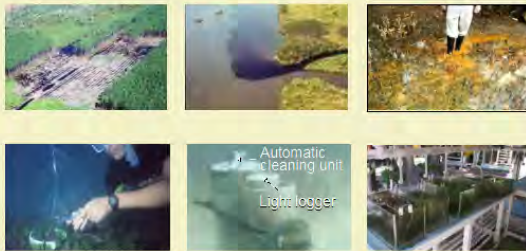
Hurricane Isabel surge height



Default Excel You + Excel You + Illustrator

integration application network

Cropping and annotation of photos can be very informative



Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance

integration application network

Crop, align, and label photos carefully



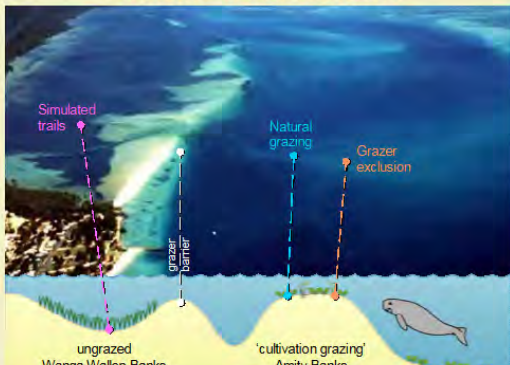
Photos that are well chosen, cropped, aligned, distributed evenly and annotated provide information on methods, study site, description & relevance

Clear labeling of photos

Pay attention to alignment & overlapping

integration application network

Combine visual elements



integration application network

I am here to help you

Jane Thomas

Science Communicator

jthomas@umces.edu
http://ian.umces.edu



integration application network

Effective Communication Using Posters

Effective communication using posters



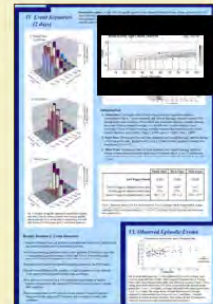
integration

application

network

Outline

- Types of posters
- Software and general approach
- General design principles
- Titles and text size
- Use maps and aerial photos for context
- Colors
- Time and handouts
- Essential rules and tips



integration

application

network

Types of science posters



Specialist scientists

Target audience determines mix of poster elements



Informed public



General public

Formatting tip: if in doubt, use a plain background

integration

application

network

Types: Technical/methods

- Audience – specialist scientists
- Includes – detailed methods
- Capturing attention less important
- Need to justify key elements of techniques
- But... still includes photos/maps/conceptual diagrams



integration

application

network

Types: Informed public

- Audience – informed public or non-specialist scientists
- Includes – clear syntheses
- Capturing attention – important
- Needs to summarize information
- Conceptual diagrams, maps and photos very useful tools



integration

application

network

Types: General public

- Audience – general public
- Includes – message, no justification
- Capturing vital attention
- Need to be visually attractive
- So... Good photos are key



integration

application

network

Start right — use the right software!



- Adobe *InDesign* – best...
 - graphics files can be linked
- Adobe *Illustrator* – good...
 - files get large
- Microsoft *PowerPoint* – avoid at any cost!
 - Inflexible and printing difficulties

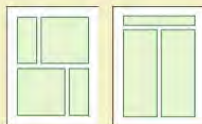
integration application network

Design principles for effective posters

- Balance
 - Grouping
 - Alignment
 - Contrast and emphasis
 - Blank space
- integration application network

Balance

These designs are symmetrical

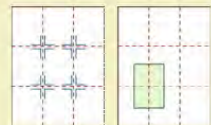


The left design is balanced, the right creates tension

integration application network

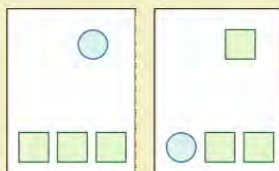
Balance

Dividing in thirds is often more subtle than dividing in halves



integration application network

Grouping



- Proximity of objects can be used to imply association – whether objects are similar or different

integration application network

Alignment



- Alignment can be used to help draw a reader through a poster
- Center alignment of text can be difficult to read

integration application network

Contrast and emphasis

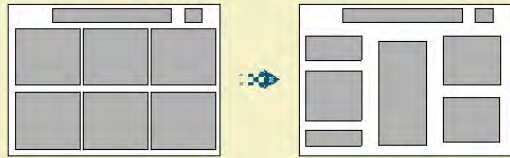
Contrast with color

Contrast with TYPE

Contrast with SIZE

integration application network

Blank space helps readability



- No blank space creates a 'crowded' feel
- Blank space is easier to read, and allows for flow between sections

integration application network

Mock up and review, review, review

Depth range and light requirements of the seagrass *Zostera capricorni* in Moreton Bay, Australia


Bio-indicators	Abstract	Methods
Results & discussion	Aims	Results & discussion
Results & discussion	Satellite photo	Results & discussion
Results & discussion		Conceptual synthesis

Title → Mock layout → Final poster

- Start with fundamental message – the title
- A mock layout helps plan balance and flow
- Does it work? Get input from others
- Run the 10 second test (the time available on average to get a reader's attention)
- Check the required size of the poster

integration application network

Use a short, active, large title




Ineffective → Effective

- The one main message of the poster should be summarized in the title
- Title can be a statement or a question
- If you can't read it from 25-30 feet/10 metres, it is too small
- Use sans serif font at 96 pt (2 inch/5 cm high letters)

integration application network

Authors and affiliations second only to title




Ineffective → Effective

- Authors' names should be easily legible
- Put authors' names at top
- Include relevant, high quality logos (not web grabs)
- Photo of principal author is useful

integration application network

Clear large text should be used to support graphics



Ineffective → Effective

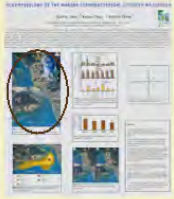
- Use a clear, system font (e.g. Arial)
- 0.5 inch/1 cm tall when printed, i.e. approx. 24 pt
- Use bullet points and extended legends (not an essay)
- Include white space to avoid clutter, avoid 'box-itis'

integration application network

Use photos/maps for context, not decoration!



