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‘Living with viruses’: informing and educating the public against all conspiracy odds.

Dominick Verschelde, Hanne Windels, Andrew Simpson, Kathy Messens and Mieke Uyttendaele

Abstract

While there is hope the coronavirus (SARS-CoV-2) can be brought under control, it will continue to impact global society in many ways. Adapting to new ways of working and communicating has influenced everyone, including the (university) museum community.

Wanting to address the public's call for information, and the fear triggered by the stream of disinformation from the internet, media, and rising conspiracy theories; we engaged ourselves to inform teachers and students on 'living with viruses' through the organization of debating sessions in the university museum.

In a collaboration between the University of Gent Faculty of Bioscience Engineering, and the Ghent University Museum, an educational master's thesis was developed and written on finding a way to educate the public on the biology of viruses, and their impact on society, with the aim of arming the public against misinformation, and wrongly induced fear due to the “infodemic” and conflicting reports related to these coronaviruses that provide fuel for conspiracy theories. This program was enabled by emphasizing the scientific method and critical thinking. As a result a teacher's package was produced enabling teachers to address the subject with secondary school students, and a follow-up debate in the Ghent University Museum. We argue this is a proactive way for universities, through their museums, to inform and engage the general public and students in debates in order to ensure critical scientific thinking, and induce calmness and reason instead of fear of unknowns and uncertainties. This form of debate and reflection can be used with any type of collection or object. A well-prepared dialogic exchange with the public framed by the university museum is a good means to have people open to informed decision-making and reflect on other points of view, and different perceptions.

Introduction

Around December 2019 the world heard about a new and highly contagious SARS-virus in Asia. By March 11 2020 the World Health Organization declared COVID-19 to be a pandemic (CUCINOTTA & VANELLI, 2020), the first in over 100 years. COVID-19, a disease caused by the SARS-CoV-2-virus, was a new viral strand within the Coronavirus family. SARS stands for Severe Acute Respiratory Syndrome (Sciensano 2020, VAN REETH, 2019-2020).

By that time, as people were desperate for information and scientists still needed to study the new virus fully, a stream of unclear, confusing, and sometimes wrong information started to emerge (WHO, 2020). Fear and doubts concerning the pandemic started an "infodemic" on the internet although the information wasn't always accurate nor founded on actual research (SPERRY & SCHEIBE 2020, VAN RAEMDONCK 2020, WHO 2020). Fear, misinformation, and disinformation soon led to a series of conspiracy theories.

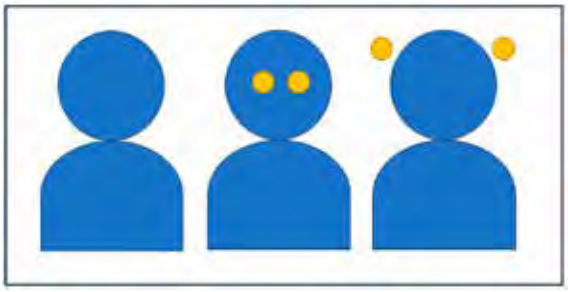

Fig. 1: First impressions: It is important to dot the 'I's correctly

It has been argued recently that belief in misinformation and conspiracy theories are no longer fringe phenomena or mundane concerns with little real-world impacts. Instead they are politically, socially and economically relevant to us all (USCINSKI 2019, 1). During the early days of the pandemic one theory claimed that 5G cellular network is the cause of the disease. De CONNICK et al. (2021) document the impact this widespread belief had with attacks on telecom workers in the U.K. (VINCENT 2020) and the burning of mobile phone masts in the Netherlands (WASSENS 2020). De CONNICK et al. (2021) also chronicle studies that show disease-related conspiracy theories encourage lower vaccination intentions, lower levels of trust in governments and health instrumentalities (LUTKENHAUS et al. 2019), and less willingness to abide by restrictive measures put in place to curtail spread of the disease (IMHOFF & LAMBERTY 2020).

