HAL
open science

Futures of Education - GHOU 2020

Emmanuel Rollinde, Carl Pennypacker, Rosa Doran, Hassane Darhmanoui, Toshihiro Handa, Kathan Kothari, Fraser Lewis, Janne Iren Robberstad, Colleen Megowan

To cite this version:

Emmanuel Rollinde, Carl Pennypacker, Rosa Doran, Hassane Darhmanoui, Toshihiro Handa, et al.. Futures of Education - GHOU 2020. [Intern report] G-HOU. 2020. hal-03089436

HAL Id: hal-03089436

https://hal.science/hal-03089436

Submitted on 28 Dec 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Futures of Education:

Learning to Become

Reports of the focus-group discussion intended to contribute to UNESCO 2021 report on Future of Education.

Thematically focused set of questions on two of the four core areas that the Unesco Commission has identified and sketched out a vision for: (2) Citizenship and participation; (3) Knowledge production, access and governance.

I. Basic information

Date of consultation:	August, 23rd 2020			
Modality:	☐ in person		☒ online	
Location:	GTTP/GHOU, Portugal. Consultation held during the GHOU 2020 Conference (handsonuniverse.org/ghou2020)			
Hosting organization:	GTTP/GHOU			
Name, title, and affiliation of facilitator(s):	Emmanuel Rollinde, University Professor, CY Cergy-Paris University, France			
Name and email address of key contact person:	Emmanuel Rollinde, Emmanuel.rollinde@cyu.fr			
Language of consultation:	English			
Time spent in consultation:	1 hour			
Consultation model(s) applied	☐ Model 1	☒ Model 2	☐ Model 3	☐ Model 4
Number of Participants:	8 + facilitator			
Participants' profiles: (please describe briefly the composition of the group)	Members of G-HOU, representative of different national structures of G-HOU All are concerned by the use of astronomy for education, through real data acquisition and modelling pedagogical activities			

Identify the main stakeholder group that participated in the consultation: (please check one box only)	☐ Youth	☒ NGOs	☐ Civil Society	☐ UN
	☒ Academia	☐ Private businesses	☐ Government	☒ Other (please specify): Association
List any other stakeholder groups that participated	Associations GTTP, GHOU, AMTA Participants affiliated to different universities			

II. Synthesis of inputs

Description of GHOU
The Hands-On Universe (HOU, handsonuniverse.org) project began in the 1990s when Carl Pennypacker, a supernova research astronomer at University of California Berkeley, invited a group of astronomers and educators to share ideas about how to make astronomy education better. The idea of **making real telescopes and telescope images available to teachers and students** took root. Along with that, image processing software tools became necessary to provide, as well as cooperation among astronomers and observatories to make telescope instruments available for use by schools. From the on-set, GHOU has been an international program, with contributions from many nations working together with common values, goals, and ethical standards. Telescope networks for use by all have been brought forward by participants in the UK, the US, and other nations. G-HOU has since promoted **scientific modelling methods in the classroom, reproducing experiments including data collection and analysis**. The mission of HOU is to train teachers on the use of modern tools and resources for science education and engage students in international scientific projects. We also aim to promote interactive science projects among HOU countries and engage educators and students in a truly global cooperation. No borders or frontiers. The project came in to Europe (EU-HOU) in 2004 with **a specific focus on the training of teachers**. The main aim of EU-HOU was to adapt the project to Europe with the creation of a series of new exercises with modern topics in Astrophysics Research and a new image processing software freely available to all educators. During the International Year of Astronomy, the Galileo Teacher Training Program, one of the cornerstones of the event, was created by the G-HOU team and since then over 100 countries have joined the effort, reaching over 50 000 teachers around the globe. Our yearly conference was online in 2020 and gathered 85 countries. “GHOU is not a program or a project, it is a movement.” A movement of people creating a network of human beings. Estimates are that over 1,000,000 students a year are reached with GHOU resources, although we want to reach many more. The round table was organised in the context of GHOU 2020 conference. All participants of this round table are leading members of GHOU in their country. They were selected to cover uniformly different parts of the world (Europe, America, Africa, Asia).

