Chapter 15

ArtScience for Health Awareness in Brazil

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15.1 Introduction

Promoting health awareness is important but challenging for ensuring public health. Recent examples include the need to control the *Aedes aegypti* to reduce urban transmission of dengue, Zika, chikungunya, and yellow fever (Fonseca 2016). The summers of 2015, 2016, and 2017 were especially alarming in Brazil, since a triple epidemic arose with these arbovirus fevers (Nunes et al. 2018). To add to the complexity faced, a sylvatic yellow fever reemerged in the country at the same time (Moreira-Soto et al. 2018), people were actively called to receive yellow fever vaccinations, the only available immunization.

The Brazilian education system promotes a fairly narrow view of health as an absence of disease (Assis and Araújo-Jorge 2018). This is a view of health that has been contested by the World Health Organization (WHO) since 1946 (Nielsen 2001) because of fails to acknowledge the social context in which health is created. Educational initiatives based on even this traditional narrow view of health have not been plentiful nor effective enough to address this situation. Vertical models of communication in use since the 1980s have failed successively to combat dengue epidemics in Brazil. These models use strategies involving mass communication campaigns and authoritative/prescriptive education actions that displace governmental responsibilities to the accountability of the most vulnerable populations (Assis and Araújo-Jorge 2018; Valla 2000). Thus, the academic community has

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been challenged to generate new strategies and actions that can engage education actors (teachers, public health vigilance agents, health management services, and academic centers) as well as the general population in expanding health awareness.

Despite the general distribution of *Aedes aegypti* in broad urban areas (Ferreira and Chiaravalloti Neto 2007; Mulligan et al. 2015), the consensus is that social determinants have a great impact on arbovirus epidemics (Ali et al. 2017; WHO 2012). Poor housing, inadequate garbage collection, and the absence of a continuous water supply (leading to the need to accumulate water in domestic reservoirs) create favorable conditions for the *Aedes* life cycle development and characterize dengue, Zika, and chikungunya infections as neglected diseases associated with poor living conditions in general.

At the Laboratory of Innovations in Therapies, Education, and Bioproducts in the Oswaldo Cruz Foundation (Fiocruz), our group adopted the concept and definitions of the ArtScience Manifesto (Root-Bernstein et al. 2011) and introduced ArtScience activities into education strategies to foster health and creativity. ArtScience is an interdisciplinary concept that hybridizes science and art practices and methods designed to favor creativity and innovation (Araújo-Jorge et al. 2018). It focuses on processes rather than on products, having the latter as a consequence of multiple engagements of awareness-raising, reasoning, and emotion of activity participants. Our goal was to address the difficulties that people of less-favored neighborhoods in Rio de Janeiro have when facing those epidemics, both with the general public and particularly with local schoolteachers (Araújo-Jorge et al. 2018). The activities converge to connect ArtScience workshops and courses with concepts of health promotion, dialoguing with the Brazilian National Policy of Health Promotion (Brazilian Ministry of Health 2010; Malta et al. 2018) and other policies that impact health. Our approach is based on the Ottawa Charter and Adelaide Statement, addressing health in all policies and the social determinants of health (WHO, Adelaide Statement on Health in All Policies 2010; WHO, Ottawa Charter for Health Promotion 1986).

Health promotion is simultaneously a field of knowledge and a field of practice, converging to reach and to improve quality of life. In the current context, health promotion has been reinforced with the goals of the United Nations' 2030 agenda (UN 2015), in which its sustainable development objectives strengthen the need for a global pact to improve the quality of life on the planet.