In general it people were not sufficiently armed enough against or suspicious of the flood of (dis) information, and science was understandably not in any position to provide needed scientifically founded explanations. The public debate on COVID-19 was loaded with disinformation. This led to further conflict and even violence which in turn also endangered human safety and rights (WHO 2020). It has been argued that disinformation is linked with a lack of the usual social or ethical standards in group and individual behavior (McCARTHY et al. 2021). Even today conspiracy theories and distrust still endanger the efficacy of vaccination programs.

There has been a clear and urgent need to not only inform the public about viruses and how we can live with them as a pandemic response, but even more on how to deal with, and how to process the mountain of information that is readily available and accessible out there as an "infodemic" response. When misinformation is fueled by rumors, stigma, and conspiracy theories there are potentially serious implications for individuals and communities. Magnification of misinformation through social media can give it higher visibility and priority over evidence-based information. In a four month study in early 2020, 82% of online COVID-19 stories were found to be false (ISLAM et al. 2020). Other studies use the concept of technological affordances to explain differing impacts of different platforms (THEOCHARIS et al. 2021). To counteract some of the negative consequences such as vaccine hesitancy, some have suggested 'localized' public education and role-modelling as helping a lot in building public trust (e.g. VERGARA et al. 2021). Our program is one such response through the agency of the university museum.

In this program we focus on the following three central questions:

- What do young people learn about viruses, and what do they need to know?
- How can we promote and critical thinking and media literacy in youth?
- Is debate a good practice to educate people in critical thinking and media literacy?

Where to start?

Educating the general public includes teaching children at an early age. We looked at the organization of Flemish school curricula (Belgium), and teaching plans to know at what age teenagers are taught about viruses, and the need for critical thinking in high school (VALCKE & STANDAERT 2020).

So we recognized different shortages concerning the knowledge on the life of viruses, and at the same time on the use of the scientific method and critical thinking.

The corona pandemic generated a flood of wrong, confusing and untested, and hence misleading, information (WHO, 2020). It also generated one massive and multi-part "infodemic". The uncertainty and fear this caused even effects the public view on the vaccine development and subsequent vaccination efforts.

We postulate that teaching about viruses and critical thinking at a young age would render a degree of early media wisdom. We came up with a plan of action in which university museums and collections can contribute and play a fundamental role. Our aim therefore, was to develop a teaching program both on the life of viruses, and the use and concerns of the scientific method. The resulting program can be used by the teacher and students in the classroom, and can then be followed by a group debate in the university museum.

Corona viruses

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 to be a pandemic, meaning that the disease was spread all over the world, stopping at no borders, and had infected a huge number of people. COVID-19 is a disease caused by the SARS-CoV-2-virus, a new virus within the Corona virus (CoV) family. Coronaviruses are single-stranded RNA viruses. They can infect a wide variety of animals including humans (KOORAKI et al. 2020). These viruses were first studied in cultures from patients with the common cold (TYRRELL & BYNOE 1966). These viruses were named coronaviruses because of their spherical virions morphology with a shell and surface projections that look like a solar corona (SAADAT et al. 2020). In Latin corona means crown. There are many different subfamilies that have been identified.

SARS stands for Severe Acute Respiratory Syndrome (VAN REETH 2019-2020). The genetic material of such viruses is known as ribonucleic acid (RNA), which undergoes mutations more easily and more frequently than deoxyribonucleic acid (DNA) as is found in our cells. This feature, along with the lifecycle, infectiousness, disease symptoms, likes and dislikes of this virus are key to understand and appreciate the severity of the problem. In itself all of this is critical information for any effective community-borne and supported battle plan to collectively tackle such a pandemic.

