Digital Storytelling as a Methodology for Articulating the Structure of Responsible Research and Innovation Axes

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Abstract

This study seeks to identify Responsible Research and Innovation (RRI) principles for producing Digital Storytelling (DS) in Investigation Group (IG) among Brazilian basic education students, based on socio-scientific themes. This investigation used qualitative research. The methodological path consisted of developing IG activities aimed at promoting and integrating RRI skills via DS construction by the students. Data were collected using a field diary, video recordings of the IG meetings, and the DS themselves. We observed that RRI axes are directly and indirectly addressed by DS, and seemed to be mostly articulated by elaborating and presenting the narratives within the IG. With the strategy of integrating DS into RRI practices, students took an investigative stance that brought school activities closer to making real changes in society. Communicating student production during and after completing the DS reinforced articulation between RRI and DS.

Keywords

Digital Storytelling; Responsible Research and Innovation (RRI); Science Education; Information and Communication Technologies (ICT).

I. Introduction

Science and technology have both positive and negative transformative characteristics on society and can have controversial implications. Therefore, it is important that society be prepared to follow scientific and technological developments (Reis, 2008). Schools play an essential role in guiding student reflections on societal challenges and promoting pedagogical programs that develop critical and reflective thinking skills relative to everyday problems based on scientific problems.

In line with educational perspectives aimed at understanding and problematizing science and technology to construct a fairer and more sustainable world, the contemporary Responsible Research and Innovation (RRI) approach seeks to develop responsible citizens that can carry out collaborative research (scientific innovations and applications toward a sustainable world), with the participation of individuals from all levels of society (Almeida & Okada, 2018; Vocht & Laherto, 2017). RRI states that research and results should be aligned with societal values, needs, and expectations, via participatory approaches (Quinn, 2012). Actions should be carried out collaboratively between all those involved, collectively creating results according to the contexts wherein they are inserted.

RRI, by definition, uses scientific concepts and approaches that cannot be characterized by any specific method or strategy, but rather as a general understanding of principles applied as a whole, combined with research development and scientific innovations for society. In particular, these principles are already applied in various fields of science. However, they are applied in an integrated and articulated way, for preparing and carrying out research and innovation to benefit society and create a more desirable future (Torres, Kowalski, Ribeiro, & Okada, 2020).

Stilgoe, Owen and Macnaghten (2013), state that the axes that make up RRI principles originated from public debates on issues related to science and technology. This approach consists of six axes or principles, which are presented in Table 1:

1) Public Engagement	“Choose together” - Involve all of society.
2) Gender Equality	“Unleash full potential” – for gender equality. Represent women and men. This should be integrated into research and innovation content.
3) Scientific Education	“Creative learning and new ideas” – for science education, making the youth more interested in mathematics, science and technology so that they can become researchers in the future. Society must provide knowledge and equip the youth with digital resources, so that they cab responsibly participate in research and innovation, contributing to scientific literacy.
4) Open-Access	“Share results, move forward” - Research and innovation practices must be clear and understandable.
5) Ethics	“Think and do right” - Research and innovation must respond to society's challenges adequately, respecting rights and following ethician guidelines.
6) Governance	“Design science for and with society” - This axis encompasses all the others. It deals with the political sphere.

Table 1. RRI Axes
Source: Adapted from Quinn, 2012.

These axes lead to different scientific and technological advancements, respecting local needs and making conscientious use of materials and instruments.

Education is an important part of the RRI approach. Some concepts are linked to RRI, and the following stand out:

- Scientific literacy;
- The nature of science; and
- socio-scientific issues (Lundström, Sjöström & Hasslöf, 2017).

Practices aimed at RRI in education are intended to develop collaborative pedagogical activities, allowing students to investigate specific themes and build arguments about dilemmas in society using investigative practices (Okada & Rodrigues, 2018).

Behrens et al. (2020), highlight that learning from new knowledge leads students to access a variety of collaborative open research and investigations. Teachers must use flexible and interactive teaching strategies with innovative perspectives in their classes, using co-investigation and co-learning approaches. Costa (2018), adds that, for co-investigation processes, participants possess relevant information based on their research, discuss issues, bring elements for collective reflection, and establish and implement procedures together. Co-learning and co-apprentices are of paramount importance, and include co-creation for Open Educational Resources (OER), and should disseminate used processes and the results. Students must be offered the opportunity to constantly reflect on collective constructions by considering the sources so that they can use them to include societal aspects.