In this context, to achieve the aforementioned goals, the center of our strategy is the use of the ArtScience approach in socially vulnerable communities, mixing multiple artistic languages and socially accessible digital technologies. We always start the first workshop by playing Rita Lee's "Saúde" ("Health"), a popular Brazilian rock-and-roll song (www.youtube.com/watch?v=zEPXOQvN6vM) that immediately introduces discussions of health promotion. Following this, we begin developing and facilitating activities such as board and computer games, sustainability and art workshops (using reusable and recyclable materials), music for health awareness (with people of various ages and diverse pathologies), dialogic circles on science fiction, production of materials for health care communication in the training of health care agents, and contributing to the "ecology of knowledge" of teenagers and

adults in socio-environmentally vulnerable areas with a high disease prevalence. We integrate the activities in the context of (1) basic and translational research on health and education, (2) “university extension” (the social link between academy and society), and (3) education (not only training) to empower the target population of the activities in a real praxis of social activism as defended by Paulo Freire’s pedagogy of autonomy for popular education (Borg and Mayo 2000). Dialogue, emancipation, reflexive capacity, hope, passion, critical analysis, and awareness about their own living conditions and the conditions of the whole planet are essential elements of this pedagogy. Other essential elements are respect toward people’s diversity of knowledge and cultures; confidence in the mutual construction of new knowledge that emerges from these dialogues, known as “ecology of knowledge” (Bowen 1985; Santos 2007); and the search for collaborative and creative solutions for the present problems (Araújo-Jorge et al. 2018; Root-Bernstein et al. 2011).

15.2 Project and Methods

15.2.1 Approach

The ArtScience project (CienciArte©) has been under development in our laboratory for 20 years (Araújo-Jorge et al. 2018), dating from the first PhD thesis that was presented in 1998. In Fig. 15.1, we present the project logo (a) as well as its mobile/itinerant version (b)—used when courses and workshops are literally “on the road,” outside the walls of Fiocruz campus and immersed directly in communities. The project applies a qualitative research, exploratory, and descriptive approach that focused initially on science education (Araújo-Jorge et al. 2004) and more recently on health promotion and health surveillance with popular participation (Garzoni et al. 2018). We developed a variety of workshops using science and art (Araújo-Jorge et al. 2004) and recognized in our practices intensive exercising of the 13

Fig. 15.1 (a) Logomark of the project; (b) logomark of the mobile version “on the road” (“na Estrada,” in Portuguese). (Logos created by the designer and PhD ArtScience student R. Todor)

cognitive categories summarized by Robert and Michelle Root-Bernstein (2001) as their 13 creative thinking tools to foster creativity (see Box 15.1).

We adopted the term *CienciArte*© as a free translation for the neologism *ArtScience*, created and defended in the *ArtScience Manifesto* (Root-Bernstein et al. 2011). We recognize *ArtScience* as a transdisciplinary new field that transforms discoveries and inventions into innovations (Fig. 15.2) through the intensive work of making connections and driven by the necessity of applying relevant knowledge and creating social technology. History is being written with the merging of science and art in different countries (Sanders 2009; Welch 2011), and in the United States, acronyms are prevalent. The 1950s saw the birth of the now already-old STS (Science-Technology-Society) approach (Auler and Bazzo 2001; Iglesia 1997), and nowadays the new versions—STEM (science, technology, engineering, and mathematics) and STEAM (science, technology, engineering, arts, and mathematics)—are under intense debate (Malina et al. 2018; Sawada et al. 2017). The “taxonomy” of this area is still confusing; a Google search on December 30, 2018 recovered thousands of results using the following words: *ArtScience* (644,000), *SciArt* (386,000), *STEAM education* (586,000), and *STEM education* (4,860,000). In our experience, it is easier to work with the neologism “*CienciArte*,” which in Portuguese blends the single “a” in both words—“*ciência*” and “*arte*”—and thus intuitively sparks the interdisciplinary concept of interfaces and interceptions among those fields. We refer to *ArtScience* as an “approach” rather than a “method” (Siler 1999), since replication is possible but results always depend on the type and depth of participant engagement.

