Astronomy Education: From Science Literacy to Cutting Edge Research in the Hands of Students

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SÃO PAULO

XLI Reunião Anual da Sociedade Astronômica Brasileira

4 a 8 de Setembro de 2017

Who are the future leaders of our planet and why Astronomy matters ?

How do we want them to be educated?

This is our planet

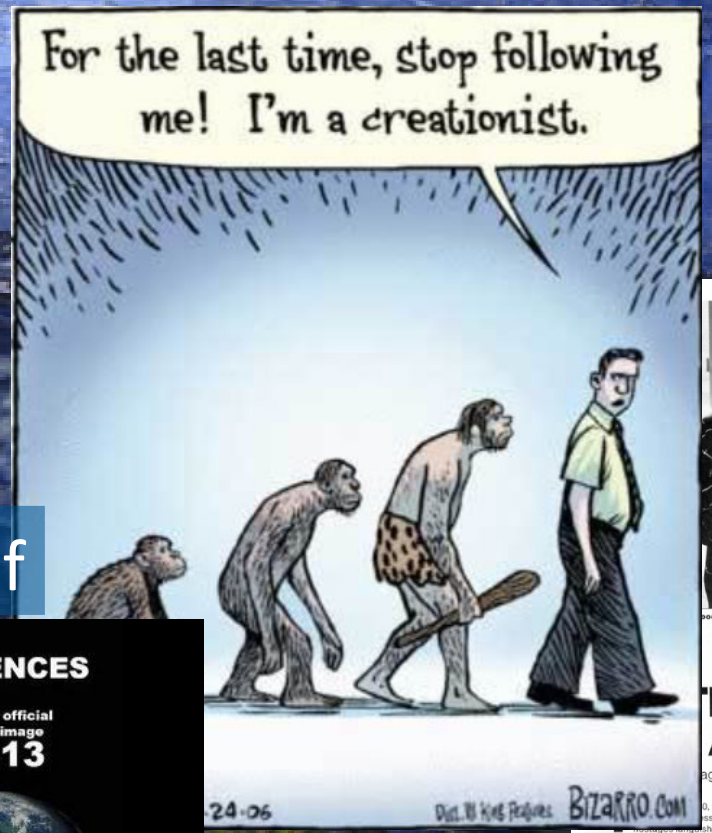
Full of surprises:
Good and bad

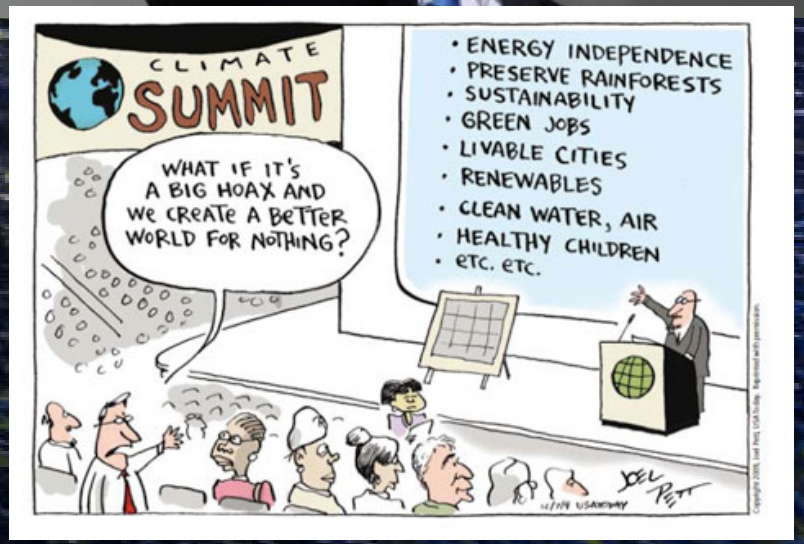
Diverse

Unstructured

Urgent need: EDUCATION and Global Perspective → Global Citizenship Awareness and Science Literacy

Flat Earth Proof





Change the way we educate our children !!!

How about we stop teaching and let students start learning

Give them a sense o wonder .....

Empowerment ....

Equality

INTEGRATED SCIENCE

interdisciplinary science that are linked together, coordinated and unified

Put the students in the center stage. Remember !! It is their future we are talking about !!!

We need critical thinkers, science literate and creative decision makers if we are to survive as a specie


The web of knowlege
The New Way of Learning
YouTube
edX
coursera
KHAN
MOOC
TED
For future generations too
In the new way of learning you can...
24/7
...decide when and where you learn as learning is always accessible.
...choose how & what you learn to fit your personal learning style and development goals
...live the New Way of Learning: you teach and you learn, you network and collaborate

What is expected from a teacher

Not all teachers are obliged to get training !?!?!?!?!?!?

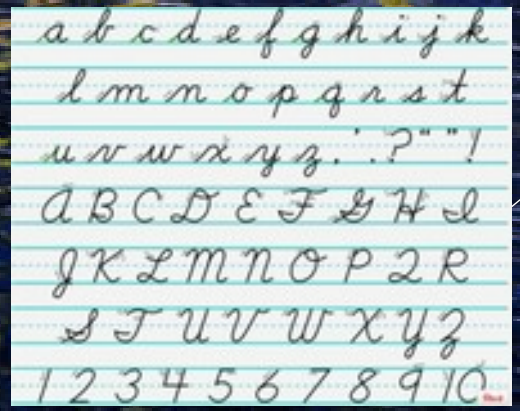
THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS			
	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

Past

Present

Future

???



COMMON CORE: Paths to 21st-Century Success

INNOVATIVE PROBLEM SOLVERS
Investigating real-world problems and finding creative ways to solve them

INVESTIGATIVE EXPLORERS
Developing research skills and using technology to find solutions

CREATIVE COMMUNICATORS
Exploring different points of view and using evidence to support and express ideas

VERSATILE READERS
Learning about the world with challenging fiction and nonfiction texts

CRITICAL THINKERS
Analyzing complex topics and learning academic vocabulary to navigate different subjects

RESOURCEFUL LEARNERS
Building a strong foundation of skills and expanding on those abilities every year

21ST-CENTURY COLLEGE AND CAREER SKILLS

Colleges and employers are seeking people to solve the problems of tomorrow. Here are **3 TOP SKILLS** students will need for college and career success in the 21st century:

ADAPTIVE PROBLEM SOLVING
Versatile individuals who approach problems in creative ways

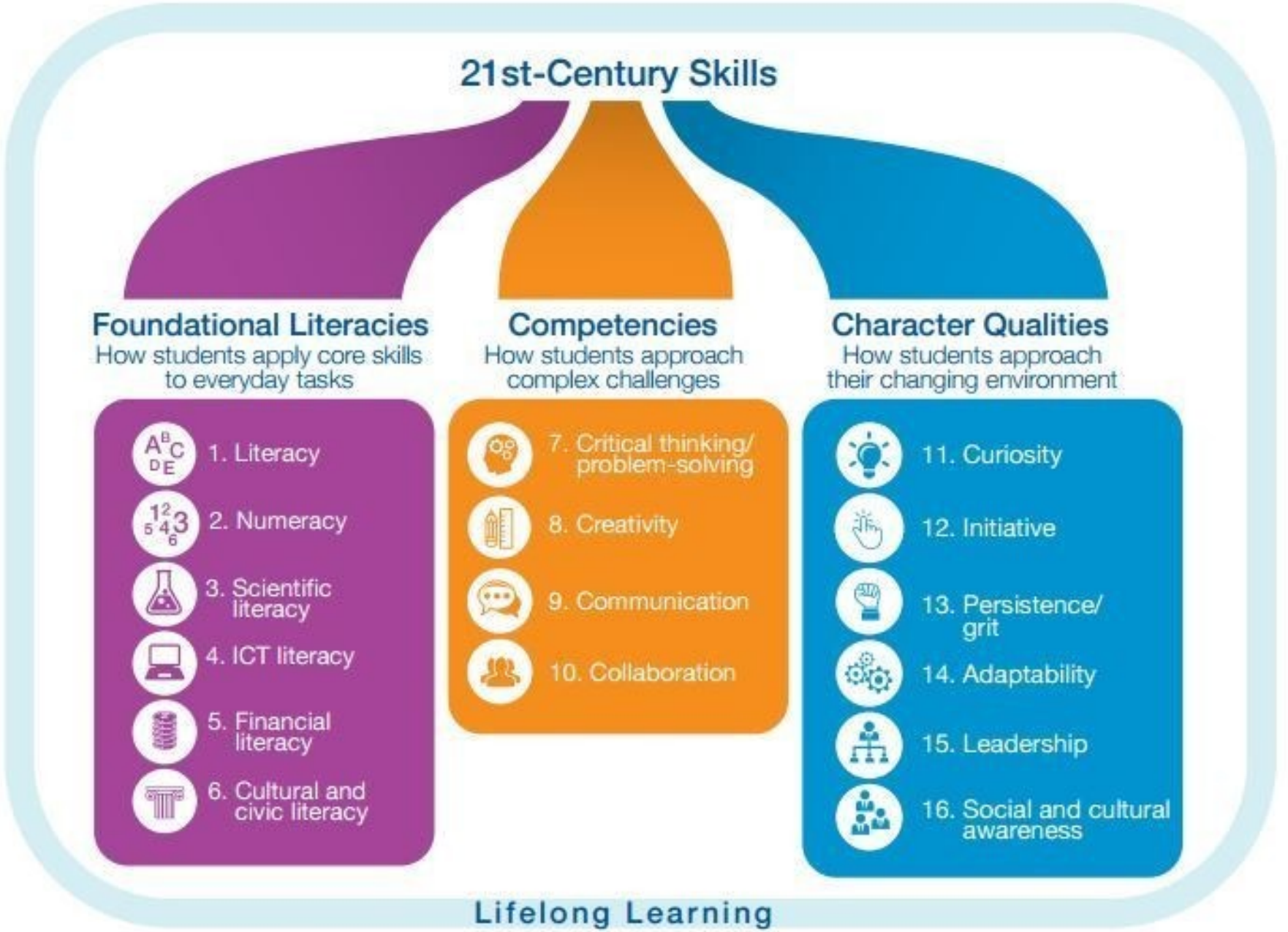
COLLABORATIVE COMMUNICATION
Global thinkers who express themselves effectively and work with people all over the world

