STEAM Hub Survey

Report

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Introduction

STEAM Hub is a networking accelerator to initiate new collaborations in the field of science communication. It is an initiative under the SMEs for Innovation pillar of the German Federal Ministry of Education and Research (BMBF) implemented by IMAGINARY.

STEAM stands for science, technology, engineering, arts and mathematics. Small and medium sized enterprises (SMEs), startups, researchers, science communicators and business developers; People with different professional interests meet and develop new ideas together.

STEAM Hub has the goal to come up with innovations for science communication in four sections:

- Hardware (Transparent touch screens, kinetic installations, real 3d, real-time rapid prototyping, interactive mat, sensors, robots, …)
- Software (Apps, games, operation systems / infrastructure, toolkits, digital interactive, AR/VR/MR, …)
- Content (AI, Industry 4.0, Blockchain, data security, DNA modification, Space Travel, Science & Art, …)
- Marketing Strategies (New markets as Airplane Entertainment Systems, new forms of participation, social inclusion, guerilla venues, new regions, …)

With saying “innovative”, we dream of something interesting, newly combined and (really) not done yet.

In the STEAM Hub network we have introduced a fairness model that is used for co-created ideas. It consists of three steps, participants are invited to define the use for each case study:

- step 1: ownership claimed by idea-owner, vendor-client relationship
- step 2: collaborating partners are owners, shared profit-model
- step 3: open source product (commercial services can be offered)

For more information about the project, please visit our website www.steam-hub.com or download the official brochure (in German) at https://www.unternehmen-region.de/de/2215.php.

The Survey

Survey Design

In summer 2018, we contacted colleagues from inside and outside Germany to collect their ideas about the future of science communication. We wanted to know their opinions about questions like: Why do we need innovations? Are there changes that we long for? Are there things we want to improve in STEAM communication?

The survey was prepared at www.surveymonkey.com and included the following topics and questions types.:

Where do people (mainly) work?	Multiple choice question
What is their function within their institution?	Multiple choice question
What is their profession in science communication?	Multiple choice question
Core topics in science communication that keep them busy	Open question with 5 answers max.
Thoughts about “innovative science communication”	Open question
What would they like to change (if money didn’t matter)	Open Sub-Questions

Partly quantitative, partly qualitative, we didn’t expect to gain general statements about the situation in the field of science communication. For us, it was more important to collect diverse data from anyone who feels that he or she has something to say regarding this topic.

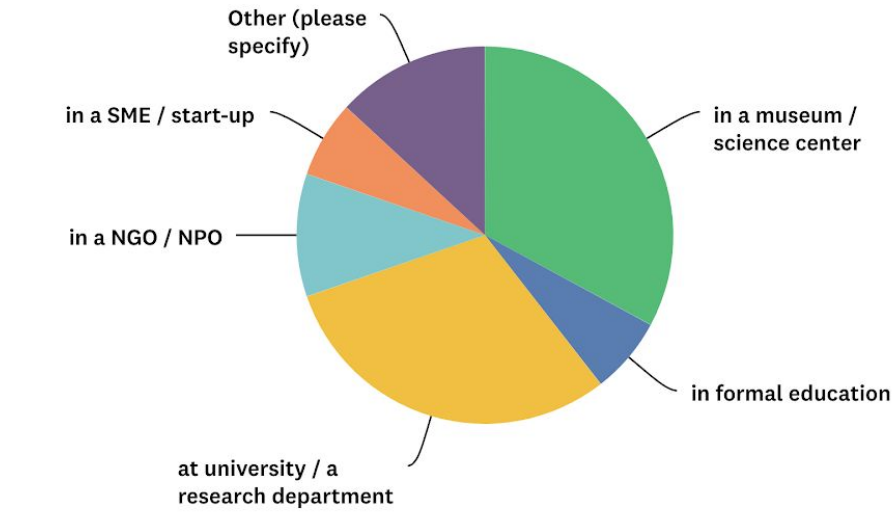
The survey was fully anonymous and the link was open to be shared for approx. two months during summer holidays. We received answers from 77 participants.