Fig. 15.2 A general scheme for the *ArtScience* approach; the curved arrows form a continuous circle starting on imagination, following through making connections (through the intense use of the 13 cognitive categories to inspire discoveries) that support inventions, which can be applied and generate innovation. (Source: *CienciArte*© collection)

In the general ArtScience scheme in Fig. 15.2, the first three steps—imagine, connect, discover—are the foundation for basic research in all science and humanity fields; discoveries continuously feed the scientific literature. However, only when discoveries are converted into inventions that serve different applications—translating knowledge into products, processes, and tools—will they be characterized as innovations, meaning something representing a novelty, either totally or partially new; something causing an impact of any nature in the social context; and something adding value, either tangible or intangible.

15.2.2 ArtScience Workshops

Focused on the goal of creating awareness for health promotion, we developed courses that innovate both with the target public (vulnerable populations affected by neglected diseases such as Chagas disease and dengue fever) and with the ArtScience pedagogical approach. In this chapter, we will describe the activities promoting health with ArtScience to prevent arbovirus spreading through *Aedes aegypti* infestation. Three courses were performed at Mangueiras neighborhood in Rio de Janeiro (the geographic region where Fiocruz is located), directly in the community areas (February 2016 and 2017) and in a public secondary school (2018). Two adaptations of this course were also prepared, one for the arid rural zone of Quixeramobim, Ceará state in northeastern Brazil in October 2016, and the other for an industrial area at the Atlantic forest of Rio de Janeiro state in the city of Itaguaí in March 2017.

15.2.2.1 Target Public and Characteristics of the Courses

These workshops were run with adolescents (15–18 years old, in the secondary schools) and with adults (19–62 years old, in the community courses). Participants were invited by social media releases detailing the course period and conditions. The project was supported by two FAPERJ grants (E-26/010.001855/2014 and E-26/201.838/2017), and the courses were completely free of charge, thus relying only on each participant's motivation to become a popular agent of health promotion and vigilance. The main course was named *Formation for Health and Vigilance popular agents: ArtScience in Aedes control* (in Portuguese, “*Curso de Formação de Agentes Populares de Saúde e Vigilância: CienciArte no controle do Aedes*”). The practical workshops were composed of face-to-face activities in house (classrooms) and field areas. All involved artistic expressions were conceived for practicing the 13 thinking tools described in Box 15.1.

Box 15.1 The 13 Creative Thinking Tools

1. **Observing and registering**, not simply watching, and going beyond the visual aspect of seeing.
2. **Imaging**, evoking images, creating visual representations in the mind.
3. **Abstracting**, to take something and simplify it to its most important single element, to imagine what something could be that it is not yet.
4. **Recognizing patterns**, identifying what is common and what is unique.
5. **Forming patterns**, creating something different by combining two or more elements together.
6. **Making analogies**, finding a relationship in size, function, form, or other.
7. **Thinking with the whole body**, moving the body through space to let imagination flow.
8. **Empathizing**, putting oneself in someone else's position, changing the perspective and the point of view.
9. **Thinking in a dimensional way**, moving from 2D to 3D, 4D, or 5D, scaling, or altering the proportions and symbols.
10. **Modeling**, creating representation of something in a physical (and even functional) form.
11. **Playing**, simply for the fun and for the enjoyment of doing something.
12. **Transforming**, altering some thing or some tool into another thing or another tool.
13. **Synthesizing**, describing in few words or in a picture a complex and whole idea.

15.2.2.2 Workshops

The workshops (WS) were prepared and combined according to the specific plans of each course, depending on the available time schedule and motivation of the participants.

WS1: What is ArtScience? Is the *Aedes* control a problem? Why ArtScience for *Aedes* control?

WS2: Observing mosquitoes and discovering novelties: in practice.

WS3: Observing the *Aedes* life cycle with the film: “O mundo macro e micro do mosquito *Aedes aegypti*: para combatê-lo é preciso conhecê-lo” (produced in Fiocruz 2015), available at: <https://youtu.be/PqUB85cE4Ls>; Exploring games about *Aedes* life cycle, available at: http://www.fiocruz.br/ioc/media/comciencia_05.pdf.

WS4: Field work: active search for mosquitoes' larvae, eggs, and adults; photo documenting mosquitoes' breeders (any open water reservoir, especially large and clean water tanks; see Powell and Tabachnick 2013).