Ineffective



Effective

- Need to provide good context (maps/aerial photos)
- Photos should AT LEAST have a caption, no decoration!
- Distinguish captions from the rest of the text

integration

application

network

Use active subtitles



Ineffective



Effective

- No editors – no hard and fast rules!
- Replace methods/results/discussion with synthetic active subtitles

integration

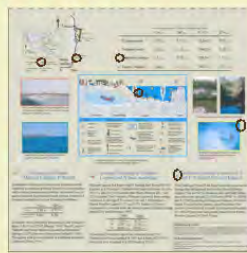
application

network

Judicious use of color



Ineffective



Effective

- Subtle background and one or two high contrast text colors
- Colors and icons can be used to link photos/figures & text

integration

application

network

Photo-strips can be effective



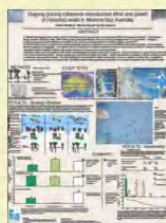
But ensure that photos are labeled and relevant

integration

application

network

Do you have a week of your life to spare?



3 – 5 days



8 – 10 days

An effective poster takes time, even after all the data is analyzed

integration

application

network

Make handouts

- Should be able to read text printed at A4
- Ensure your address is readable



integration

application

network

A poster is an advert not a review!!

- Title: concise, take home message, large
- Authors, affiliations, acknowledgements clearly legible
- Use self explanatory, stand-alone graphics
- Two or three subtle colors, can use to link elements
- Be aware of audience – importance of attention grabbing
- Think twice before using a photo as background
- Take time to review poster – is everything justifying the title?
- Provide handouts of the poster
- Create the file at full size; use CYMK to print
- Provide PDF as well and all fonts (or use system fonts)

integration

application

network

Conceptual Diagrams

Conceptual diagrams

A tool for effective science communication

Dr. Tim Carruthers

Workshop on Science Communication for Southeast Asia and South Asia
12-14 September, 2005
Bangkok, Thailand

University of Melbourne
CENTRE FOR ENVIRONMENTAL SCIENCE

integration application network

What is a conceptual diagram?

'Concept' from Latin 'conceptus' (meaning *thought*); something conceived in the mind (Webster's 3rd Dictionary, 1986)

'Diagram' from Greek 'diagramma' (meaning *to mark out by lines*); a graphic design that explains rather than represents, a drawing that shows arrangement and relations (Webster's 3rd Dictionary, 1986)

'Model' from Latin 'modulus' (meaning *small measure*); an abstract representation of a system or process (Turner, Gardner & O'Neill, 2001)

Conceptual diagram = A diagram using symbols that depicts the essential attributes of a system

integration application network

Why use conceptual diagrams?

- Helps to clarify thinking (words can be ambiguous; an image commits to the message being portrayed)
- Communication (one-way and two-way – idea presentation and idea development)
- Identify gaps / priorities / essential elements
- Develop syntheses (or present synthesis)

integration application network

Conceptual diagrams provide an interface

Science Conceptual diagram Community

Current understanding → Shared vision → Priorities & environmental values

Credibility & support → Shared vision → Commitment & resources

integration application network

Good conceptual diagrams are used extensively

Z scheme of photosynthesis

Plate tectonics

integration application network

Darwin used conceptual diagrams to explain his theory of coral reef formation

integration application network

Conceptual diagrams use symbols: an ancient technique to depict unequivocal messages



Cave drawing
(Australian aborigines)



Darwin's conceptual diagram



integration

application

network

Symbols (icons) are a key element of conceptual diagrams

- **'Symbol'** from Greek 'symbolon' (token of identity) and Latin 'symbolum' (token, sign)
- **'Icon'** from Greek 'eikon' (to resemble); pictorial representation
- A sign that signifies by virtue of sharing a property with what it represents
 - something that stands for or suggests something tangible
 - a visible thing that stands for something invisible or intangible
- Symbols used in mathematics (e.g. π), chemistry (e.g. ^{210}Pb), music (e.g. $\frac{3}{4}$), weather (e.g. ☁), religion (e.g. ☪), corporations (e.g. Nike), and organizations (e.g. +)
- Symbols can be universal; language independent
- Symbols are scalable; size of symbol can represent relative importance (e.g. small vs. large)
- Symbols can be information-rich: size, shape, color and position of symbols can convey information

integration

application

network

Both shape and color of symbols can be important for recognition



integration

application

network

Symbols are an important feature of everyday life



Shape, color, and images used for traffic signs

integration

application

network

In conceptual diagrams, as in maps, symbols need to be explained in a legend

Map legend



Conceptual diagram legend

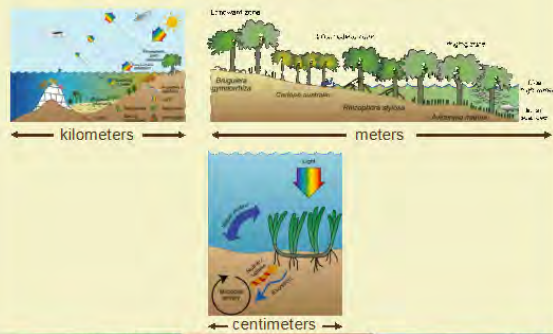


integration

application

network

Conceptual diagrams can depict processes at different scales...