Results

The following report was made to sum up some interesting findings. If you are interested in getting the (anonymous) raw data to analyse with respect to other questions or methods, please contact us at steamhub@imaginary.org.

Question 1: Where do you (mainly) work

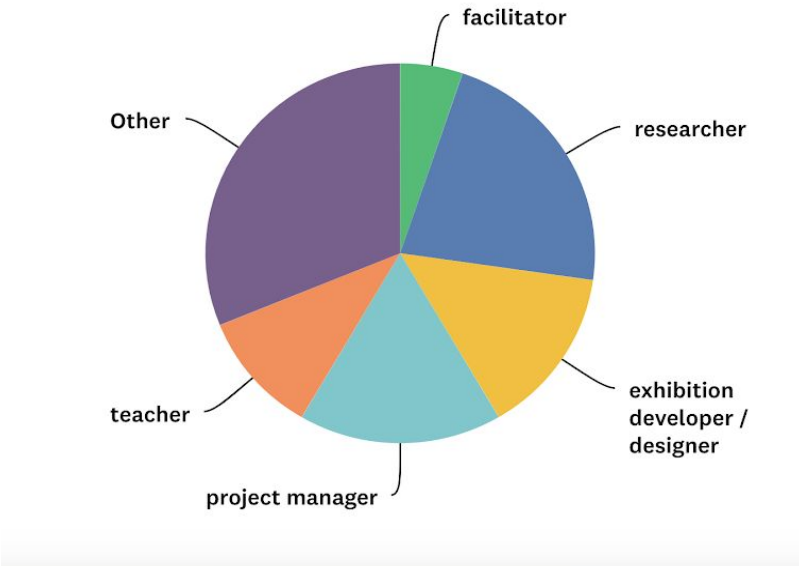
As STEAM Hub wanted to reach SME, museums, science centers, teachers, researchers and artists, the first part of the survey was designed to get to know our participants. Where do people work, in which role and expertise? We first asked about the (main) workplace of participants.



One third answered with “museum or science center”, one third worked in a research department or at universities. Around 10 percent of the participants worked in a NGO/NPO and 5 participants each in a SME or in formal education. The rest chose “Other” and specified mainly with saying that they work as freelancer / artist freelancer or they mentioned mixed answers, such as “in a university museum”.

Question 2: You work as…

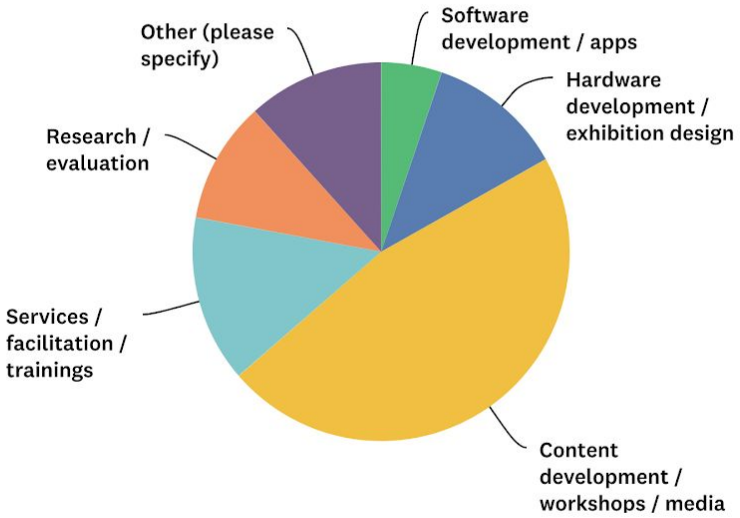
In the second question, we wanted to learn what the role of participants was in their institution.



20% worked as researchers, a bit less as project managers (16%) or exhibit developers / designers (14%). One out of 10 worked as a teacher and 5 participants as facilitators. Participants, who chose “other”, mainly were in a leading position (director, CEO, head, etc.), some others were artists or had a mixed role.