DIGITAL FLUENCY
Tech-savvy workers who use technical and digital media skills in their everyday work

CTQ CENTER FOR TEACHING QUALITY
TEACHERS TRANSFORMING TEACHING

WWW.TEACHINGQUALITY.ORG/CORESUCCESS

Exhibit 1: Students require 16 skills for the 21st century



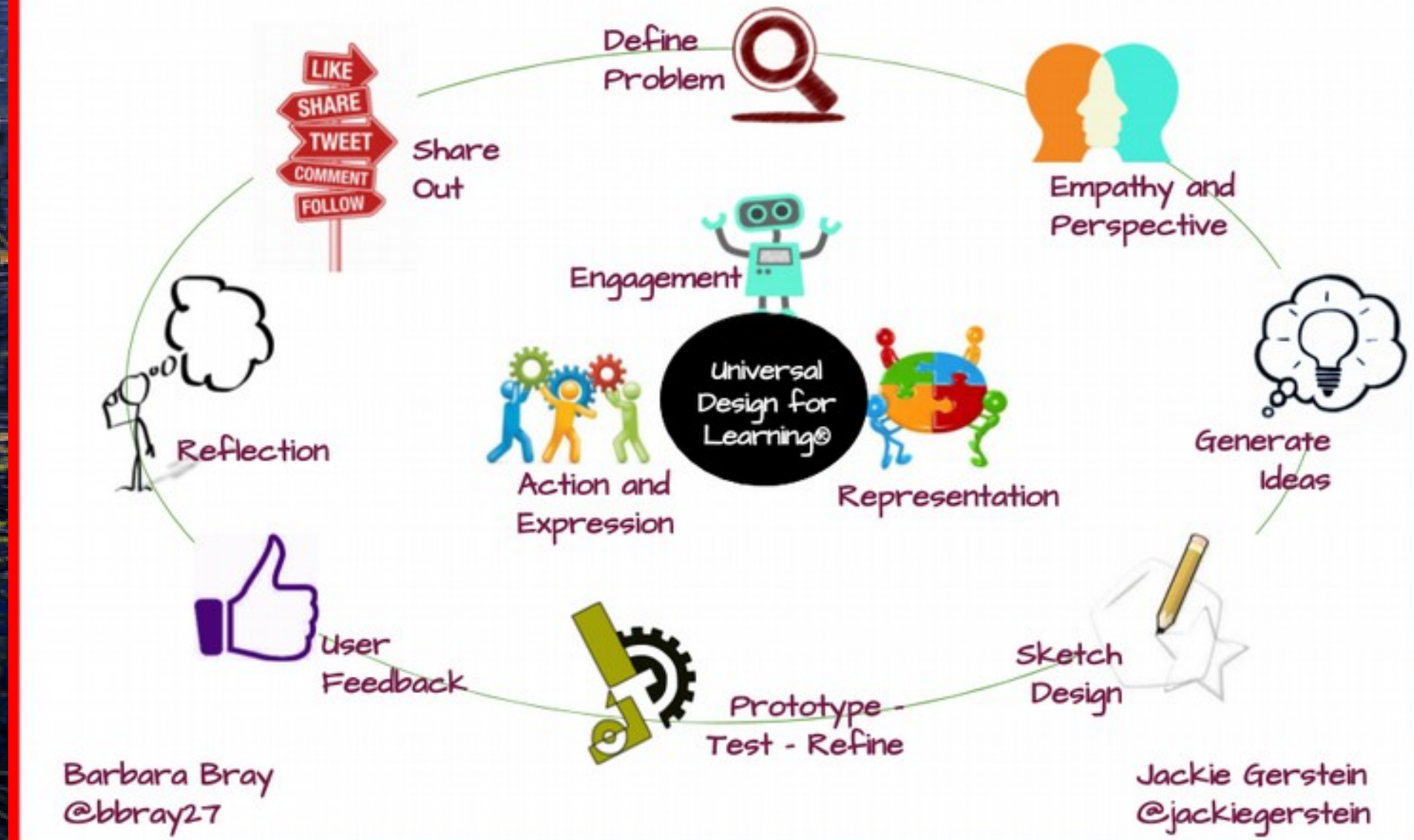
Note: ICT stands for information and communications technology.

What is expected from all of us !!!

And I do this in my own school?

Design Thinking Process and UDL Planning Tool

goo.gl/OVOhOn



Barbara Bray
@bbray27

Jackie Gerstein
@jackiegerstein

e-Learning ROADMAP

National Centre for Technology in Education

		Initial	e-Enabled	e-Confident	e-Mature
Leadership & Planning	Vision	Vision focuses mainly on ICT equipment.	e-learning vision is developed by e-learning Team.	e-learning vision is fully integrated into the whole school vision.	e-learning vision is wide ranging and shared by all stakeholders. It is actively tested through the student learning experience.
	Plan	Basic ICT Plan is in place.	e Learning Plan has been developed by e Learning Team. One teacher or a group of teachers has assumed leadership for ICT planning in the school.	Comprehensive e-learning Plan is integral to the whole school plan. The development of the plan is led by principal/ICT co-ordinating teacher/e-Learning Team with all staff contributing and whole school acceptance. There is a designated ICT co-ordinating teacher with clearly defined duties and responsibilities.	Teachers implement the e Learning Plan in their daily work. Staff & students are actively engaged in innovative and exemplary practice.
	Integration	Focus is mainly on ICT equipment and the acquisition of basic ICT skills.	Focus is mainly on supporting the integration of ICT usage throughout the school.	Focus is mainly on supporting more comprehensive integration of ICT and the exploration of new and more effective approaches to ICT integration.	Focus is mainly on supporting and facilitating personalised and self directed learning.
	Acceptable Use Policy	School has developed an Acceptable Use Policy for the Internet.	School has developed an AUP following consultation with staff, students, parents/guardians, board of management/trustees.	School has developed and ratified an AUP for Internet and ICT use following consultations with staff, students, and parents. All stakeholders are familiar with its contents and the plan is fully implemented.	The AUP accommodates innovative use of new technologies, and facilitates the development of an ethical and responsible approach to the use of these technologies.
	Special Educational Needs	Support of ICT as a tool for learning in special educational needs exists but is uncoordinated.	Use of ICT is focused on the areas of learning support and resource teaching.	School supports and encourages the use of a wide range of ICT resources and assistive technologies throughout the school to facilitate the inclusion of students with special educational needs in line with the EPSEN Act.	School includes the use of ICT and assistive technologies in the development of all Individual Educational Plans (IEP) for students with special educational needs and uses ICT in all aspects of special educational needs assessment.
lum	Teacher Understanding	Teachers have a general understanding of how e-learning can improve teaching and learning.	A number of teachers understand methodologies to integrate ICT into the curriculum.	Most teachers understand how e-learning can be used in the curriculum to improve student learning.	Teachers have determined their own methodologies [illegible] ICT into the curriculum.

Co-funded by the Erasmus+ Programme of the European Union

DSoE Digital Schools of Europe

Each nation(region, school, student …) a different solution

How are you handling the fingerprint of your students ?

How are you targeting special needs? Gender balance ?

Is ICT a priority in your country ?