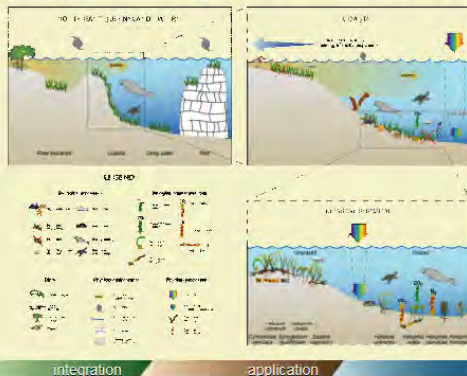


integration

application

network

Conceptual diagrams can be nested



integration

application

network

Conceptual diagrams are not...



... cartoons

integration

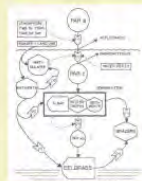
application

network

Conceptual diagrams are not...



... cartoons



... model relationships

integration

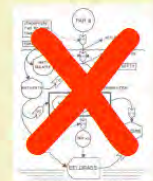
application

network

Conceptual diagrams are not...



... cartoons



... model relationships



- ... colored box & arrow diagrams

integration

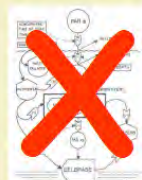
application

network

Conceptual diagrams are not...



... cartoons



... model relationships



... colored box & arrow diagrams

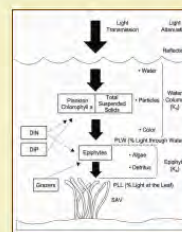
... A REPLACEMENT FOR GOOD,
WELL INTERPRETED DATA !

integration

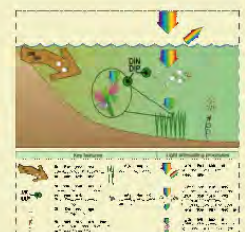
application

network

Conceptual diagrams can augment the effective communication of scientific understanding



Conceptual diagram
that needs two pages
of explanatory text

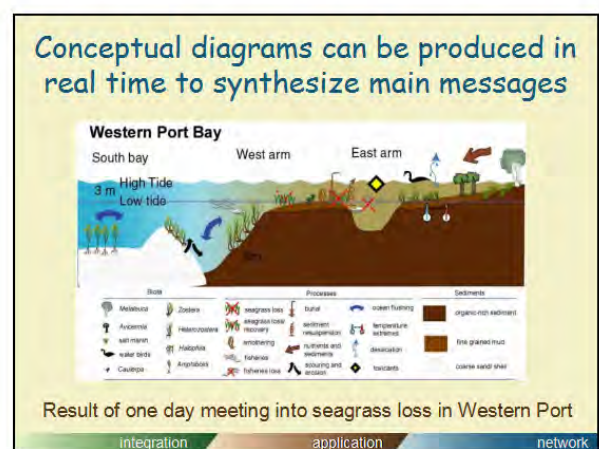
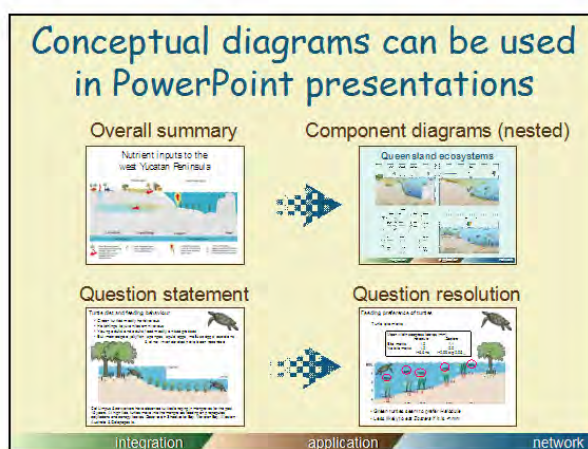
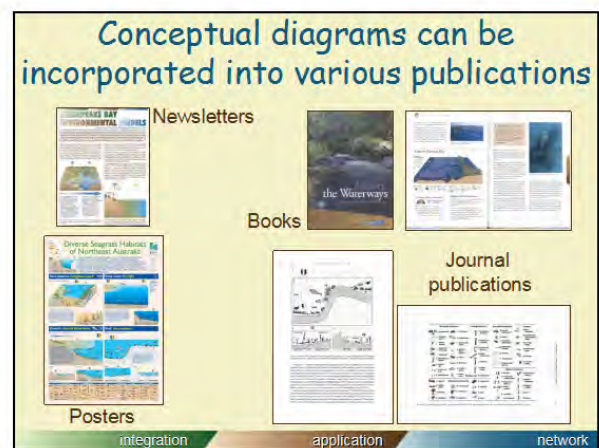
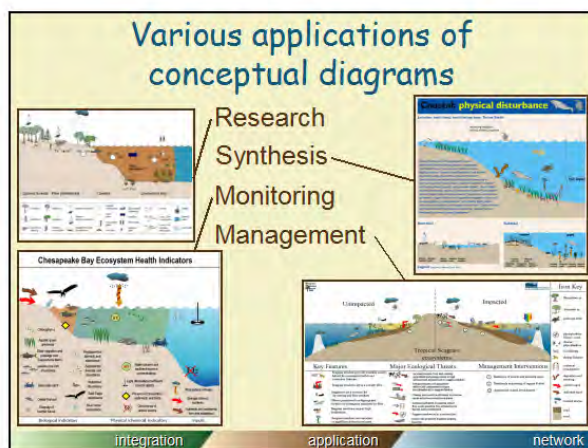
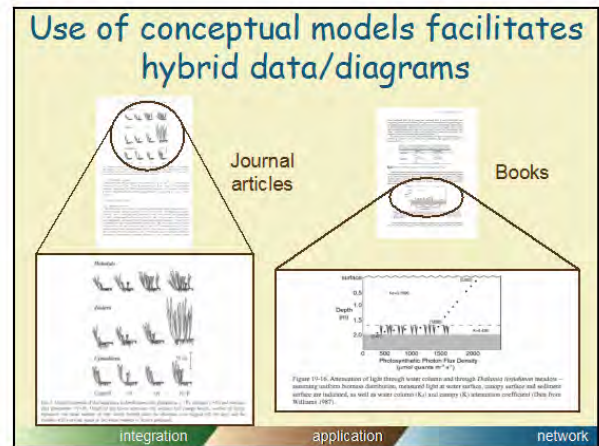
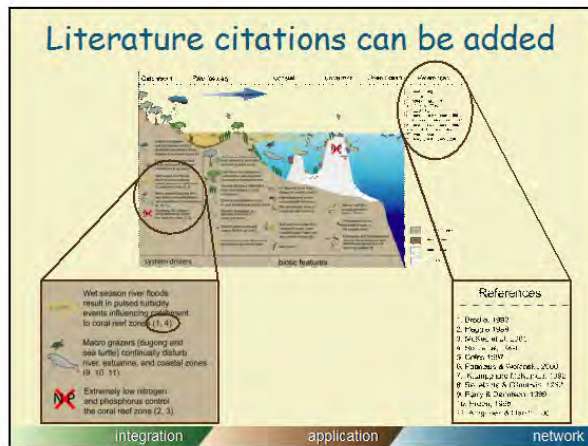