The impact of the pandemic meant that epidemic modelling was at the forefront of public policy making (BERTOZZI et al. 2020) at a time when little was known of the different factors that would effect, i.e. either inhibit or enhance the contagion. This prompted a sudden profusion of analyses in the scientific literature digesting huge data sets to elaborate and identify pertinent factors that would assist public policy making. These included the effects of climate (CHEN et al. 2020), seasonality (LIU et al. 2021) and population density (ROCKLÖV & SJÖDIN 2020, WONG & LI 2020). Others have noted that while classical statistical models can produce some satisfactory results they can miss intricacies and argue that datasets for such complex modelling should be used to train artificial neural networks before deriving useful predictions (e.g. CAR et al. 2020).

The Scientific Method and Critical thinking

The scientific method and critical thinking is not exclusive to research and researchers, but can help everyone to understand, and to make positive contributions to society as engaged citizens. The scientific

method teaches us to be open to all ideas, and urges us to look for proof in order to think of the best possible solutions and hence help with our decisions and actions. To have media literacy you need a degree of scientific literacy. The ability and enthusiasm to argue and debate on subjects is also inherent to critical thinking. 'Scientific thinking is something people do, not something they have' (KUHN 2011).

A scientist needs to regard all hypothesis as possible, but will only accept an idea when proven to be true. From a scientific point of view, you don't have to believe that 'God exists' as that has yet to be proven, but you cannot say that 'God does not exists', as you cannot prove that either. Critical thinking is a way of looking at situations and interpreting observations as objectively as possible. It can also help in trying to distinguish information from disinformation. It's purpose is not to influence people, but to enable them to form and take an educated standpoint. It has been argued that scientific literacy through critical thinking skills can be introduced early in a child's educational journey (VIEIRA & TENREIRO-VIEIRA 2016). We argue that developing the critical thinking skills of visitors to the university museum should be considered as part of the university's social contract. People have the right to, and need to be taught how to, form critically analyzed opinions free from fear and without it leading to conspiracy theories. This takes a degree of 'scientific literacy' (THOMSON et al. 2016). This is not an inherent human ability, but something that everyone needs to learn how to do and apply.

Science is a never ending process (HULL 1988) and cycle. As suggested in the above example, ideas and hypotheses are tested again and again and are only accepted as a fact when proven (BioInteractive, 2018). A hypothesis that ends up being disproven is discarded. When new information or proof is found, the theory is immediately adapted to this new information and fact. Science is not a faith, but must grow through constant vigilance, critical analysis and regular testing (SIMPSON & WINCHESTER-SEETO 2005). Science works towards augmenting knowledge, reducing uncertainty, and hence reducing fear of the unknown. Science does not believe, but tests over and over again. Science is not the knowledge produced by a few persons, but the result of the cooperation of an entire community working together. The development of COVID-19 vaccines is a good example of this: the world achieved in one year what otherwise would have taken an individual company a decade. This achievement is currently being documented in a university museum, the History of Science Museum at Oxford University (ACKERMAN 2021).

Twenty first century skills: the need for media literacy

Problem solving, creative thought, critical control, communication, cooperation are not only important for science, but also for society. These traits are sometimes referred to as twenty first century skills, but have been used long before now (VALCKE & DE WEVER 2019). Some have argued their importance now results from fundamental changes through the significant shift in advanced economies from manufacturing to knowledge services. Information and communication technology changes have transformed the nature of work and the meaning of social relationships. New social practices have evolved because of the massive expansion in use of new digital technologies (BINKLEY et al. 2012).

It is very important to be able to distinguish propaganda from information. In 2019 the Flemish government actually added 'digital literacy', *i.e.* computer – and information skills combined with media wisdom (THIJS et al. 2014, VALCKE & DE WEVER 2019), as one of the 16 key competences to the new teaching plans for high schools. It is essential that student learn to search, find, assess, and process all possible information readily available on the internet. Teaching this at a young age is important as, honestly, it can take a lifetime to master it. The true danger of disinformation and prejudice is that it competes with the actual truth. People can have different opinions, but we need a form of consensus on what is true, and what is debatable in order to be able to comprehend and consider different points of view (VAN RAEMDONCK, 2020). In the Flemish education system the term 'Democratic Dialogue' is used to cover this process of managing divergent points of view in a facilitated educational setting (GÖREGEN & VAN RAEMDONCK 2020).