Thematic focus: ___ **Citizenship and participation**_____
(we do not reproduce Prompt 1 here)

Prompt 2. How education can support robust citizenship and participation practices.
Our discussion focused on science education that is the expertise of GHOU. • Science and citizenship Scientific thinking means to observe, collect, analyse, compare data… Everyone is born as a scientist. But in school we forget because the teacher tells us "not ask so many questions, this is a silly question…". First we need to be interested. Second, we need to use our intuition, to create our own experience, or "I want to know". We need to make hypotheses, to test them, to discuss with each other, acknowledge every points of view. Then, we need to be able to communicate our point of view, accept that we might be right, and then wrong, and then right… This is how science works. If you embed that in your soul, if you accept your natural condition of scientist, then you will be a natural inquirer for the rest of your life. If someone tells you, "get up and close the door" and you do not ask why, then you are a fool. We have to ask. Even a teacher might be wrong. And if I am wrong, I have the right to learn, not to be told silly or that I should know. We have to question everything. Education should help any student to identify what is scientific thinking rather than to speak as a scientist. Science is very well matched to democracy. One the one hand, as a scientist I believe only myself, that means I am free from other people. But on the other hand I am not independent from others. So I have to wonder what are the evidence, whether a theory matches or not the observations. We communicate and discuss. Finally, I decide by myself, this theory is correct, this experience is reliable. So the scientific way is making discussion and finally leaving each person deciding for itself. Scientific thinking is direct to the democratic system. • Knowledge as models We focus on acquiring knowledge for use. Knowledge for the sake of knowledge is great, but for the general population of students that will be tomorrow's citizens, they need knowledge that they can use and specifically knowledge they acquired themselves. Nowadays most of the knowledge is stored on the internet. People can scroll down the particular knowledge. Yet, it is not enough to have pieces of knowledge to use in our thinking. We need ways to structure that knowledge. That is what models are for, to understand and to connect. Students need to know how to use models, conceptual models. They need to know how to specifically build the model they need. Using scientific methods in the classroom, as described in the next prompt, one reproduces experiments, makes new experiments and uses scientific thinking.

Prompt 3. Imagine new ways of supporting robust citizenship and participation practices.

Prompt 3.
• Acquiring data We are in the 21st century and surrounded by a vast amount of data. Rumor mills on the internet talk about so many strange ideas that are not supported by data. Besides, nobody knows what the next problem is going to be. Hence, students need to know how to get data and how to use conceptual tools to make sense of those data in order to find patterns. They need to be not only data literate. They need to be data users, to acquire observations, to have a sense of observations. Students need to know how to think for themselves, how to get the data themselves or to fact-check what people tell them. Looking at data, or using other's data is not enough; generating data gives power, belief in ourselves. Overall, students need to review science or to replicate experiences that have already been made, but using real data that have given birth to this knowledge. Even better, students may participate to science by analyzing themselves the huge amount of data available in astronomy, using the same methodology as researchers and discovering the same objects (exoplanets, asteroids, supernovae…). Consequently, we always provide data or make students acquire data that is real and has all these real imperfections in it. We want to give them clean data but not perfect data because that's the world that scientists live in. When you draw a trend line or a gradient on a graph, not all the points on the graph sit on the trend line. And most important, the profession of a scientist is to make hypothesis and test them again and again until they find satisfactory answers that can be soon after overcome. Making a "mistake" makes science progress. So it is a good thing to make a mistake. We have to make sure students realize not all questions to all answers are just "clickable". Not everything we do is just black and white, not every bad politician is always bad, not every good politician is always good. • Local knowledge. We need to link the scientific knowledge to what people are used to. As for astronomy knowledge, we are all under the same sky but we need to be careful to convince everyone about it. By accounting for local, traditional and cultural knowledge, we will introduce deeper knowledge and mutual understanding. As an example, some farmers in Morocco know that to start to sow, or to put grass, they need to wait for a specific constellation. This is a local Berbere knowledge inherited by generations. But when we explain to kids what constellations are, they have a better understanding of the sky that they can transfer to generations, without contradicting traditions. • STEAM (Science, Technology, Engineering, Arts and Mathematics). STEAM accounts for science and art. It is a man-made thing to divide knowledge in different boxes. We are holistic human beings. A work of art in some fundamental way is a representation of the artist's vision. Such a representation, through dialog and study, can lead to larger models that encompass broader topics, and lead to inquiry, dialog, and learning. There is so much science in art and so much art in science. It is natural to merge them, while taking both fields seriously on their own terms. This is how you can get some really interesting things happening. Both can support and inspire each other to something greater. The world needs to be redesigned into a healthier place. You need the best from all worlds, the best from science and the best from art. That is sustainable design. You can get products (in the large sense), that are friendly for people, planet, prosperity, peace and partnership. Sustainable design means to be able to create something forever without depleting resources or polluting. This is the main definition of sustainability. To make the world a better place, we need STEAM.