Conceptual diagram
with stand-alone legend

integration

application

network



The Ten Commandments of conceptual diagrams...



1. Thou shalt honor thy audience
2. Thou shalt simplify
3. Thou shalt not use garish colors or apply colors inconsistently
4. Thou shalt use legends in thy diagrams
5. Thou shalt not covet a single style
6. Thou shalt not be constrained by geometry
7. Thou shalt use arrows sparingly
8. Thou shalt not be afraid of making new symbols
9. Thou shalt revise and revise and revise ...
10. Thou shalt use diagrams for peer and non-peer audiences

integration

application

network

Computer technology has revolutionized the way we assemble material



integration

application

network

Conceptionary

Concept: Acid rain kills forests

Definition: Acidification of rainfall by emissions kills trees

Keywords: Atmospheric pollution (NO_x)
Acid rain
Tree death

Each person is timed and has to draw the concept for others to guess – all keywords must be written down to finish

integration

application

network

Dumplings in a teapot

Pitiwong Tantichodok
Walailak University
Nakhon Si Thammarat
Thailand
tpitiwon@wu.ac.th

“茶壺里煮餃子，倒不出來”

“chá hú lǐ zhǔ jiǎozi, dào bù chū lái.”

*boiling dumplings
in a teapot,
no way to get them out*



What I am going to talk about?

Science Communication with the public

Knowledge and Communication

Communication in
Integrated Coastal Zone Management

Coastal Information Center

Nemo Project

Science Communication with the public

- One way communication or monologue
- Two or more way communication or dialogue
 - Not limited to face to face conversations
 - One to one
 - One to many
 - Many to many
 - Many to one

Science Communication with the public

- One way communication or monologue
 - Information dissemination
 - One to one
 - One to many
 - Putting out information with no expectation of response

Science Communication with the public

- Two or more way communication or dialogue
 - Consultation
 - Seek advice from the public
 - One to one, one to many
 - Public hearing, public meetings
 - Interactive meetings, focus groups
 - Deliberative meetings, consultative panels
 - Consensus meeting, Delphi technique
 - Web board or web discussion

Science Communication with the public

- Two or more way communication or dialogue Engagement
- Stimulate the public interest and raise the awareness in science or coastal zone issues
- Meetings and debates, lectures
- Events –science fair or festivals
- Museum, Science Centers, Interpretation Centers
- Extension Programs
- Shopping Centers

Science Communication with the public

- Written forms
- Conversation forms
- Paper-based forms
- Electronic forms
- Exhibition, Displays, Campaigns
- Media: radio, T.V., movies, documentaries

Paradigm for community development

- Self dependence (people empowerment)
- Sustainability
- Knowledge-based development

Knowledge-based Society

- Learning society
Life-long learning/education
- Dynamic rather than static
- Knowledge production
Knowledge management

What is knowledge?

-Body of information that might consists of facts, opinions, ideas, theories, models principles, subject matter

or

-Acquaintance with facts, truths, or principles, as from study or investigation

The stuff in books, computers, etc is regarded as information or data,

but it is stored in peoples' heads as KNOWLEDGE.

Definitions of terms

Data -facts assumed to be a matter of observation

Information -data communicated or received concerning some facts or circumstance; data that has been interpreted to some extent

Knowledge -acquaintance with facts, truths or principles from study or investigation; implying a level of understanding of the system or issue

Wisdom -knowledge of what is true or right coupled with just (right) judgment as to action; implying capacity to apply knowledge to reach sound judgment



Oceans of data

Rivers of information

Small puddles of knowledge

And the odd drops of wisdom

We are drowning in information

If you don't understand the stuff you are reading, then it's still information, not knowledge.

Knowing that
-facts and information

Knowing how
-the ability to do something

Knowledge can be divided into 2 categories:

Explicit knowledge

Explicit knowledge is systematic and easy to formalize.

Facts, instructions, safety protocols, manuals, data etc.

Tacit knowledge

Tacit knowledge is difficult to say in writing and is acquired through personal experience.

Crafts, swimming, driving, activities, etc

Use tacit knowledge to solve problems.

Explicit knowledge

Explicit knowledge can be handled by technology.
Books, web, MIS (Management of information system) etc.