Debate or discussion – a moderated discussion

A debate is characterized by the fact that subject, certain questions, participants, and timeframe are decided upon in advance. The participants are knowledgeable on the subject, and they debate in front of an audience. A moderator assures that everyone gets his or her turn to speak, and keeps an eye on the allotted time. In this program we want to include the audience as active participants in the dialogue. This introduces the possibility of different elements coming into the discussion and possibly enlivening the

debate. This engages the audience (e.g. schoolchildren or students) to actively think about the subject, and gradually formulate their own 'educated' or informed view on the topic. The best way to describe an undertaking such as this is a Moderated Discussion. There are no defined or prescribed outcomes, but the process and exchanges are facilitated by a neutral moderator.

In this project, preparations for the moderated discussion are done in the classroom prior to the visit to the university museum. After exposure to the subject material at school, students can prepare a few questions which are then carried forward to the university museum. Questions emerge as a result of collaborative learning dialogue in the school setting that provides individual students with motivation for the university museum component. The museum's moderator combines these questions with the museum's own program for the debate, resulting in the format of the moderated discussion. This process of building motivation in students in this way has been noted in studies of asynchronous peer-supported on-line discussions (XIE & KE 2011).

The Ghent University Museum (GUM)

The Ghent University Museum opened its doors for the public during October, 2020, in full corona circumstances; an institutional child of the pandemic. Many years in planning, It involved bringing a number of museums and collections together into a centralized facility and was part of a trend in a number of universities at the time to manage their material collections with an institution-level strategy (SIMPSON 2014). The museum consists of the following collections: Archaeology, Ethnography, History of Medicine, History of Sciences, Morphology, and Zoology. There is also a strong cooperation with the Botanical Garden.

The new museum has a cross-disciplinary remit as a forum for science, doubt and arts. It combines and presents a range of objects from the various Ghent University collections presented around the story of the scientist and science capturing the nature of scientific investigation and the process of discovery encompassing: chaos, doubt, imagination, knowledge, measuring, modeling, and networking. The GUM focuses on the story of the scientist; a journey with obstacles, false leads, doubts, and always a search for answers. This journey is repeated time after time. The moderated discussion through the use of a facilitator is a common design element in many GUM programs (e.g. DE SCHRIJVER et al. 2016). For many of the museum programs the 'journey of the scientist' is represented by a time-limited guided tour through the permanent exhibition, as a way of evoking a personal understanding of the 'journey' for our visitors.

For this 'Living with viruses' project we list the main features and messages of the classroom and university museum phase of the program below.

1. For the preliminary classroom work prior to the visit to the university museum we focus on scaffolding with what students need to know to engage with the topic. For this we prepared a teachers package with the following information:

    - What is a virus? How does it compare with Prokaryota and Eukaryota?
    - Virus' structure, and genetic makeup
    - Virus' lifecycle, multiplication and 'evolution' (mutations, recombination)
    - Ways to tackle a viral infection; what is a vaccine?
    - What is Sars and CoV-19?
    - After these five content areas are covered, students prepare questions they would like to be discussed and possibly answered at the moderated discussion in the university museum.

The following topics are also introduced in the classroom, but are addressed in more detail during the GUM workshop:

    - How to arm oneself against misinformation; the first steps towards media literacy
    - The scientific method, and the power of critical thinking
    - What to expect in and during the moderated discussion at the Ghent University Museum.