Thematic focus: ___ **Knowledge Production, Access and Governance** _____
We did not use Prompt 1.
Prompt 2. Thinking in terms of 'best practices', how does education ideally protect or support knowledge becoming more of a global public good?

Prompt 2.
Lot of knowledge may be brought by scientists in education. But scientists often are not trained science communicators. On the other hand, educators have to deliver a message on topics that they are not experts on, and deliver cutting-edge science to the hands of children. Usually they are not mastering the technology, they are not mastering the science behind. GHOU practice is to prepare the educators to be travel companions of the children, within the context of astronomy. Educators are helping the children to acquire the knowledge on the way while they are using their own knowledge. Once they get the training they become ambassadors and prepare other teachers. From the point of view of one specific school, all teachers from all subjects can collaborate together while this path is being walked because astronomy is such a discipline that allows you to integrate many diverse topics. The story can be told as an over view and theme. This a policy that has to be supported by the community, the scientists, the surrounding schools. So all of this will have the consequence that content learning will be acquired and the learning will be deeper than if the teacher was just following the steps of a curricula or a book. We propose to bring teacher training to a higher level, to bring support, community, STEAM, cutting-edge science to the hands of any teachers. Beyond science, GHOU gives the opportunity to listen to each other. In every training, every classroom, someone will bring its cultural aspect. There is no translation for each word, just the meaning of things is universal. Looking at an observatory has a meaning without words. Our practice is facilitating this to happen in a very humane, free, volunteer and supportive way.

Prompt 3. It's possible that education might need to be radically transformed so as to build the kinds of economic security and human-centered work that we desire for the future. Thinking imaginatively and creatively, what can you come up with as ways we should reimagine schools and education more broadly?

Prompt 3.
• Decolonization of education Firstly, efforts have to be localized, because teachers and students react differently. Training and teaching have to meet a few "best practice" criteria but those should not assume a local or cultural knowledge. Second, as far as astronomy is concerned, teachers must promote children-centered activities, observations with naked eyes or with a (robotic) telescope, whatever possible in their own locality. Sometimes even inside one country different realities may emerge. Some are more culturally engaged in their community with local habits that one cannot alleviate. A moon may look like a rabbit or a cheese… So decolonisation of education is already there. You eliminate a lot of obstacles by doing so. Everyone starts wherever it is, at its own pace, without leaving anyone behind. • Community What I can create on my own is limited to my experience and my thoughts. If I collaborate with other people, the collective experience and ideas and thoughts are so much larger. In a creative process, we get the best from several worlds and probably the best solution. The professional scientific community is full of collaborations and smaller communities, at many scales. In many ways, GHOU models itself after aspects of the scientific community in terms of sharing data, ideas, scientific topics, and facilities. An excellent example is the exoplanet study programs evolving in some parts of GHOU. This involves students forming international collaborations, sharing data, being in communication, and developing long term friendships and bonds within the exoplanet collaboration team. All the while, local students need to interact with their local teacher, who can help support their learning, explain details of the data analysis that might not be explained very well, and support the students' learning and growth. If GHOU approached students in isolation without their teachers or other community member, the system might fail or at least work at a much less effective level. And the teacher involved can share his.her knowledge with other teachers. Other teachers would often appreciate learning that some of their students are searching for planets around other stars, and such a local excitement within the community helps support continual engagement in the team. It is important to give teachers and schools a community, so they are not doing it alone, because whatever we do, as science people, we do it better together. So communication and community become very important. The development and use of robotic telescopes in education allows us to provide additional online learning and support (via e.g. Zoom, Webex, Teams) allowing GHOU people to share more easily their knowledge and enthusiasm to teachers and educators. This is especially pertinent as we move toward 'Big Data' and incorporate new working practices mid- and post-CoVID. Knowledge is best acquired when the teacher and students are inspired. GHOU takes teacher and student seriously in providing accurate, up to date, information and access to real telescopes. Equally important is a network supporting teachers and students, helping with providing the knowledge and inspiring by mere support.