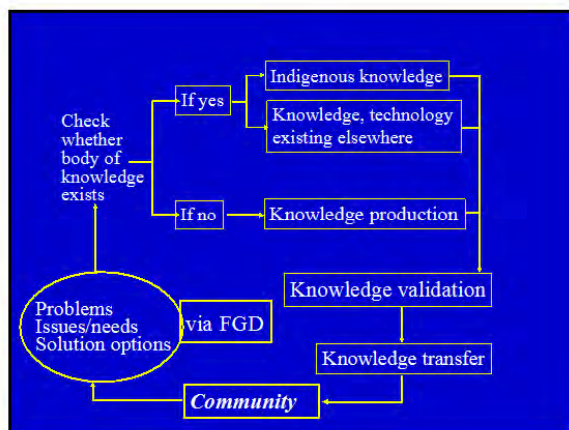
Tacit knowledge

Tacit knowledge cannot be managed and cannot be documented.
Transferred through relationship.
But we can manage the environment that encourages or facilitates the exchange of information.

Knowledge Management [KM]

developed by business management and organizational practitioners/ theorists in early 1990s.

KM is the way that organizations create (knowledge creation), capture (knowledge capture), share (knowledge sharing), and use knowledge to achieve the objectives.



Knowledge Management

- Check stocks of body of knowledge, e.g. indigenous knowledge, existing technology from elsewhere
- Knowledge production/creation
- Knowledge validation
- Knowledge application
- Knowledge transfer or transmission
- Knowledge repatriation
- Knowledge sharing
- Knowledge dissemination

Coastal Zone Management

Identification of problem statements, needs, priority of issues, solution options

Techniques used

Focus Group Discussion,
Embedding in the communities,
In-depth Interview,
Mind Mapping,
Card technique



FGD session of rice farmers at Chian Yai, Nakhon Si Thammarat



FGD session of rice farmers at
Chian Yai, Nakhon Si Thammarat



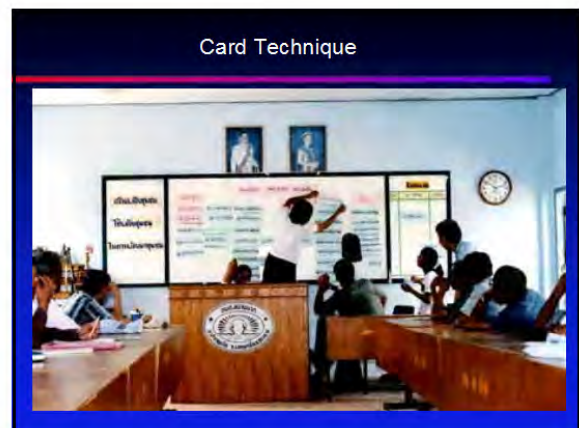
In-depth interview



Timeline chronology with the elder

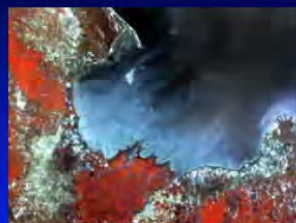


Mind-mapping



Card Technique

Coastal Information Center

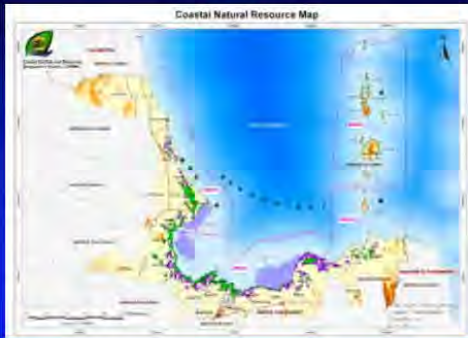


Ban Don Bay,
Surat-thani

Coastal Information Center



Coastal Information Center



Coastal Information Center

Ban Don Bay
Coastal Habitats and Resources Management
[CHARM] Project
– EU and Department of Fisheries, Thailand

focuses on Ecosystem-based management

Ecosystem-based Management

McLeod, K. L., J. Lubchenco, S. R. Palumbi, and A. A. Rosenberg, 2005,

Scientific Consensus Statement on Marine Ecosystem-Based Management.

Signed by 219 academic scientists and policy experts with relevant expertise and published by the Communication Partnership for Science and the Sea

Released on March 21, 2005

Ecosystem-based Management [EBM]

Managing the whole system with multiple interacting parts, not just one part at a time.

EBM depends on best available scientific research and information to determine the ecological interactions and processes necessary to sustain ecosystem structure and function

Preservation of Marine Biodiversity

Co-management and Participatory Governance

Adaptive Management

Ecosystem-based Management [EBM]

- More science and information to support decision-making
- understand natural resource interrelationship, and focus on sustainability of the whole ecosystem

Ecosystem-Based Management Requires More Scientific Information

Coastal Information Center [CIC]

CIC acts as a clearinghouse

a place whose function is to
acquire,
manage,
and distribute or disseminate
information to interested parties

Coastal Information Center [CIC]

CIC will be developed as a repository for

- research information,
- local environmental and resource information
- local environmental issues,
- EIA studies, monitoring data
- reports, guidelines, information materials from resource management agencies, NGOs, environmental advocacy organizations
- compendiums of symposium, conference, workshops
- international treaties, conventions, agreements

Coastal Information Center [CIC]

CIC should

- facilitate the transfer of information and integration of research results with the coastal management and decision making processes.
- develop a coastal information database and information management system.
- develop a GIS database and facilitate a GIS access to assist in integrated coastal zone management

Coastal Information Center [CIC]

CIC should

- facilitate community involvement and educational outreach programs
- identify stakeholders to be addressed
- determine degrees of understanding the issues and what information stakeholders should have
- tailor messages to that particular audience

Science Camp: Nemo Project



Sending the right message
-marine conservation

But kids did not get the message!!