WS5: Mapping the neighborhood region, recognizing and localizing *Aedes* breeders, and tracing strategies for control: why a week table control? How do the environmental determinants and the urban organization favor the presence of *Aedes* mosquitoes and the incidence of arbovirus fevers?

WS6: Making stop-motion films and a TV news report sketch for a potential community channel where the community itself and its real context were presented.

WS7: 5D modeling of the major problems: collective construction of simple structured sculptured models presenting solutions to a challenging question and implicating more than only three dimensions, thus including time, movement, sound, tactile, or olfactory perceptions (fourth dimension), as well as symbolic elements expressing a fifth dimension (see Siler 1999).

WS8: Garbage and life: a sensitive look at garbage in public and private spaces.

WS9: Theater sketch: performing the problem and its solutions.

WS10: Synthesis: what have you learned? How will you use what you have learned?

As mentioned, all the workshops exercised one or more of the 13 cognitive categories (Box 15.1), with "Observing" the first and most continuous one. Figure 15.3a–e show different moments during the workshops. A recent paper showed in more detail some of the images used in WS1 (Garzoni et al. 2018). The different courses combined one or more workshops depending on the time available. Due to a lack of space, we will describe in detail WS5–WS10 in other publications.

WS1 (What is ArtScience? Is the *Aedes* control a problem? Why ArtScience for *Aedes* control?) introduced the subject, the problem, and the methodology. In a sequence of 30 slides, the participants were invited to think and to present their own view of the arbovirus problem. We explored the free association of words and of images and the ability to draw and model with clay, as if they were back in kindergarten classrooms. Their impressions emerged as we talked about "What is ArtScience for you?"

Talking in a fun way; learning in a scientific way about what matters, and with art, in a manner that we all can understand; getting awareness of what we are learning; putting on practice through the arts, an easier means for all to understand; in a practical and not theoretical way; art is dynamic and fun; art impacts people, their voices, the theater, the films; it is good that we do not keep the knowledge for ourselves, since this knowledge is affecting all of us (transcript of participants' answers in a workshop).

The participants also shared opinions and impressions about the ideas they discussed concerning dengue, Zika, and chikungunya fevers: "What are we talking about when we talk about *Aedes*?"

Is to talk about how you feel when you get dengue, six days at home, without feeling like eating or drinking anything; about any knowledge related to the mosquito; about knowing

Fig. 15.3 (a) Moments and materials of workshops, showing activities of observing mosquitoes; (b) recognizing patterns by observing images of *Aedes* control campaigns. (Images from governmental sites (<http://www.blog.saude.gov.br/index.php/combate-ao-aedes/50453-proteja-da-sua-casa-do-mosquito-da-dengue-antes-de-sair-de-ferias>; <http://www.ioc.fiocruz.br/dengue/textos/10minutos.html>; <https://www.vargemgrandedorioapardo.mg.gov.br/noticias/campanha-contra-dengue>; <http://www.10minutossalvamvidas.rj.gov.br/Site/Conteudo/Material.aspx>); (c) playing with a game that shows the *Aedes* life cycle in a circle with 45 days (available in the material “Com Ciência na Escola #5” (www.fiocruz.br/ioc/media/comciencia_05.pdf))

how to fight it; about a problem that spread beyond Brazil; is to talk and trigger in people awareness about the risk of having a “deformed” generation of children attained by Zika; is to talk about sterilizing water, the environment must be clean; is to know more than just we have heard (transcript of participants’ answers in a workshop).

The two major practical activities were conducted in WS2 (observing mosquitoes and discovering novelties) and WS4 (field work), mixing direct observation with video observations (WS3). Figure 15.3a shows a moment in WS2 when a young girl observes adult *Aedes* during an activity where all the mosquitoes’ life cycle stages were presented to the participants. All the activities reinforce the first thinking tool

(“observing”) and are derived from it, thus attaining the main goal of the workshops: to exercise and sensitize the act of looking—to watch more than see.