One can alter the saying “It takes a village to raise a child” into “It takes a well-educated child to raise a village”. One example is the family who was driving at night, and their child, who had just attended a GHOU-workshop asked if they could pull over and look at the stars. And the child shared so much knowledge about the moon to his parents and siblings, telling them things they didn´t know. It is inspiring to us, that students can be our teacher, they can teach their own surroundings.

- global citizenship through astronomy

In a fundamental way, astronomy teaches some of the most powerful and compelling basis for community – all humans come from re-cycled star matter, and there is little difference in the chemical origin of any of us. Essentially, in a kind of overstated way, we are all star children and all humans are star brothers and sister. This is a deep fact that many sciences cannot expand upon. And in fact, extending this “atoms from the stars” model a bit, we can begin to see how humans fit into a delicate ecosystem, where our atoms are continually exchanged in and out of the ecosystem, and each other. Hence boundaries between humans, on an atomic – system viewpoint are lowered somewhat.

Students connect through a telescope in another part of the world where it is dark. It makes people connect and learn about each other. Teachers from different parts of the world come to workshops, learning about ways to educate people, our children, how to think scientifically, analyse things in a global way. This is not only about children and teachers, but also the general public. Programs like “dark sky”, “Eratosthenes”, promote a sense of belonging to this globe that we all live on.

- Happiness

We want our children to become thinkers and learners, and that will make them happy. They will know they can figure stuff out. Children genuinely love to study and measure astronomy images, as certified by many of our internal researches. Education should be based on the word “critical” but also on the word “happy”. Children should be happy exploring education, dreaming, assessing data. That’s how the future could be. Education system has brought out a lot of pressure to the children. The beauty would be that education focus on the happiness of children and allow them to explore whatever they can.

III. Feedback on Consultation

Are there any other questions that should be posed in the context of the *Futures of Education* consultations?	
Is there anything else you wish to relay to UNESCO and/or the International Commission?	

VI. Consultation Sign-In Sheet

Mr/Ms	First Name	Family Name	Organization/ Affiliation	Please provide your email address if you wish to receive updates on the project	If you wish to be acknowledged please tick here
Pr (Mr)	Emmanuel	Rollinde	LDAR/CY Cergy-Paris University, France-HOU	emmanuel.rollinde@cyu.fr	X
Dr (Mr)	Carl	Pennypacker	University of California, Berkeley, USA-HOU	crpennypacker@lbl.gov	X
Dr (Ms)	Rosa	Doran	NUCLIO – Núcleo Interactivo de Astronomia Executive Council, GTTP, Portugal-HOU	rosa.doran@nuclio.org	X
Mr	Hassane	Darhmanoui	Al Akhawayn University, Ifrane, Marocco, Marocco-HOU	H.Darhmaoui@aui.ma	X
Dr (Mr)	Toshihiro	Handa	Kagoshima Univerisity, Faculty of Science, Japan-HOU	handa-univ@coffee.ocn.ne.jp	X
Mr	Kathan	Kothari	Manthan Educational Programme Society, India, HOU-India	kathankothari@gmail.com	X
Dr (Mr)	Fraser	Lewis	Faulkes Telescope Project, National Schools Observatory, UK-HOU	fraser.lewis68@gmail.com	X
Ms	Janne Iren	Robberstad	Department of Arts Education, Western Norway University of Applied Sciences (STEAM education), GSO, GHOO	Janne.Iren.Robberstad@hvl.no	X
Dr (Ms)	Colleen	Megowan	American Modeling Teachers Association, USA	colleen@modelinginstruction.org	X