Nemo Camp

A program at Walailak University to reach out young school students in coastal areas in southern Thailand

- to generate or raise conservation awareness
- to create interest and educate young people in marine environment
- to introduce young students scientific thinking and inquiry

Lecture: wow science, wow biology



Lecture: wow science, wow biology and fun



Lecture: wow science, wow biology and fun



Field investigation (note taking and reporting)



Field investigation (note taking and reporting)



Marine biology drawing and coloring



Drawing and coloring winners



Field sampling and investigation



Field sampling and investigation



Field sampling and investigation



Mobile posters



Donating educational materials to coastal schools



Great learning experience



Language problem in communication?



Use the right kind of utensil to boil dumplings,



then we'll have good-eating dumplings

Case study of effective science communication

Healthy Waterways Partnership

A case study of effective science communication

Ben Longstaff
Science Integrator
(NOAA/UMCES)

and

Eva G. Abal
Science Coordinator
(vseabal@mailbox.uq.edu.au)



www.healthywaterways.org

Presentation Outline

- What is the Healthy Waterways Partnership?
- Communication approaches used by Partnership monitoring program
- Injecting a communication philosophy into the Chesapeake Bay Program

Healthy Waterways Partnership

- Whole-of-government
- Whole-of-community
- Regional
- Partnership

Collaborative approach to understanding, planning for and managing the use of South East Queensland waterways.

Healthy Waterways Vision

South East Queensland, its waterways and catchments will, by 2020, be a healthy ecosystem supporting the livelihoods and lifestyles of residents and visitors and will be managed through collaboration between community, government and industry.



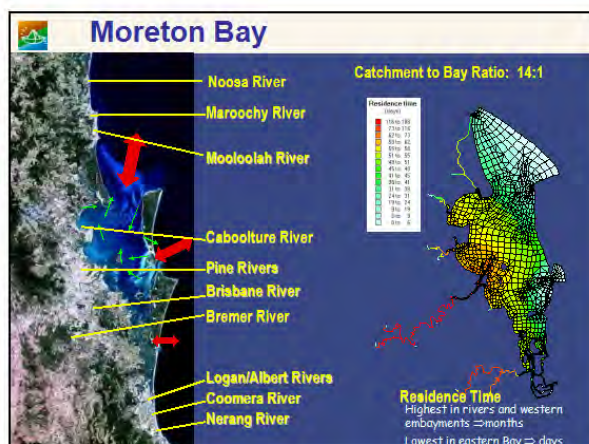
Where are we?



The South East Queensland catchment:

- Population: 2.3 million; Area: 22,672 km²
- Fastest growing region in Australia

"Beautiful one day...perfect the next..."



South East Queensland

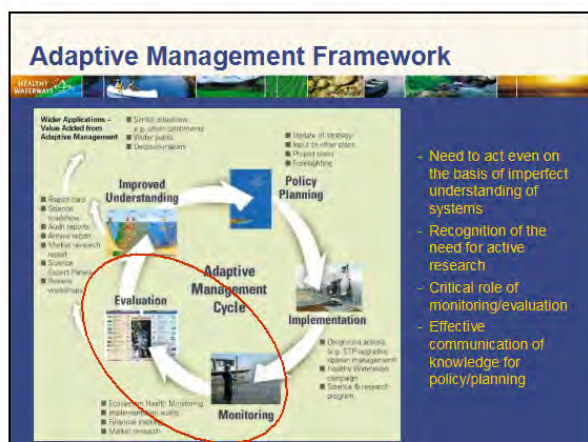
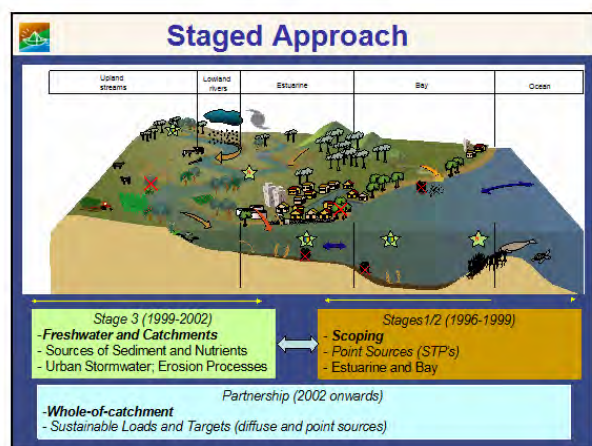
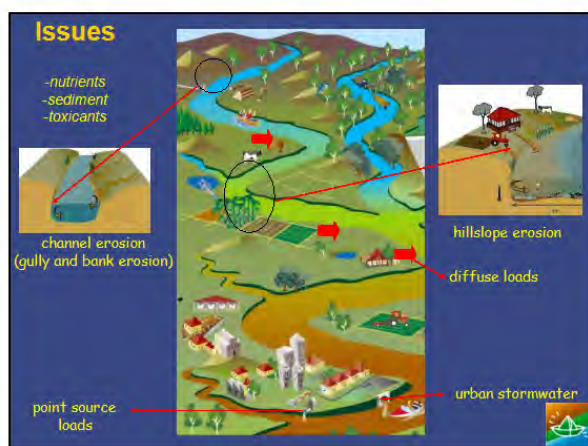
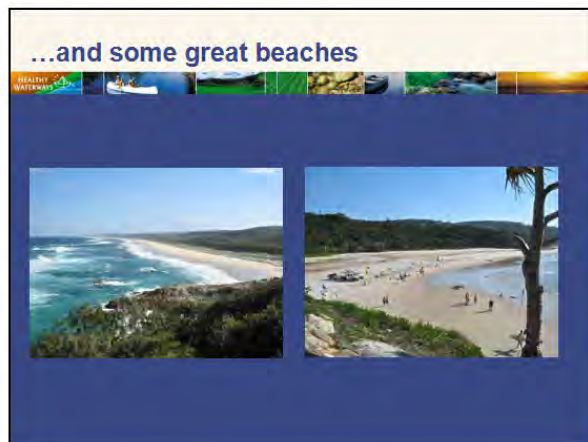
Diversity of waterways with complex habitats and associated communities