Question 3: Working fields

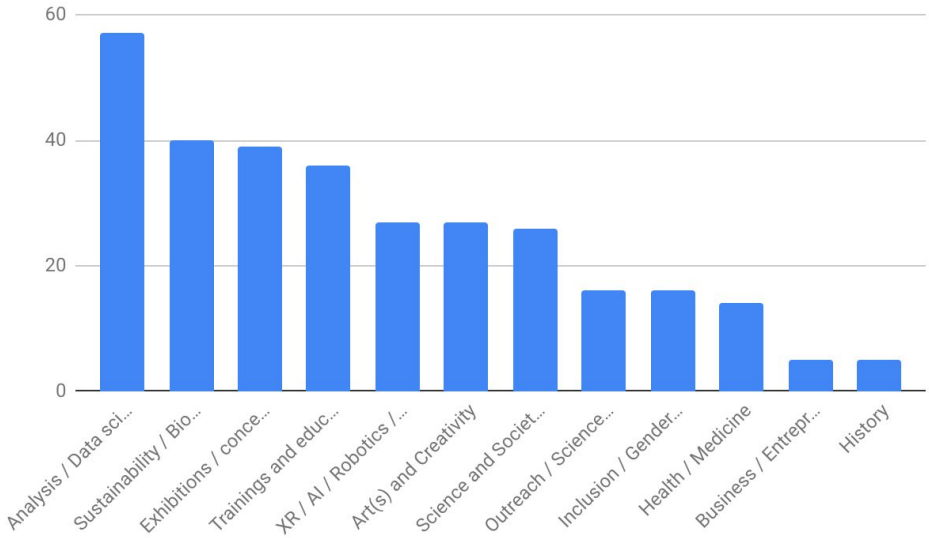
After knowing the institution type and function within the institution, we wanted to know more about the working fields of each participant. The fields were chosen according to the goal of STEAM Hub to innovate four sections of science communication. The naming of this sections changed following the process of the project, but basically we talk about Hardware / Software / Content and Service innovations.



Almost half of participants worked in content development (46%). One out of seventh worked in facilitation, trainings or services. Only 4 participants developed software or apps. The rest pretty equally (11% each) chose research / evaluation, hardware development / exhibition design and “Other”. And when saying “Other”, most meant that they combined more than one field and wanted to specify (f.ex. designing maths toys for exhibitions).

Question 4: What are the topics, science communicators are busy with at the moment?

We asked for max. 5 core topics that participants and their colleagues were involved at. This was a question with open answers, so when analyzing the answers, we were building categories. As we didn’t ask for a specific order of mentioned topics, we treated all topics equally (that means, we were not taking into account if a topic was mentioned as first or fifth topic).



The topics that were mentioned most frequently were from the category “Analysis, Data Science”. This includes topics that are related to current (maths) research, such as dynamical systems, algorithm, shape analysis, embedded systems, quadratic equations, quantum field theory, etc. This category being number one is related to IMAGINARY and maths communication as our core topic. This is why a lot of our partners are researchers and mathematicians.

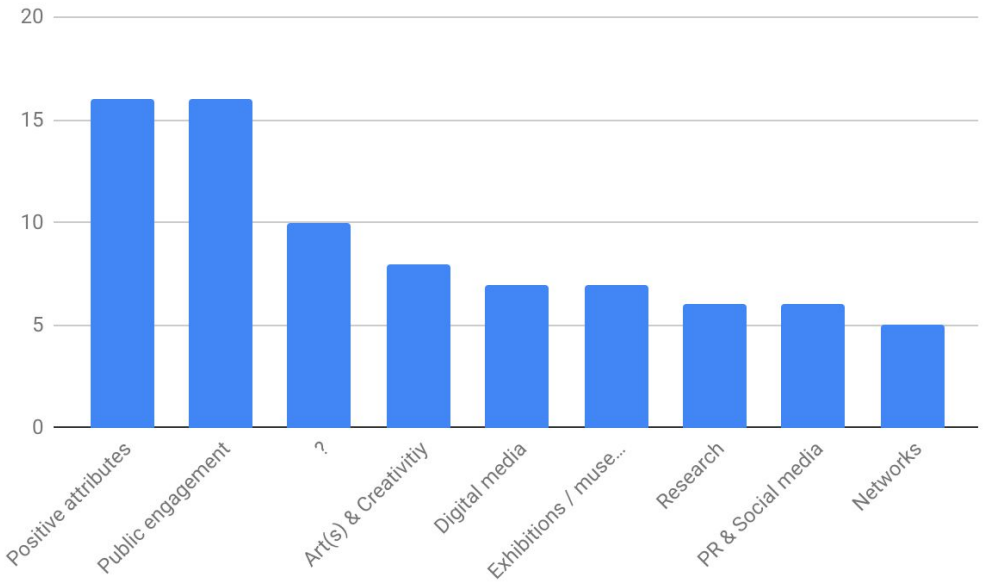
Second frequently were topics that fit into the category sustainability / biodiversity. This is maybe more expectable when asking an average crowd of science communicators about core topics. Also very important was the category “Exhibitions” with topics like exhibit design, new ideas for formats, exhibitions and collection policies.