In WS1, different slides provoke the participants. It is common to find errors in websites, such as mosquito images that are not *Aedes* in dengue control campaigns.

“Abstracting” (Box 15.1, tool #3) is another important tool that is exercised in the different workshops: what could this image represent besides that which it really is? The exercise of abstracting is not generally proposed in scholarly practices, yet it is an important tool to foster creativity in both art and science, as well as in the day-to-day lives of citizens. In many moments, we inserted “modeling” (Box 15.1, tool #10) and “synthesizing” (Box 15.1, tool #13) activities. An example of this is shown in Fig. 15.4, where we display the result of a 10-minute creative work by a group mixing 2D-image selection and collage with 3D modeling of *Aedes aegypti* exposure risk situations.

Following the 13 thinking tools (Box 15.1), we encouraged the participants to transform the available *Aedes* breeder control tables (Fig. 15.4b, c) into sources and inspiration materials to prepare their own individual tables (Fig. 15.4d). Two main criticisms were made regarding the table shown in Fig. 15.4b, in which 13 breeders are shown horizontally in images in the first line to be checked weekly: (1) not all the breeders are relevant for all the situations, and (2) the concept that all the relevant breeders should be actively surveilled for the presence of larvae for 8 weeks is not obvious from a simple reading of this material. A change was consequently introduced in the new version, constructed collectively with the WS participants (Fig. 15.4d): the eight-week period of vigilance was inserted in the horizontal lines and then highlighted.

Images, sounds, films, and texts on both the mosquito and the socio-environmental settings associated with the health care conditions for each group were used for awareness raising, encouraging questions and reflections on each theme. The participants produced drawings and photographs for stimulating the act of viewing under both a scientific and an artistic perspective, discussed texts, wrote folders on health care, engaged in handicraft production, and composed songs. The joint approach of science and art with the participants—using images, music, literature, and handicraft work as tools of observation, awareness raising, and mobilization—is innovative and resulted in active and critical participation. An intense and enriching dialogue took place between scientific and popular forms of knowledge, favoring the promotion of citizenship. The results produced allow for a reflection on social inequality and on the socio-environmental problems directly related to the disease carrier agents. A consequence is the proposal of collaborative and creative solutions, in a formative process of young people as multipliers for the control and prevention of diseases and health awareness promotion.

An important idea to highlight here is that such ArtScience events implicate active partnership of the community leaders involved. In the case of the Manguinhos area, the course was co-organized by the Community Intersectoral Management

Council, elected once a year and engaging all the civil society associations of the neighborhood as well as all the public sector involved in education and health services. In the case of the schools, the course involved the directors, the teachers, and the student representatives. After finishing the courses, the participants themselves became partners, since they received a Fiocruz certificate of “Popular Agent of Health Promotion and Vigilance.” Participants also presented their own plan of action, a final work to complete the course, planning their interventions as “popular agents.” Evaluation was based on this presentation. The study of these “interventions” is in our future objectives.

Our main concern relating to “what went wrong?” pertains to the infrastructural challenges in delivering the workshops outside the optimal conditions of the academic campus of Fiocruz. Deciding to go “on the road” (Fig. 15.1b) did not simply entail a different logo or catchphrase. To successfully engage all the partnerships necessary for the project in a specific locality, we had to grapple with the real problems of that neighborhood and maintain a focus on sensitive hearing, being open to change and adapting the content to that reality. Sometimes, to perform the course, we had to overcome simple infrastructure deficiencies such as lack of climatization (discomforting situations for the participants) or absence of Internet access for image and video searches. We learned the lesson that for any “on the road” course, all the partners should aggregate their talents and do their best. Organization was critical; everything needed should be previewed for the activities, without depending on screens, projections, or sounds from the hosting site. Furthermore, all of this is strongly dependent on the political, community, and organizational context. Thus, any dissemination of the project would always be limited by these conditions.