Mangroves

...and of immense social, economic and environmental value





A clear identity

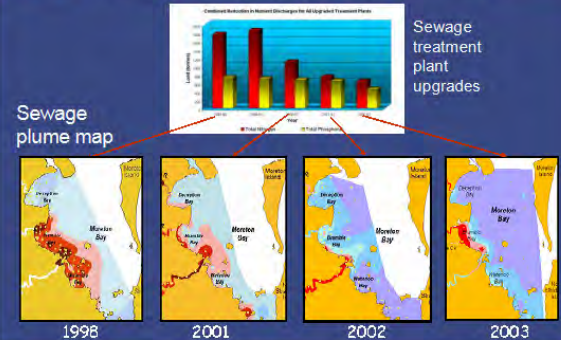
- Many monitoring activities
- Many agencies/organizations
- Many funding sources

→ One monitoring program



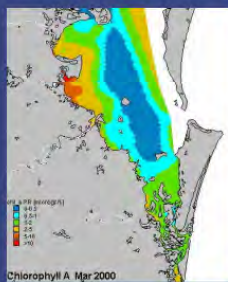
- Easier to coordinate and manage
- Provide unified communication approach
- Improved public profile

Visualization of results



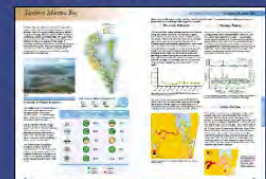
Visualization of results

Chlorophyll-a

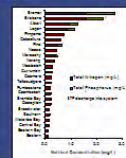


Local and regional stories

What's in my backyard
(Local)



How does my backyard compare
to others
(regional)



Conceptual diagrams

How we monitor ecosystem health

- Moreton Bay Study (1997/98)
- Design and Implementation of Baseline Monitoring task



Zones of anthropogenic impact do not deteriorate

Key Processes operate to maintain stable and sustainable ecosystem

Critical Habitats remain intact

Communication products

- Presentations
- Report Card
- Newsletters
- Website
- Posters



Types of audience

- Government (local, state, federal)
- Industry (including peak bodies and corporate sponsors)
- Community (including special interest groups, schools, wider public)
- Researchers (e.g. universities)



www.healthywaterways.org

EHMP rules of giving presentations

Rule 1


Make the effort – go to the audience (it can be a lot of fun!)

- Upon request
- Annual road show

Rule 2

Tailor presentation to the audience

- Local reference
- Topic



EHMP rules of giving presentations

Rule 3


Be consistent in the message and presentation style




Rule 4

Be enthusiastic and engaged

Ecosystem Health Report Cards



Ecosystem Health Report Cards



How effective was the Report Card?

Monday, 24th November 2003, Sunshine Coast Daily

Water wisdom: a cultural thing
Thursday, 27 November 2003, ABC Network

River of shame
Report shows council's treatment plant is worst polluter

Thursday, 27th November 2003, Sunshine Coast Daily

Council commits to repairing river

Tuesday, 25th November 2003, Sunshine Coast Daily

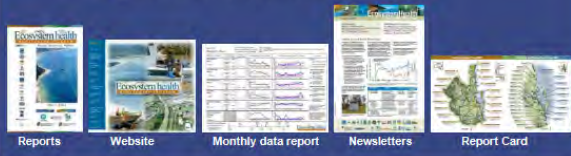
Maroochy seeks help to fix river
We don't have all the answers: Thompson

\$50,000 Research Study – What is the sustainable load for Maroochy River?

Communication central to success

Continual release of communication products

- Keeps stakeholders and community aware of developments
- Increases knowledge of community and stakeholders
- Keep profile of Program raised
- Instigates action (report card)



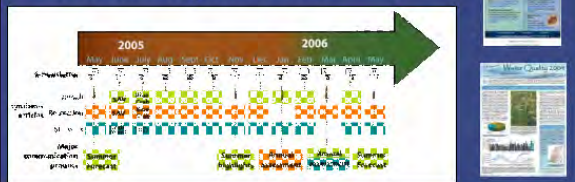
Other Healthy Waterways communication products



Applying these principals to Chesapeake Bay Program

Started a proactive communication cycle

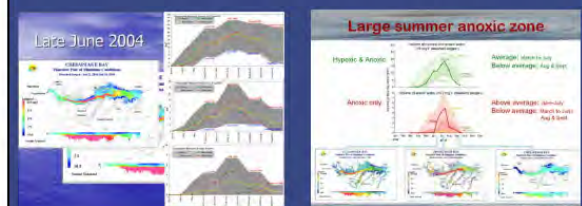
- E-newsletters
- Newsletters
- Report card, forecast, updates
- Current, well organized website



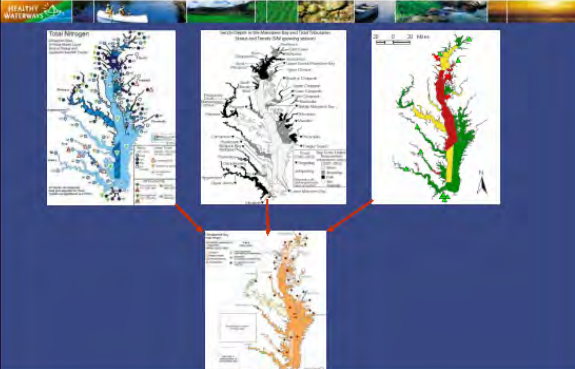
Applying these principals to Chesapeake Bay Program

Insisting on well prepared and effective oral presentations

Which one will get the message across?