Trainings and Education as one core topic within science communication work (for teachers, for scientists, for post-docs, as mentors, with e-learning) take position number four, followed by technologies (like Augmented Reality (AR), Mixed Reality (MR), Virtual Reality (VR), webcams, Artificial Intelligence (AI), digital fabrication, etc.) and art(s) related topics.

Social innovation topics like social inclusion, gender balance, citizen science, responsible research and innovation, outreach etc. built the next group of categories. Last (but still with more than 20 mentions) followed subjects such as health, entrepreneurship and history.

Question 5: Spontaneous thoughts about “innovative science communication”

As the question “Your first association when you hear innovative science communication” was designed as open question with a text box, again we had to classify the answers to get a visual impression of participants thoughts.



Most mentioned were kind of “positive attributes” (such as: open minded, accessible, exciting, attractive, cool, exciting, fun, engaging) and mentions that could subsummized in the category “public engagement” (such as: involve target audience, connected learning, empower society, out of ivory tower, adaptation of content to visitor, at eye level).

For about 10 participants, this questions led to a counter question or contained general critique (such as: Huh?, nothing, how?, buzzword, difficult, too many long words, that it probably isn't).

Next categories were “art(s) and creativity”, “digital media”, “exhibitions and museums” and “research”. Six participants spontaneously associated innovative science communication with “PR and media” and still 5 participants first thought about “networks”.

Question 6: If money didn’t matter…

For the last group of questions, we wanted to hear what people dream of, where they see potential for improvement or what they’d wish for. Assuming that money didn’t matter, we asked them about investments they would make. It was not obligatory to answer all questions, so the number of answers might illustrate the relevance of a question. Therefore we listed the questions not in the original order, but sorted by the number of answers (starting with the highest number).

If money didn’t matter, I’d invest in staff for... (56 answers)

Answers to this question could either tell us which functions are underrepresented in staff because people are not core members or further professionalisation is seen as needed. On the

other hand it could tell us more about the busiest staff members and therefore the need for more helping hands.

Most participants would invest in staff for (more, better) science communication or support for outreach and research. People would also be willing to invest in designers and in staff for education, teaching, facilitation and collaboration with universities. Some examples of answers:

- I'd invest in staff for developing new ways of communication.
- I'd invest in someone with a background in (science) education (e.g. for scientifically evaluating our content).
- I'd invest in staff for audience research & evaluation.
- I'd invest in staff for pop-up science centers.
- I'd invest in staff for personal interactions.
- I'd invest in staff for teacher's further education.
- I'd invest in designers that can help scientists to smooth out their rough ideas into shareable gems.
- I'd invest in staff for research and outreach equally.
- I'd invest in explainers in the exhibition.

Furthermore, participants saw a need for help in more general functions such as project management, software development, administration and HR.

If money didn't matter, I'd invest in an exhibit about... (50 answers)

As expected, the list of exhibits was related with the topics that people were occupied with. Not surprising that the focus on maths exhibits was very visible. For example, people would invest in an maths-exhibit about:

- the most abstract thing possible in maths
- Speculation
- The Power of Ten
- Maths and Football
- Maths and Music
- Experimental mathematics

Others would rather invest in an exhibit about:

- the world inequalities in access to basic needs
- periods or the pill
- failures in science and its role in discoveries
- past & present of repairing things - from fixing socks to changing iPhone screens
- women in technology
- vaccines
- Why science matters
- Garbage

If money didn't matter, I'd invest in a specific offer for this target group... (50 answers)

When we asked this question, we wanted to know, which target groups participants don't see fully served yet. We received two interesting kinds of answers: answers to the question of target groups and answers to the question of specific offers / services.