……

Personalized Solutions

Inquiry Based Teacher Training
Teacher Centered Training

- It is not about my project, it is not about teachers, it is about their students …

In Portugal


Angra do
Heroismo


Funchal


Viseu
Guarda
Figueira
da Foz
Portugal
Cáceres
Mérida
Badajoz
Evora
Setubal
Municipality
Huelva
Cádiz

GALILEO

Teacher Training Program

IAU

THE UNIVERSE
YOURS TO DISCOVER

BEYOND

INTERNATIONAL YEAR OF
ASTRONOMY

NUCLIO
Núcleo Interactivo de Astronomia

G-HOU

International Network


LHS LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY
CITEUC
CENTRO DE INVESTIGAÇÃO DA TERRA E DO ESPAÇO
UNIVERSIDADE DE COIMBRA
CASCAIS
CÂMARA MUNICIPAL
eleste
NUCLIO
PLATON
GO-LAB
ELLINOGERMANIKI AGOGI
FUNDAÇÃO CALOUSTE GULBENKIAN
COSPAR
DSoE
Digital Schools of Europe
COSMIC LIGHT
INTERNATIONAL YEAR OF LIGHT 2015
SP
SOCIEDADE PORTUGUESA DE ASTRONOMIA
BRITISH COUNCIL
SPACE awareness
esa
STORIES OF TOMORROW
EdMuse
UNIVERSE AWARENESS
Europlanet
NOAO
NATIONAL OPTICAL ASTRONOMY OBSERVATORY
FAULKES TELESCOPE
LCOGT .net
ASTRONOMICAL SOCIETY OF THE PACIFIC
The World At Night
TWAN
DARK SKIES RANGERS
ASTRONOMERS WITHOUT BORDERS
Black Holes in My School
SCIENCE ON STAGE PORTUGAL
discover #cosmos
Ciência Viva
OPEN DISCOVERY SPACE
GALILEO MOBILE
IASC
EU-HOU
MPT
AFRICA HOU
UNIVERSE QUEST
inspiring SCIENCE education
PLOAD
Grupo Luso-Afro de Astronomia para o Desenvolvimento
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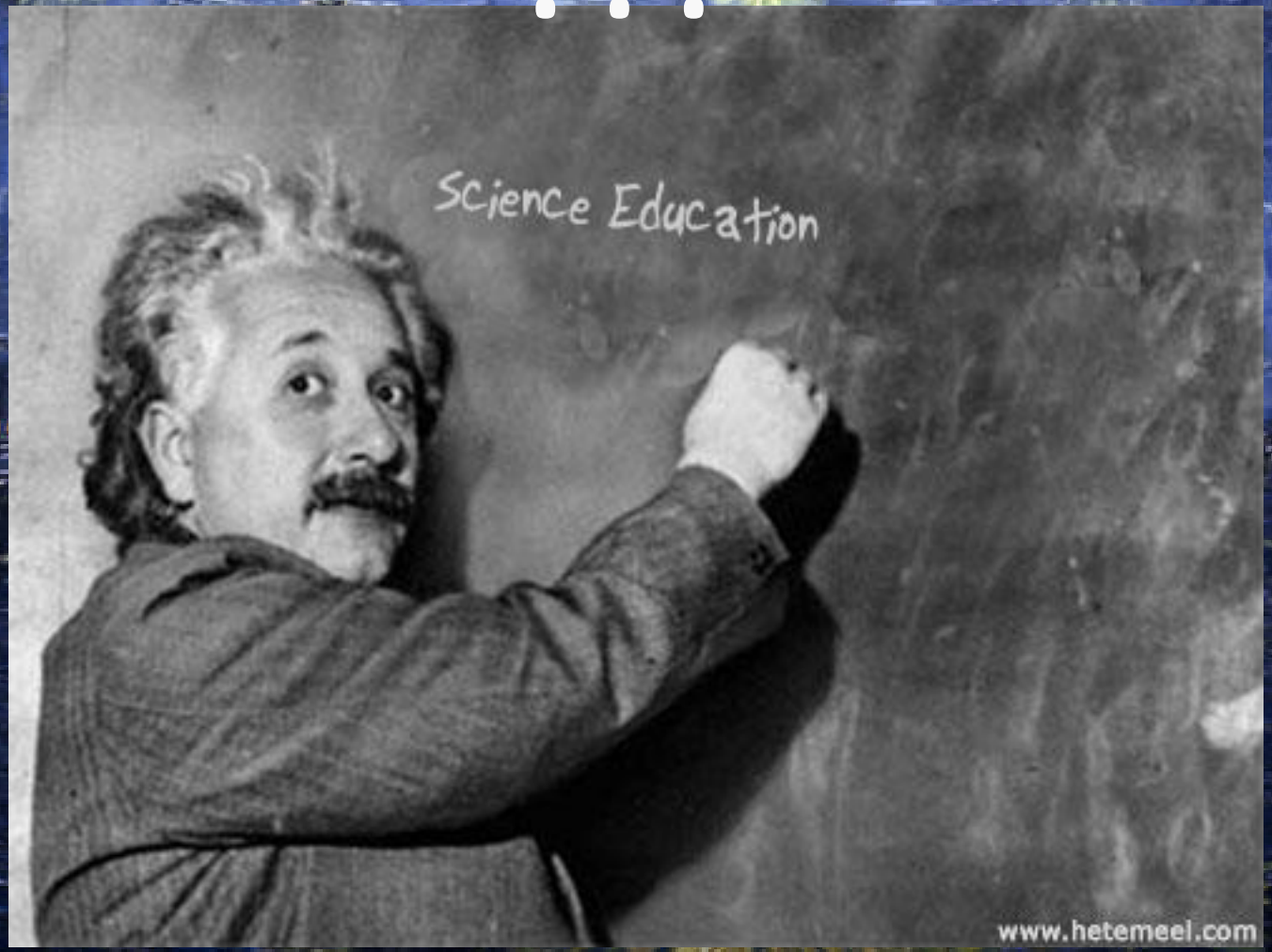
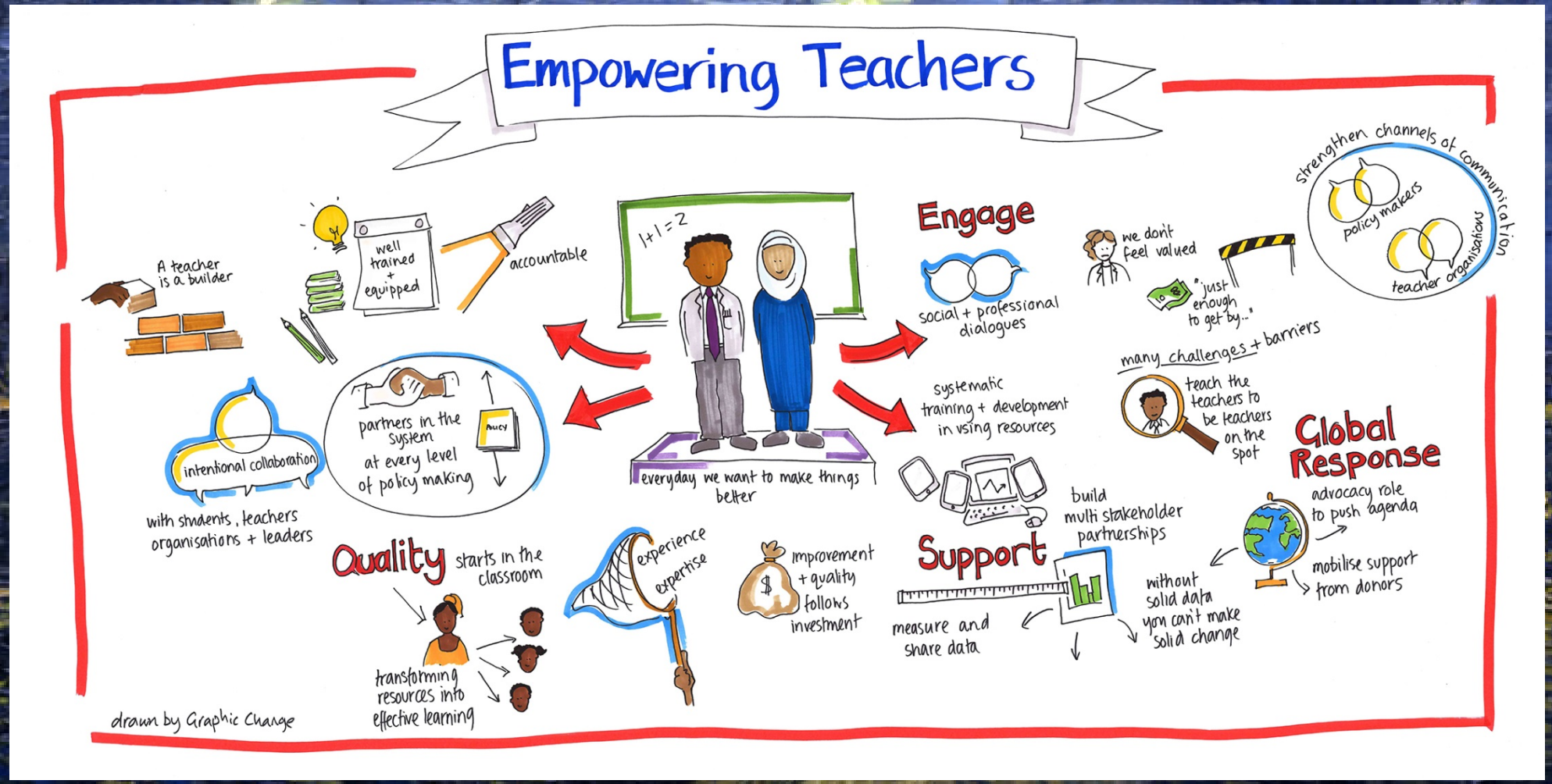
G-HOU
GALILEO
Teacher Training Program
IAU
THE UNIVERSE
ASTRONOMY