Consistency in presentation




Considerations

- Audience (technical, mayors, technical officers, interest groups, general public)
- Purpose/objectives/expected outcomes (update, awareness, funding support, showcase, justification for a management action plan)
- Resources available (budget, venues, personnel)
- Timeframe and frequency (as needs basis)



Do not say a little in many words, but a great deal in a few....
Pythagoras

Any questions?



HEALTHY WATERWAYS

www.healthywaterways.org

Conclusion

The Partnership has produced information-based outcomes which have led to significant cost savings in water quality management by its stakeholders. This has been achieved by:

- providing a clear focus for management actions that has ownership of governments, industry and community.
- targeted scientific researches to address issues requiring appropriate management actions
- management actions based on sound understanding of the waterways, rigorous public consultation/involvement program and strategy development incorporating commitments from all levels of stakeholders
- **effective scientific communication**

Over-all outcome: Healthy catchments-healthy waterways vision



Making it happen. . .

Healthy Waterways Partners

- Queensland Government agencies
- 19 local governments
- Industry (rural and urban)
- Community
- Traditional owners
- Researchers

Operating Philosophy

- Adaptive management framework
- Stakeholder involvement
- Implementation of management actions at the most appropriate level within a regional framework
- Continually improving knowledge for management



Policy Council/Board

- 19 Local Governments
- 6 State Agencies
- Community & Industry rep
- Science Rep

CEO's Committee

SECRETARIAT (12 staff members)

- Administration
- Science and Monitoring
- Planning and Implementation
- Healthy Waterways Campaign

Implementation Groups (5 Groups)

STATE AGENCIES (6)

- Water Quality / Ecological Health
- Catchments and Flows
- Water Supply
- Extractives Industry
- Natural Resource Management/ Environmental Planning
- Waterways Recreation
- River Transport
- Cultural Heritage & Noise

Scientific Advisory Group (scientists from 5 local universities, CSIRO, State Agencies)

Traditional Owners Advisory Group

Community and Industry Advisory Group (c-40 community, catchment, industry, environmental groups)

www.healthywaterways.org

Science Program

- Provide effective communication of scientific principles and research results to stakeholders and the wider community, in collaboration with the Healthy Waterways Campaign
 - ensure communication approaches are relevant to specific audiences
- Facilitate increased community awareness of waterways and catchment issues so as to generate broad support for the Healthy Waterways/Healthy Catchments vision
 - target stakeholder action to protect and enhance the health of waterways
 - increase appreciation of waterways as an important part of lifestyle and culture

www.healthywaterways.org

Objectives

- Update to stakeholders (newsletters, road shows)
 - enhance their current knowledge and awareness
 - facilitate discussion and solicit issues
- assist in development and implementation of management actions
 - justify/request funding (e.g. presentations)
- Seek feedback (e.g. peer review process)
- Showcase the Partnership activities (e.g. Riversymposium)

www.healthywaterways.org

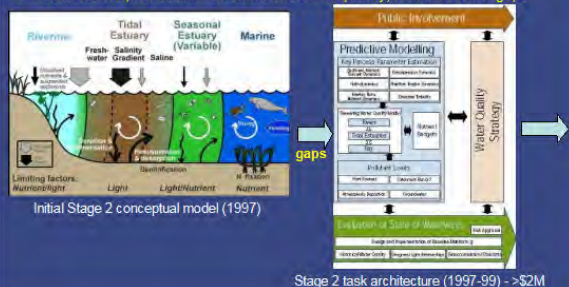
Examples of tools used in science communication

- Conceptual models
- Decision support tools (numerical models)
- Ecosystem Health Monitoring Program
 - maps
 - EHMP Report Cards
- Other products

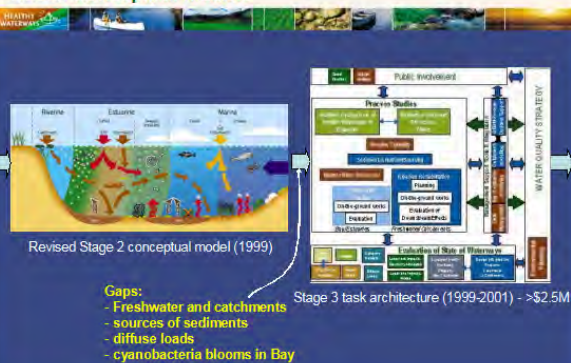
Value of the tools

Examples of Science Communication: use of conceptual models

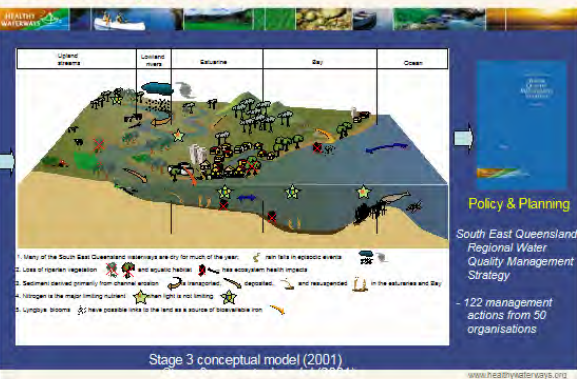
- illustrate and synthesise both preliminary and current understanding of the waterways
- facilitates the prioritisation of issues and consequently, identification of gaps



Examples of Science Communication: use of conceptual models



Examples of Science Communication: use of conceptual models



Implementation of the Plan