Of course, we know the discourse and see why it's problematic to group individuals and treat them as unity. But for this quite general question it seemed to be an useful model.
Related to target groups there were answers that used the age of visitors to describe whom they would like to design a specific offer for. Most mentioned: teenagers (between 12 and 18 years), followed by young adults (up to 35 years), children (6-12 years) and elderly people.

Other answers described the target group with other sociodemographic attributes. Looking at these answers, most mentioned: underprivileged people, refugees, hard-to-reach audience, followed by students, junior researchers and teachers.

Some answers included a more precise description, like "students who loved science but lost interest due to crappy classroom settings", "primary teachers that hate math" or "those who are from disadvantaged backgrounds who would never imagine science/third level education is for them".

Only once mentioned were: "pre-school kids", "blind", "politicians", "science center travelers" and "nerds".

When we looked at the answers that were related to specific offers, participants seemed to wish for:

- VIP treatment and/or free tickets for pupils
- Bring your own device stations
- An open "school for life"
- Free coffee for visitors
- Access to more innovative science communication methods
- Support for scientists doing science communication

If money didn't matter, I'd invest in a facilitator that is able to (46 answers)

Facilitators, explainers, guides, tutors,... There are a lot of names for the people that are our "faces" towards our visitors. Participants wished for the following abilities.

Facilitators should be able to:

- instruct new explainers (and be explicit on what (s)he does)
- Tell good/unusual stories
- Engage the public / make science available to the public
- Bring information to schools around the country

- Motivate people
- Use practical evaluation / monitoring methods
- Unearth hidden questions
- Work with teachers
- Burn for the cause
- Bridge barriers between disciplines
- Take care for a maker space
- Explain science through dance
- Draw
- Engage people of all backgrounds
- Facilitate science show
- know new topics that are not in the team yet
- know sign language
- Not hide behind science knowledge
- Be humorous

If money didn't matter, I'd invest in this tech gadget... (45 answers)

Surprisingly, most of the answers were related to quite "normal" (better) equipment for daily work in science communication, like a new laptop, a translator, a drone camera, VR glasses, 3D printer, maker space equipment, astronomy telescope, electric car etc.

Some wished for gadgets that seemed to be more fancy like a 12 D cinema, a computer driven industrial knitting machine or a quantum computer.

Other answers showed the potential of innovation when wishing for a bicycle powered tree house elevator, real-time 3D printing or holograms of historic people to be used as explainers.

Two answers contained explicit critique that technology becomes more and more important in science communication, by saying: "tech gadgets are overrated, idea and content of an exhibit matter" and "one of the core problems in science communication that this comes up first".

If money didn't matter, I'd invest in a team of researchers to evaluate this question... (44 answers)

Regarding science communication, participants were interested in answers on research questions like:

- **Impact**
    - The impact of our science communication
    - social impact
    - long-term impact
    - impact of involving our target audience
- **Text in exhibitions**
    - How to write museum texts that people LIKE to read?

    - Do the visitors in our house read something, or is written information obsolete?
- **Maths communication**
    - The effect of visual narrative in the understanding of mathematical concepts?
    - Why math confuses certain people?
    - How to increase the coolness factor of being interested in math?
- **Visitor studies**
    - What would make more lower income visitors come?
    - What do people of the region want to see in our new museum?
- **Museum Studies**
    - Are interactive technologies really helping exhibitions?
    - How to reach people in a way that they not only understand something, but to be active?
    - What factors of exhibitions are relevant so that visitors take something inspirational for their lives out if it?
- **Art & Science**
    - Can we really include art into STE(A)M?
    - Do art experiences have a longitudinal affect on people's intentions and behaviour?
- **Science & Society**
    - How to increase people's trust in science?
    - How to develop new tools to empower critical thinking and awareness of responsibilities among the visitors?
    - How to best give opportunities to take part in debates around science?