Science Education
www.hetemeel.com


Modern Science Education
www.hetemeel.com


Empowering Teachers
A teacher is a builder
well trained + equipped
accountable
1+1=2
Engage
social + professional dialogues
we don't feel valued
"just enough to get by..."
strengthen channels of communication
policy makers
teacher organisations
many challenges + barriers
teach the teachers to be teachers on the spot
systematic training + development in using resources
intentional collaboration
with students, teachers organisations + leaders
partners in the system at every level of policy making
policy
everyday we want to make things better
Global Response
advocacy role to push agenda
mobilise support from donors
build multi stakeholder partnerships
Support
without solid data you can't make solid change
measure and share data
Quality starts in the classroom
transforming resources into effective learning
experience
expertise
improvement + quality follows investment
drawn by Graphic Change

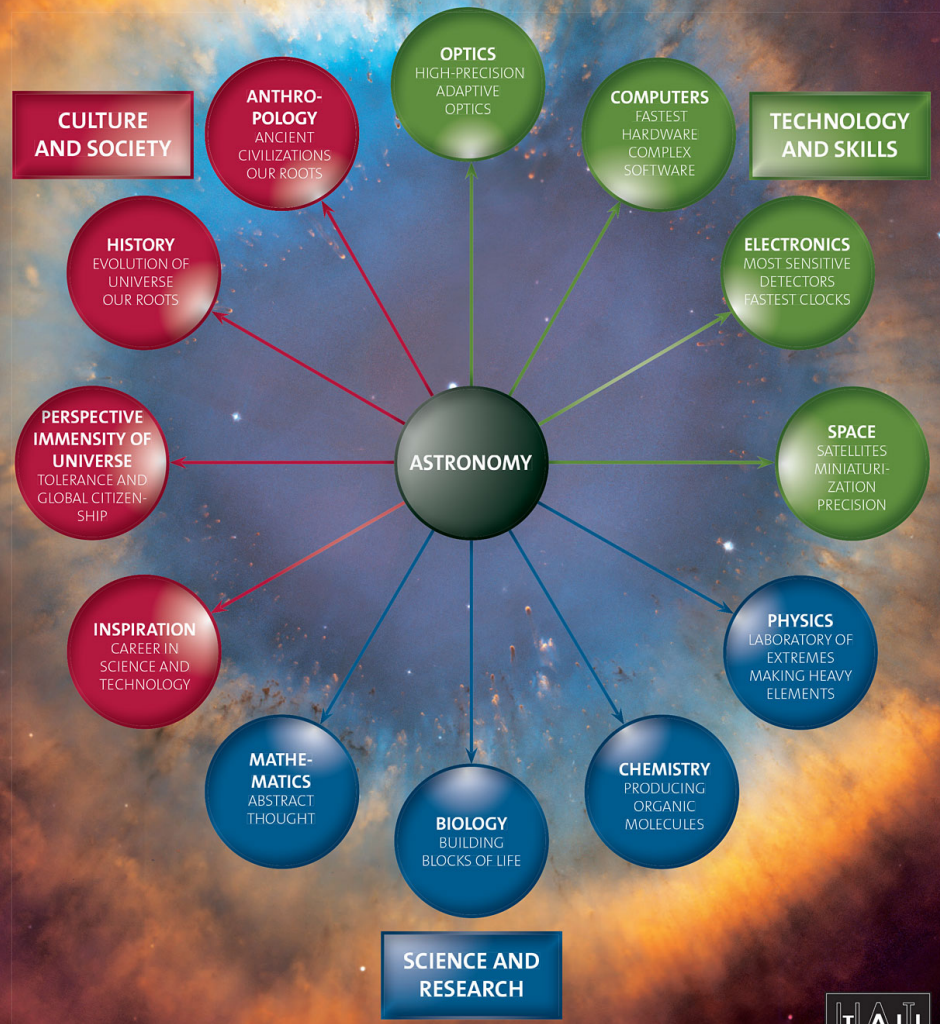
International Astronomical Union

Astronomy for Development

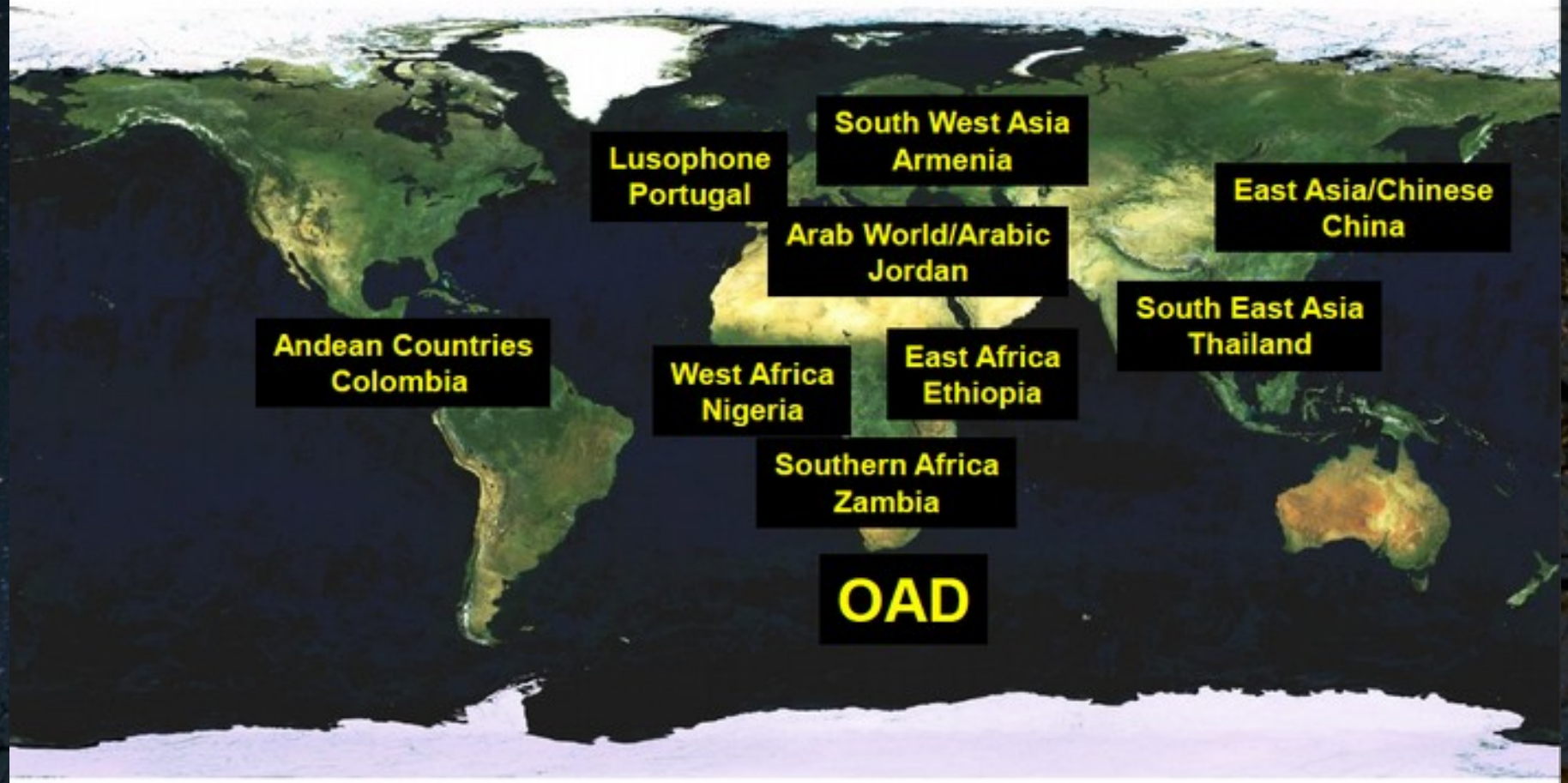
Building from the IYA2009

Strategic Plan 2010–2020

with 2012 update on implementation



OAD Regional Offices




PLOAD
Grupo Lusófono de Astronomia
para o Desenvolvimento
IAU
OAD
International Astronomical Union
Office of Astronomy for Development
PLOAD
Portuguese Language Office of
Astronomy for Development