15.3 Discussion

ArtScience activities are not a new discovery or issue for education. In fact, STEAM, SciArt, ArtScience, Art & Science, Science-Art, and many other forms appear in the literature of creativity studies, and the evolution of STEM to STEAM-based curricula is in progress in many countries, as we stated in our introduction. The

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Fig. 15.4 (continued) (a) Shows a 10-minute creative work mixing 2D-image selection and collage with 3D modeling of risk situations. (b) Shows part of the whole image available in the public material prepared for the “10 minutes campaign” (<http://www.ioc.fiocruz.br/dengue/folder.pdf>) that was used as a source for “observation.” Two transformations were prepared during the courses: in Fig. 15.4c, the eight-week period of vigilance was inserted into and then highlighted in the horizontal lines, and the breeder figures were changed for clearer ones, placed vertically. In Fig. 15.4d, we developed a “do-it-yourself” control table, in which the participant chooses, draws, and describes the most relevant breeders toward which he/she has to sustain active vigilance during the eight-week period

innovation here is in ArtScience being applied to foster health awareness. The arts have been present in health education activities since the beginning of the Brazilian social movement known as Popular Education in Health (Stotz et al. 2005; Trezza et al. 2007), but they did not yet incorporate scientific concepts, images, or methodologies. Efforts toward ArtScience mixing scientific images, principles, and practices to build an actual new field (Araújo-Jorge et al. 2018; Sawada et al. 2017), are in practice at the Institute Oswaldo Cruz-Fiocruz, where educational materials are being continuously developed (<http://www.fiocruz.br/ioc/cgi/cgilua.exe/sys/start.htm?sid=45>). Moreover, ArtScience-based activities can contribute to achievement of the goals proposed in the 2030 Agenda for Sustainable Development (<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>).

Adopting for health promotion the foundations and principles exposed in the ArtScience manifesto (Root-Bernstein et al. 2011), we concluded that it can be a structuring idea in the global health education scene, as was also proposed by Dominiczak (2015). This approach is innovative and results in active and critical participation. A rich dialogue occurs between scientific and popular forms of knowledge, promoting citizenship. Social inequalities and environmental problems directly related to health conditions are debated. This allows for the reflection and proposal of collaborative and creative solutions, in a formative process of young people as multipliers for the control and prevention of diseases and for the promotion of health awareness. Its combination with the “ecology of knowledge” (Bowen 1985; Santos 2007) is a powerful tool in the exchange of knowledge with communities. As one member of our team commented, “We went deep in Manguinhos...until the soul.” We do not know which side of the partners learned more from the other—whether it was the “students” completing their course as “Popular Agents of Health Promotion and Vigilance,” or whether it was the “teachers” that were transformed into more sensitive persons after interacting with Manguinhos inhabitants in the ArtScience practices. Converging with Paulo Freire’s pedagogy, educators transform themselves as education transforms the society (Freire 1973, 1998). In this way, our ArtScience approach fits exactly with the general goal of this book, as stated in Chap. 1 of this volume.

15.4 Conclusion

The fundamentals of ArtScience can be applied to any health, scientific or artistic domain, which can evolve into a very powerful approach to empower and encourage participation in vulnerable communities. ArtScience can translate social, political, epidemiological and biomedical concepts into popular educational activities. It can contribute to the development of critical awareness, for example, around human

rights including health, on an individual and collective level. From this work, we gained a profound understanding that ArtScience involves tools and bridges, by its transdisciplinary character, which can result in social transformation. ArtScience strategies have contributed to solving complex multidimensional problems such as emergent and re-emergent epidemics, making people face the social determinants of health in a creative and collaborative way.

Acknowledgements The authors thank Todd Siler, Harvey Seifter, and João Silveira and the team from the Laboratory of Innovations for Therapies, Education and Bioproducts – Oswaldo Cruz Institute, for interesting discussions that helped to improve this work. We also thank the Brazilian agencies CNPq, CAPES, and FAPERJ, as well as Fiocruz for funding the ArtScience activities.

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