If money didn't matter, I'd invest in a solution for this inhouse problem (41 answers)

Regarding inhouse problems, participants were looking for solutions for sectors such as:

- working conditions (teamwork, burn-out)
- tech solution (IT system, multimedia experiences, cost-effective website)
- infrastructure (not enough space, storage / new air condition / effectively help our visitors to get about our very complicated building)
- financial issues (sustainable funding for non-profit, low-cost prototyping methods, longterm liquidity)
- Content, design (right scale between shiny empty animation and scientific core with real scientists / creating new interactive, hands-on workshops)
- Collaboration (working with "arrogant" scientists in science communication / cooperation between staff / not enough time and resources)
- Accessibility (totally barrier-free buildings)

Most mentioned inhouse problems were related to infrastructure. And there especially a lack of space seemed to be a well known problem for most of the institutions.

The next common problems were related to collaboration issues. Working with whom and how seemed to cause a lot of internal discussions. The importance of these discussions war partly surprising (as we talk about professional communicators), but partly clear just because of the high amount of (very diverse) collaborations that are usually handled in our field.

If money didn't matter, I'd invest in this method / product to revolutionise science communication... (41 answers)

The idea of this question was to give participants a chance to dream about innovative, (un)realistic formats that they would be interested to develop or to have one day. When looking at the survey, we could find quite down-to-earth answers that seemed clearly related to the core topics that we've collected earlier. There was basically only one topic that came up in different ways in different answers: Participants seemed to see a need for new formats to motivate or train scientists in science communication. Hardly no one mentioned a specific method or product, but the topic itself was clearly stated.

Here are some additional ideas that came up:

- Professionally produced TV series to be broadcasted through internet
- Developing soft skills! Back to basics.
- Academic credits for publicly engaged scientists
- e-decision making, e-literacy
- Tinder for science projects/project partners
- An open source collaborative approach

If money didn't matter, I'd invest in a collaboration partner that knows how to... (37 answers)

The most favorite collaboration partner of our participants would be one that knows how to design and develop (less dense) exhibitions without screens and is able to code reliably. Ideally also converts rough ideas into working apps. It would also be appreciated to collaborate with someone who knows how to get big money, writes grants, is a successful fundraiser and ideally would do money and business tasks in general. This would be as important as a partner that effectively knows how to reach out to include everybody, engages the public and knows how to tell compelling stories about the most complex content. Besides that people wish for a collaboration partner that values scientific work, understands how much effort it costs to develop a good exhibit, does not only focus on western science and is able to develop good indicators for evaluation and monitoring.

Follow up

As the main networking event of STEAM Hub, we hosted a two-day conference in Berlin on the 18th and 19th of October 2018. More than 65 professionals met to discuss and develop new ideas for the future of science communication. We were happy to welcome participants as/from

museums / science communication (21), SME (19), researchers (8), artists (5) and education / teachers (4).[1]

The conference was organized as a networking event. That means all sessions within the program were designed to support networking between participants. Engaging discussions, interactive, reverse sessions and extended breaks were used to create a non-hierarchical setting, letting the expertise of all participates shine.

The results of the STEAM Hub survey fed the design of the program of the networking conference and helped defining discussion topics that seem to be relevant for the community.

Some derived topics / questions were for example discussed in a World Café on day one:

- Art(s) & Science Communication
    - What is the role of arts in STE(A)M?
    - Can art(s) tangle topics that science can't?
    - Do artists have more freedom in communicating science than other communicators?

- Innovation & Science Communication
    - Why / in which direction should we innovate science communication?
    - Whom do we have to have on board to do so?
    - How would you lift science communication to a next level? What would this next level be?

- Money & Science communication
    - (How) Can we live from science communication?
    - What are we gaining from science communication?
    - Should / Could science communication be totally independent from government funding? And from big corporations?

- Science Communication and Education
    - How should (concrete) innovations look like when it comes to collaboration between formal and non-formal education?
    - Besides content and education… What should people learn at science centers / museums / science festivals that would be a benefit for our society?

[1] Participants were asked to categorize themselves at registration (number in brackets is total of participants in this group). 9 participants chose the category "other".