Background

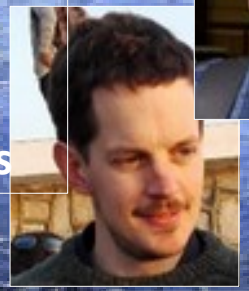
- > 280 million Portuguese speakers
- most widely spoken in the southern hemisphere

Agreement IAU-GA 2015

Portugal - NUCLIO

ICT experts

Steph Tyska
Carlos Santos



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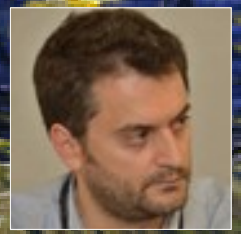

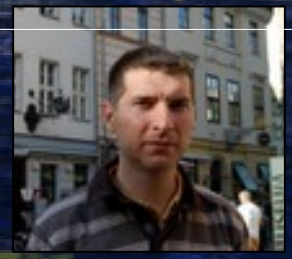

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Gustavo Rojas
Nélio Sazaki
Paulo Bretones
Paulo Poppé
Paulo Sobreira
Rodolfo Lima
Rundsthen de Nader
Vinícius Oliveira
Virginia Alves

Cape Verde

Ivanilda Cabral
Adilson Semedo

East Timor

António Barreto
Cláudio Cardoso

Mozambique

Valente Cuambe
Cláudio Moises

S Tome and Principe

Manuel Penhor
Lúcio Carvalho
Diangel Pires da Costa

From classrooms to observatories

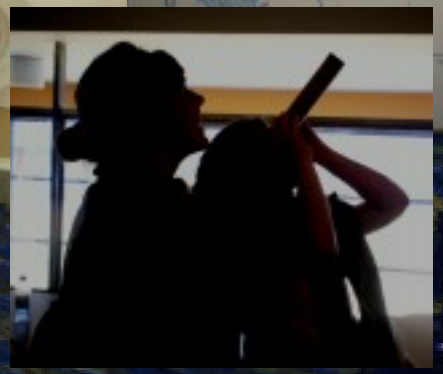
HANDS-ON WITHOUT COMPUTERS



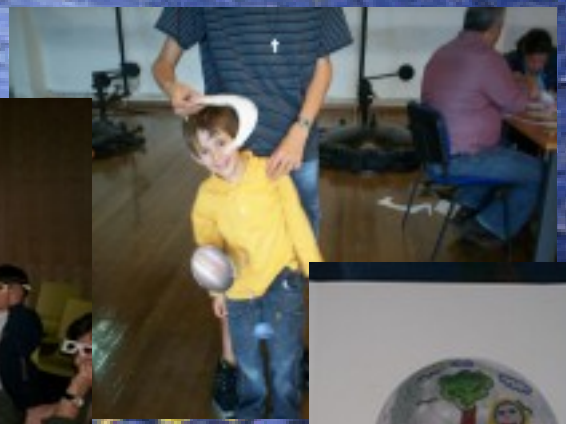


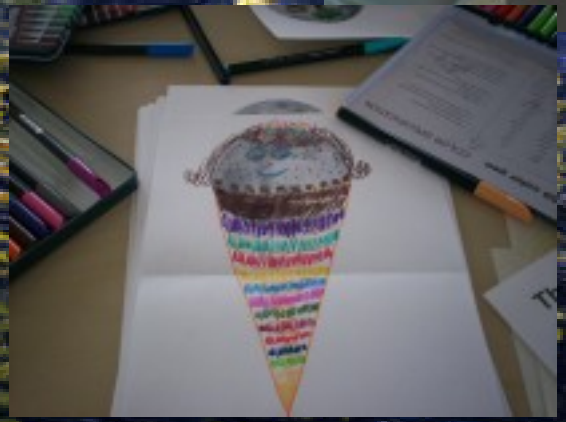






HANDS-ON WITHOUT COMPUTERS





DARK SKIES RANGERS

NOAO

NUCLIO

Núcleo Interactivo de Astronomia

DARK SKIES RANGERS

Open Schools for Open Societies

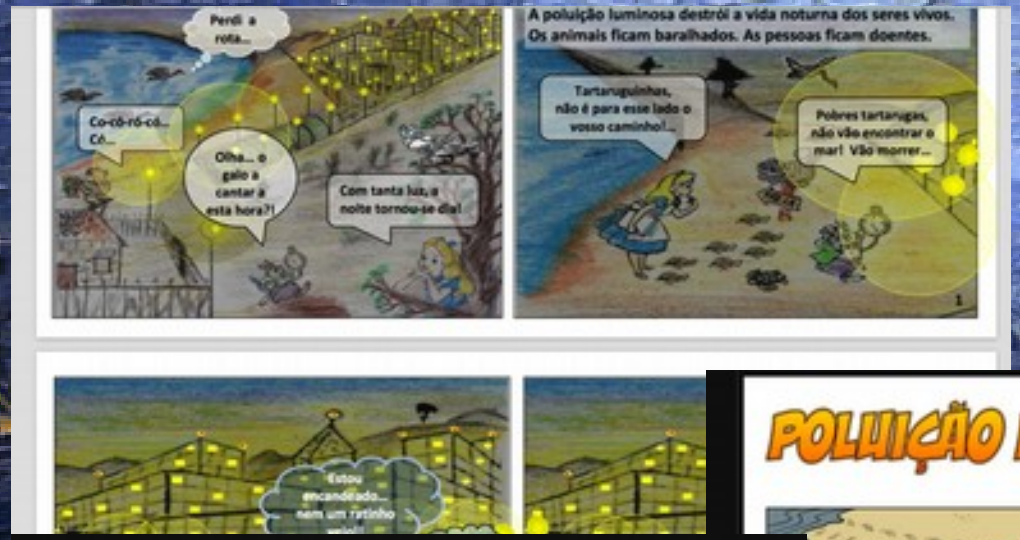
International Day of Light

May 16th

Games


PLAY AND LEARN HOW TO DEFEND THE LIGHT FROM THE UNIVERSE
DARK SKIES RANGERS GAME
RULES
PREPARATION FOR THE GAME
START
END
NUCLIO
GO-LAB
Let's turn off the lights to light up the stars!
GLORY STARS
DARK SKIES RANGERS
RULES
START
100
Francisco José Pinto Pires, 8 years, Centro Escolar da Araucária, Vila Real, Portugal

Comics


Perdi a rota...
Co-có-ró-có-có...
Olha... o galo a cantar a esta hora?!
Com tanta luz, a noite tornou-se dia!
A poluição luminosa destrói a vida noturna dos seres vivos. Os animais ficam baralhados. As pessoas ficam doentes.
Tartaruguinhas, não é para esse lado o vosso caminho!...
Pobres tartarugas, não vão encontrar o mar! Vão morrer...
1
Estou encandeado... nem um ratinho


Menção honrosa
1
2
3
4
5
6
AND NOT ILLUMINATE THE WHOLE UNIVERSE!

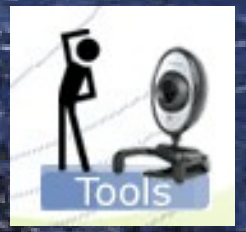

POLUIÇÃO LUMINOSA
O mamã disse-nos que tínhamos de seguir a luz, mas qual delas será?


Olá Sabrina!
Olá Max!!!
Olha, amanhã eu vou ver as estrelas com o Kiko no parque. Queres vir também?
Sim, porque não.
Olá Max! Olá Kiko!
Pensava que havia mais estrelas no céu!
É há, mas como na cidade há muita iluminação, não vemos as estrelas nitidamente!!!
Realmente!
Pois é!!!
Pois claro!

Hands-on Universe

- Supernova
- Asteroids
- Jupiter Moons
- Solar Activity
- Black hole in the Center of our galaxy
- Cepheids
- Exoplanets