2. For the following session in the university museum we introduce the concept of the moderated discussion. This part of the program consists of the following elements:

- Collection objects are used to 'decorate' the discussion room or table, and to illustrate the introduction to the moderated discussion
- The strength of the scientific method and the nature of critical reasoning
- Discussion on whether a virus is a living organism?
- Discussion what a virus' strengths are
- Hence what do we need to look out for, and how should we react to the threats they pose?
- Distinguish between what is known, what is needed to be known, and what is unclear
- Approach of being cautious but not fearing the unknown.
- Where to look for information that is reliable
- Inform yourself well and think before you react: changing media habits
- Remember the importance of critical thinking
- Summarize the messages from the discussion to be taken home

Discussion

Conspiracy theories are both ubiquitous and challenging for contemporary society. This is a rapidly emerging socio-psychological research field. They are characterized by four specific attributes; they are consequential with real impact on people; they are universal in that belief in them is widespread; they are emotional not based on rational deliberations; and they are social i.e. closely associated with motivations underlying intergroup conflict (VAN PROOIJEN & DOUGLAS 2018). Uncertainty and fear accompany conspiracy theories. While there are a broad range of social responses that are needed to ameliorate the potential dangers posed by widespread belief in conspiracy theories, an obvious strategy for university museums and collections is to deploy their spaces and collections for positive programs that promote critical thinking and question irrational beliefs. There is meaning and opportunity for all kinds of university collections to use their objects as a tool or a focal point for debate with the public on any related subject. This involves fostering the ability to see multiple sides to a singular issue, being able to reason dispassionately, being open to new evidence that disrupts your assumptions, deducing conclusions from facts and demanding that claims are backed by evidence. This has always been an important remit for museum education (e.g. FELTON & KUHN 2007). But when it is based in the university museum, this represents the university enacting its social contract with society. The university museum provides the necessary and essential context so the details of the issues can be understood (see Figure 1).

Informing the public, addressing their questions, and taking their concerns into account are crucial steps in addressing local and universal challenges and threats by promoting rationality and providing insight and perspective on critical issues. University museums can help inform the public on a range of subjects, arm them against misinformation, and hence prevent fear and panic. In this paper we try to address teenagers concerns about the COVID-19 pandemic by creating a package on the strength of the scientific method and critical thinking. 'Living with viruses': informing and educating the public against all conspiracy odds was the result. To serve the community concerning this global issue, the teachers' package and discussion form in English are available on request from the Ghent University Museum. We hope to be able to report on the impact of the program in the future.

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This paper stemmed from a workshop presentation during the UMAC Universeum 2021 conference (held entirely online during the COVID-19 pandemic). The idea to develop into an article stemmed from Dominick Verschelde. As the Ghent University Museums Zoology Collections manager, and the Sciences Research and Education Coordinator, he recognized the need to document new engagement practices in the museum in response to the impact of the pandemic. He provided an initial draft and oversaw the process of writing the paper. Hanne Windels is a bio-engineer who recently finished an educational Masters thesis on 'Living with viruses' at the Faculty of Bioscience Engineering in cooperation with the Ghent University Museum. She focused on critical and scientific thinking in the context of the current pandemic. Professor Dr Kathy Messens, an associate professor at the Department of Biotechnology of the

Faculty of Bioscience Engineering teaches a wide variety of courses from biotechnology to nutrition. Her knowledge of genetics contributed to the paper. Professor Dr Mieke Uyttendaele is a professor in food microbiology at the Department Food Technology, Food Safety and Health of the Faculty of Bioscience Engineering. She is also the Faculty Director of Education and Internationalization and engaged in the Educational Master's program in Science and Technology. She brings microbiological insights and an understanding of teaching practices to the paper. Andrew Simpson, Research Fellow at the Chau Chak Wing Museum, Sydney University chaired the workshop session at the conference and incorporated extra content from the workshop into the manuscript.

Dominick Verschelde is a marine Biologist with expertise in taxonomy. He is the Ghent University Museums Zoology Collections manager, and the Sciences Research and Educations Coordinator in which he aims to bridge the public and collections with the universities research and education programs.

In loving memory of Amélie.

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