HANDS-ON RESEARCH

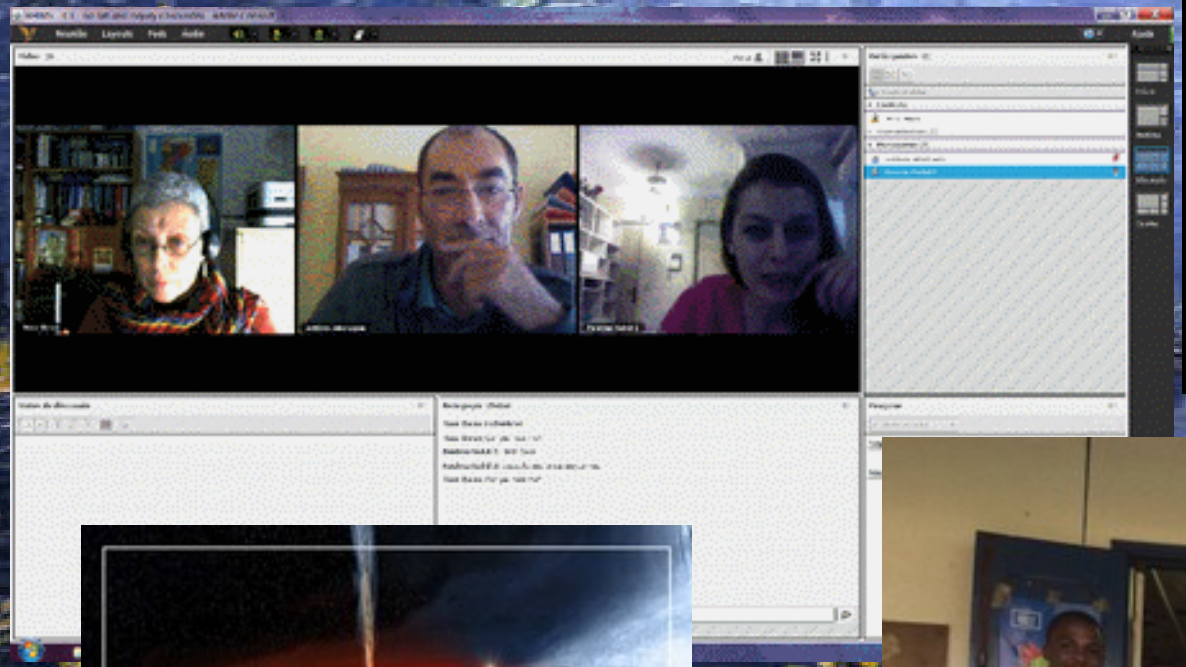


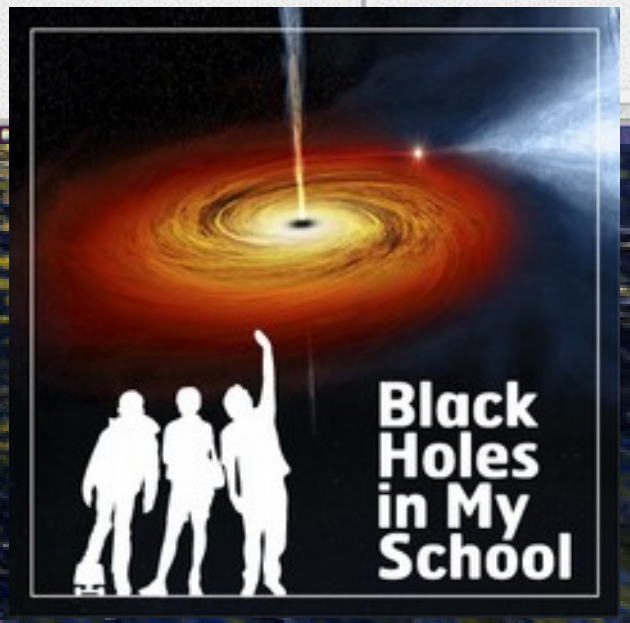
webca

Radio Telescopes

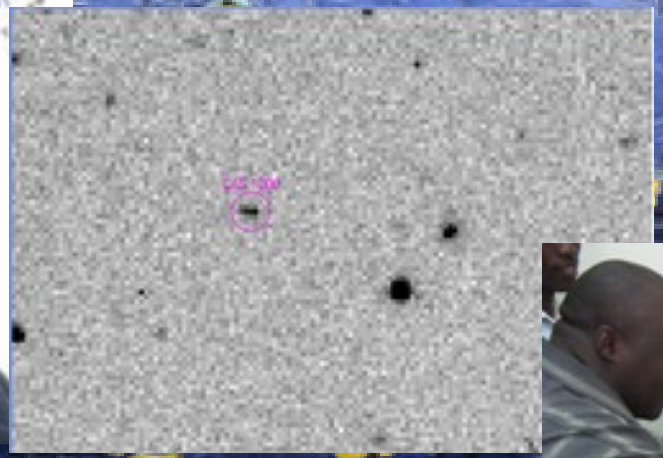
Optical Tele

BHIMS

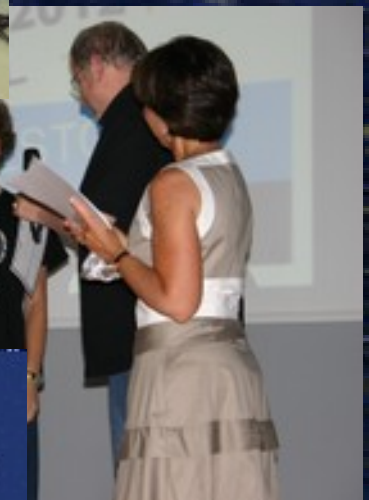




International Astronomical Search Collaboration



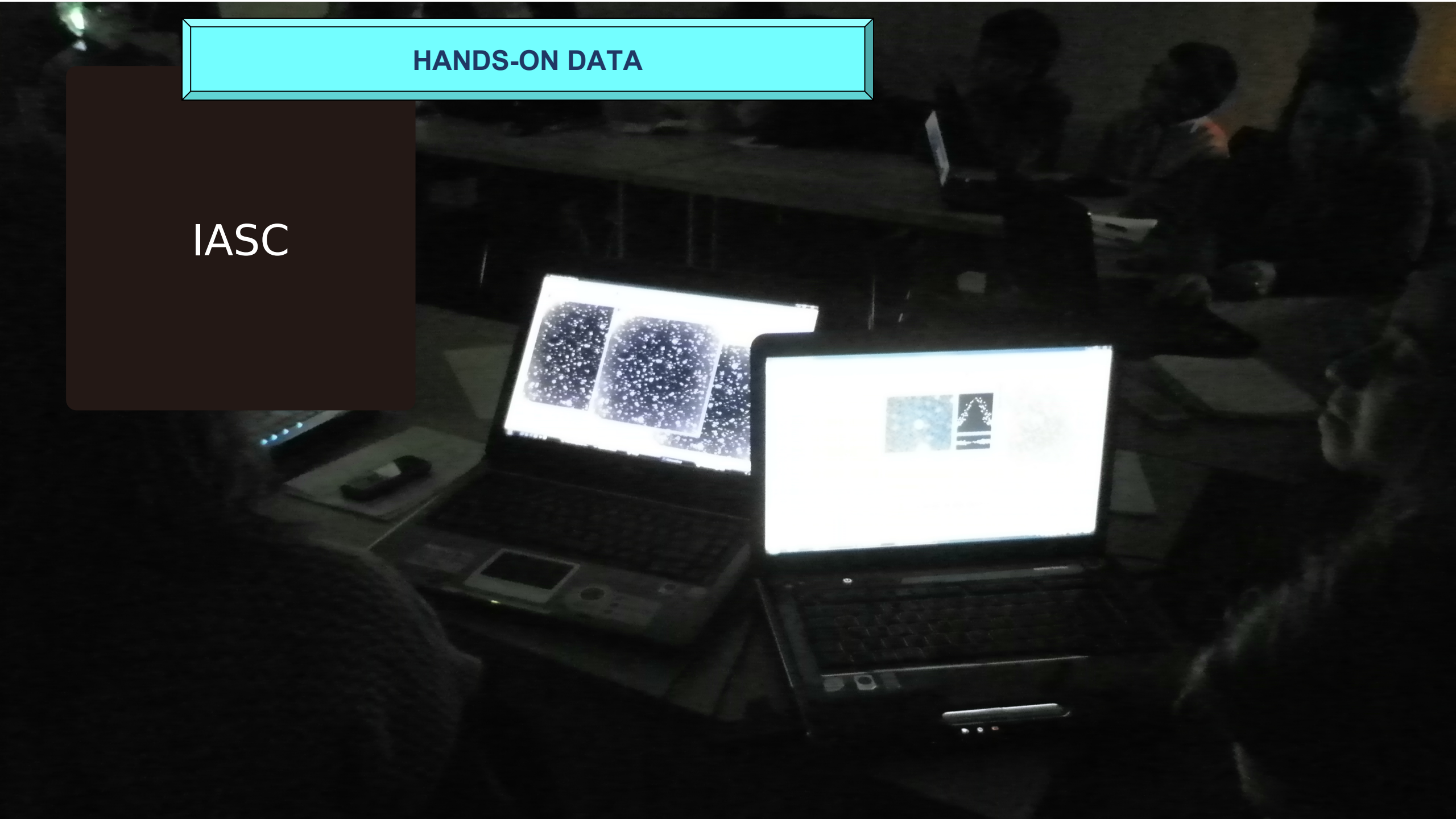
45 Países
Mais de 500
Escolas



Haus der Astronomie
Centre for Astronomy Education and Outreach

HANDS-ON DATA

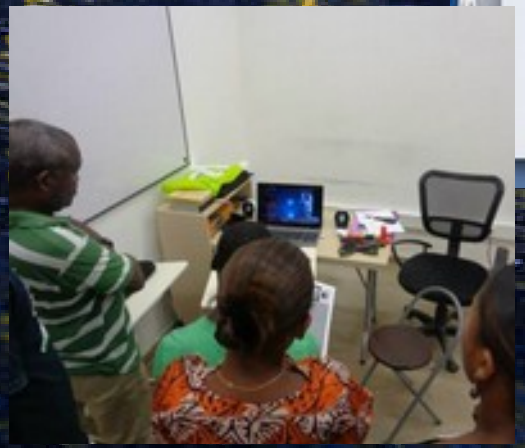
IASC



INCLUSIVE ASTRONOMY

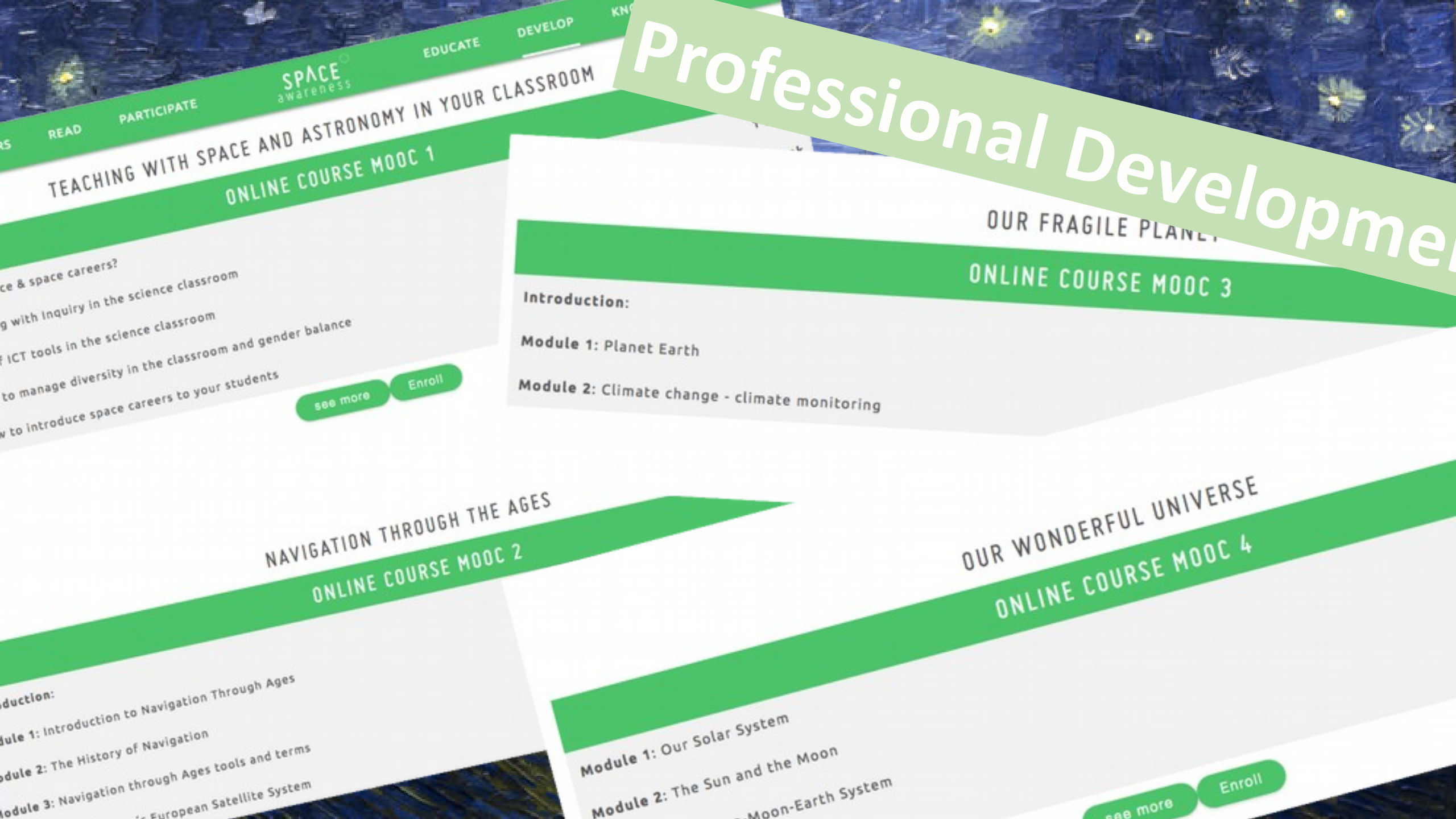
eGTT P


Do Planeta Terra ao
Espaço
Sugestões de tarefas experimentais para dentro e fora da sala de aula

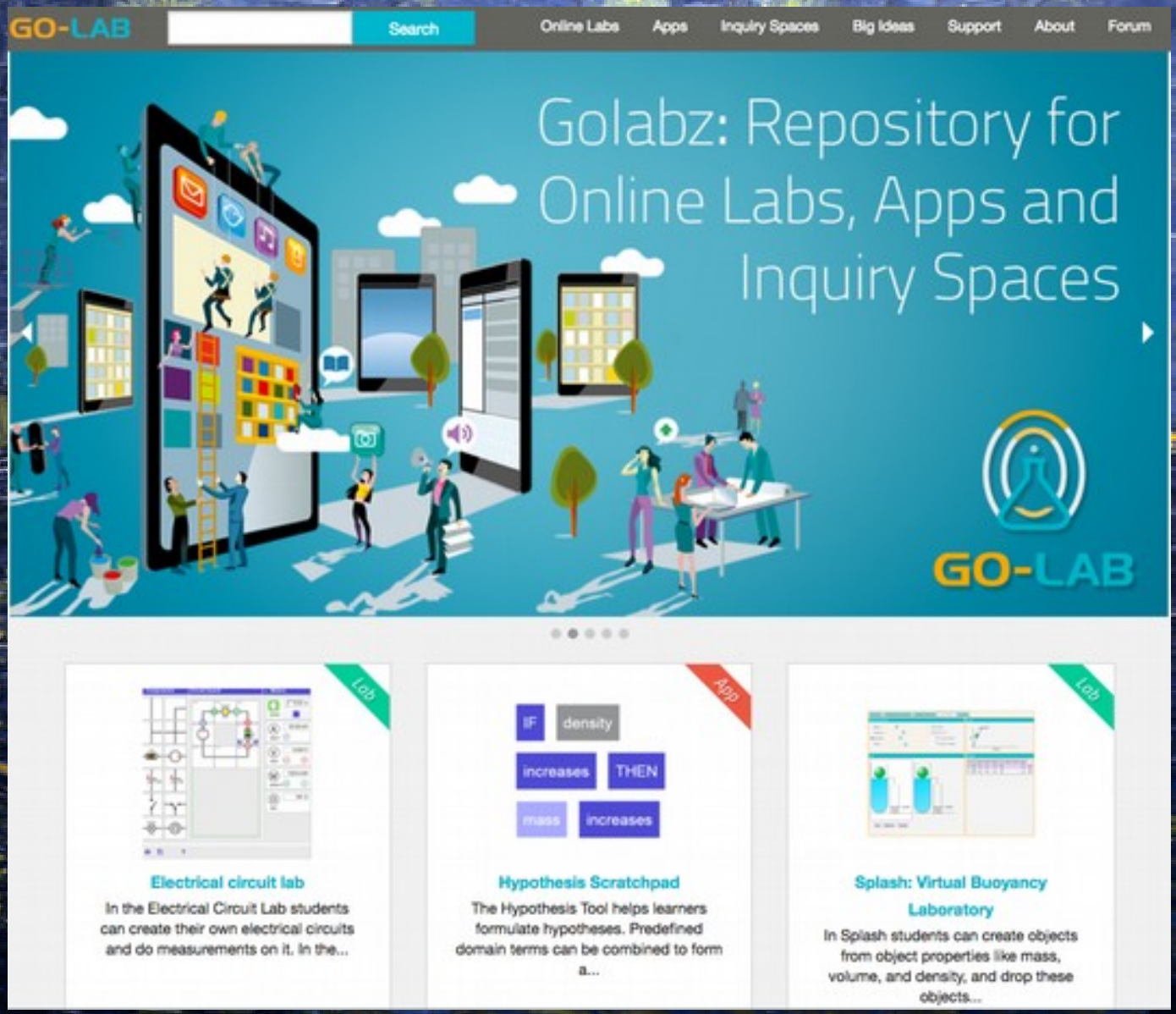


SPACE awareness

Resources


Professional Developme
READ
PARTICIPATE
SPACE awareness
EDUCATE
DEVELOP
TEACHING WITH SPACE AND ASTRONOMY IN YOUR CLASSROOM
ONLINE COURSE MOOC 1
ce & space careers?
g with inquiry in the science classroom
f ICT tools in the science classroom
to manage diversity in the classroom and gender balance
w to introduce space careers to your students
see more
Enroll
OUR FRAGILE PLANE
ONLINE COURSE MOOC 3
Introduction:
Module 1: Planet Earth
Module 2: Climate change - climate monitoring
NAVIGATION THROUGH THE AGES
ONLINE COURSE MOOC 2
duction:
dule 1: Introduction to Navigation Through Ages
odule 2: The History of Navigation
odule 3: Navigation through Ages tools and terms
European Satellite System
OUR WONDERFUL UNIVERSE
ONLINE COURSE MOOC 4
Module 1: Our Solar System
Module 2: The Sun and the Moon
Moon-Earth System
see more
Enroll

GO-LAB



Lab types

Virtual lab (401)
Remote lab (59)
Data set (17)

Statistics

The repository contains:

477 Labs.
591 Inquiry Spaces.
43 Apps.

Online lab wish list

Propose a lab

Next-Lab project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731685.

5 pillars for community building (work in progress) → Developed in the framework of the project Go-lab

(Co-funded by EU (7th Framework Programme))

Engagement	Training	Support	Recognition	Community
Visionary Workshops	Face-2-face training	Teacher's Helpdesk	Certification and Accreditation	Teacher's Communities
Reflection Workshops	Online Training	In School Support	Contests	Mailing Lists / Newsletters
Pilot Days	International /National schools		Digital Badges	Social Media Channels
	Pilot's cascade		Best Practices Exchange	

Competence Profile

Developed in the framework of the project Go-lab

(Co-funded by EU (7th Framework Programme)

Using the Go-Lab environment	Get acquainted with Go-Lab portal and the ILS model	Explore and adopt some ILS	Create their own ILS	Implement ILS with their students	Train others
ICT Skills	Basic ICT skills	Acquainted with the use of online labs and simulations	Capable of developing online lessons and create metadata	Skilled in the use of ICT, in the creation of learning scenarios, etc.	Capable of sharing their expertise with others
IBSE experience	New to IBSE	Some experience in student centred teaching	Has experience in the IBSE model	Skilled in using the IBSE model with students	Master IBSE and is capable of introducing others to the concept
Online / Remote Labs	Integrate some labs in their lessons	Integrate ILS in their lessons	Develop ILS and pilot test them	Integrate the use of ILS in several lessons	Support other teachers to implement ILS in their classrooms

PLATON: Promoting Learning Approaches for the Teaching of Natural Sciences

Framework for IBL and Interdisciplinarity

Promoting Innovative Learning Approaches for the Teaching of Natural Science
2016-1-PT01-KA201- 022881

Co-funded by the Erasmus+ Programme of the European Union

The PLATON e-Agorá

Find what you are looking for

The 3D Interdisciplinary Map of Science Ideas

Discover an overarching organization scheme for concepts and principles that goes beyond traditional curriculum organization.

Activities and Assessment Tools

Get access to a collection of curriculum-related activities that link the science class with the world around us and a selection of innovative assessment tools for your class.

Inquiry Under the Microscope

Learn how to break down inquiry into its components and introduce them in your everyday teaching at your own pace, progressively as a series of small adaptations.

Training Resources

Receive all the additional training you need through a set of detailed guidelines and other online PLATON training materials desgined for teachers.

Stories of Tomorrow

Students Visions on the Future of Space Exploration

HOME ABOUT US RESOURCES NEWS CONTACT

Funded by the H2020 Framework Programme of the European Union

Open Schools for Open Societies

A holistic approach to schools as science hubs

Funded by the H2020 Framework Programme of the European Union

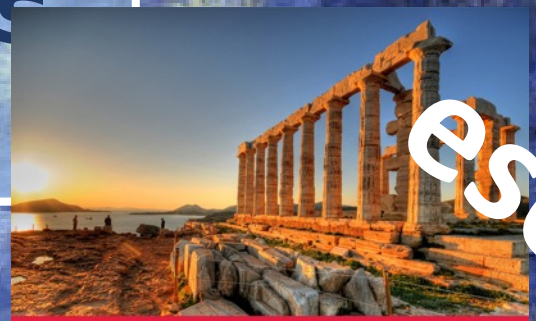
International Opportunities

European Science Education Academy

esea.ea.gr

ESA - GTTP SPACE AWARENESS WORKSHOP

BEYOND EARTH ORBIT

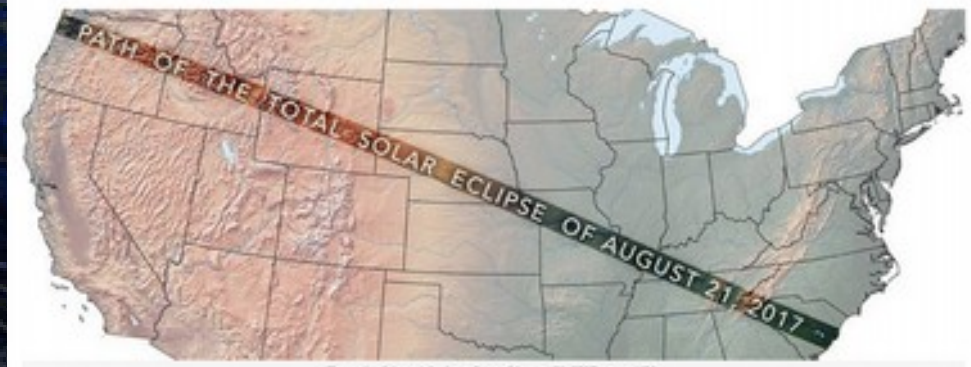


INSPIRING SCIENCE EDUCATION ACADEMY 2016

ASTRONOMY ADVENTURES IN CANARY ISLANDS

SCIENCE THROUGH SPACE & TIME

Save the Date: Global Hands-On Universe Conference 2017 and Galileo Teacher Training Programme International Workshop



The path of the total solar eclipse of August 21, 2017 across USA.

ELLINOGERMANIKI AGOGI

NUCLIO
Núcleo Interactivo de Astronomia

2019 – 100 years of the observations in Principe and Sobral

- ❑ Science conference in Principe
- ❑ History meeting in Coimbra
- ❑ Teacher training and PLOAD meeting in Principe
- ❑ Science Trails: from Principe to the world

Wish List: Endorsement of IAU, funding (work in progress), Publicity and YOU ☺ !!!

Science on Stage Portugal - 2019

100th Aniversary of IAU

400 teachers from all over Europe sharing best practices

Integration of PLOAD countries ????

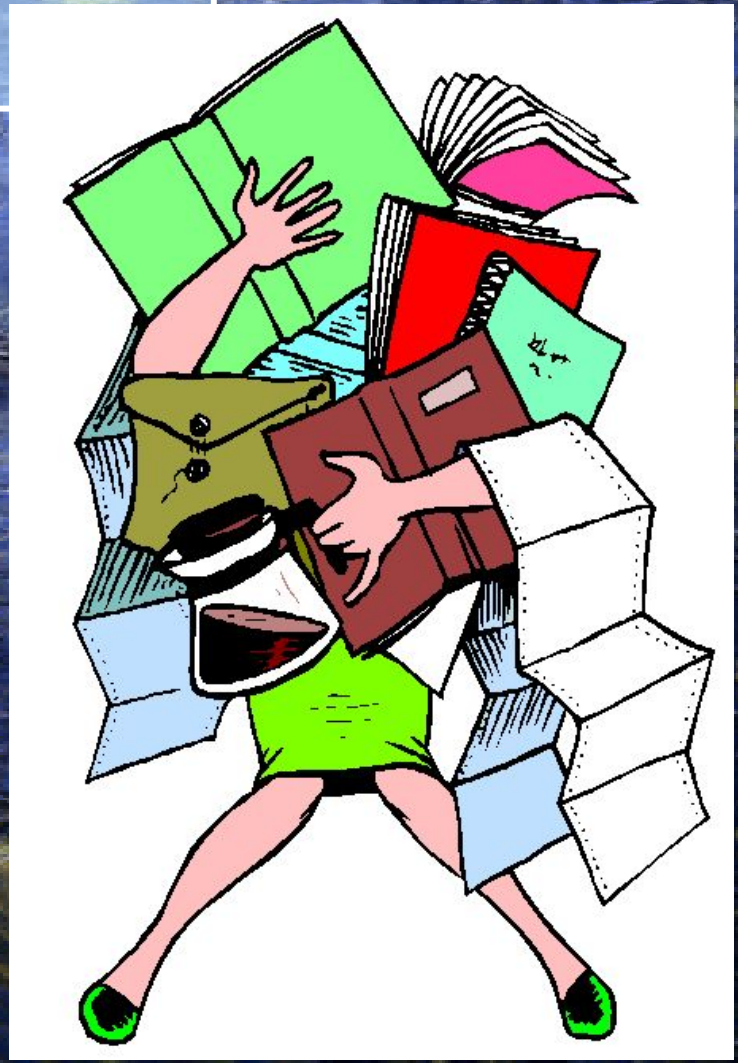
50 year of Moon Landing

SCIENCE ON STAGE PORTUGAL

Work in Progress !!

How exactly are we going to do this ?!?!?…

- On the road …
- Online ….
- Always on !!
- With your support ….




And this is how we try to
fill the missing parts .....