We live in a time when collective constructions are facilitated by technological resources, which makes accessing and exchanging information from reliable sources increasingly accessible. On the other hand, false information on any subject is also available and is a challenge that teaching and learning institutions must overcome. Marques and Reis (2018), emphasize that education systems should consider students as being subjects capable of contributing to solving problems that threaten individuals, societies, and environments. For these authors, if schools wait for these students to become adults, they can miss opportunities to form citizens capable of participating in society.

Considering the central role of digital technologies in everyday life, Digital Storytelling (DS) can promote individual and collective reflection processes needed to understand science and the transformations it triggers, since DS places young people as protagonists and citizens, and not as supporting actors or spectators who hold no voice, and who can take no action. Even in traditional narratives that do not use digital resources, the subject relates with themselves, with others, and with the object of knowledge (Bruner, 1991). It is worth stressing that DS, and other languages and forms of thought representation, can be used. Publication processes, collaboration, and co-authorship can also be facilitated. Rodrigues (2017), highlights that DS publications place the onus of responsibility for the content on writers, leading them to assume authorship for what was produced, i.e., establishing a relationship with otherness, by “allowing themselves to be seen” throughout the entire process. From an RRI perspective, this responsibility is shared among all participants. As was highlighted by Santos, Ribeiro and Rossini (2020 p. 62), “[…] research authorship is shared, due to its proposal: devices are built collaboratively by all subjects involved in the research process (participants, actors and authors), configuring collective participation”.

Narratives can function as needed instruments for understanding how individuals or collectives build knowledge as subjects who participate in experiences, giving new meaning to the collective. Narratives make unique experiences public, and the act of learning brings the individual closer to their experiences (Rodrigues, 2019), placing them before others. RRI, in turn, gives the subject in an active and responsible societal role. So, parallels can be drawn between DS and RRI, since both

show the subject's role in building knowledge, and show their role in society, uniquely and significantly valuing real experiences.

Considering the RRI axes of public engagement, gender equality, scientific education, open-access, ethics and governance (Quinn, 2012; Stilgoe, Owen & Macnaghten, 2013), this article will analyze speeches and DS produced by students at elementary school in Brazil, led by an Investigation Group (IG) structured on RRI principles, seeking to identify these axes in DS, and in their construction processes, as well as the possible contributions of DS as pedagogical resources for conducting educational actions associated with RRI.

II. Methodology

This study was developed using an empirical IG at a school located in the southern of Minas Gerais State, Brazil, with 8th and 9th-grade elementary school students, aged between 13 and 15. Five face-to-face meetings lasting 2 hour and 30 minutes were held over five weeks.

Data was collected using footage of the IG meetings, and in field diaries, for the DS produced by the students when carrying out the Investigation Group.

The “Garbage” theme was chosen by the students as the focus of research, given the various garbage problems they identified in the city in which they live. The students collectively elaborated a problem-question for the Investigation Group. The dynamics of the IG sought to develop strategies for confronting and articulating theory and reality together with different social players. We thought it essential to publicize the material developed by students (DS and Action Projects) as a response to the community issues. DS and action proposals were presented to school teachers, students, and guests from the community.

For the data analysis, we adopted a qualitative approach. First, we compiled and classified the collected material. Then the data were decomposed into fragments and recomposed (which was performed several times). Afterwards, we interpreted the organized material. Finally, we drew conclusions for the entire study (Yin, 2016). Identification codes were created to organize the data, as per Table 2.

Code	Number	Research material
DS - Pair	1 to 4	DS produced by the paired students (doubles).
FDR	1 to 5	The field diary of the researchers.
T	1 to 5	Transcribed video logs.
E	1 to 8	Represent the students that gave specific speeches during the Investigation Group.
P	1 to 4	Refers to speeches for policymakers and University participants who engaged in the Investigation Group conversations.

Table 2: Organizing the collected research material
Source: The authors of this study.

To represent student speech in the research Field Diary, we adopted a combined code approach, like for example “FDR2 – E1”, where FDR refers to “Field Diary”, 2 corresponds to the second Investigation Group meeting, and E1 corresponds to student speech 1. The “FDR” code is replaced by “T” when information comes from video recording transcriptions.

III. Results and Discussions

We have presented and analyzed data excerpts that allowed us to identify how RRI approaches were present in producing DS in the Investigation Group.

To produce DS, the students participating in the Investigation Group were organized into pairs. Each pair could freely choose a digital resource used to build narratives, and none of the pairs could choose the same media outlet, as per Figure 1:

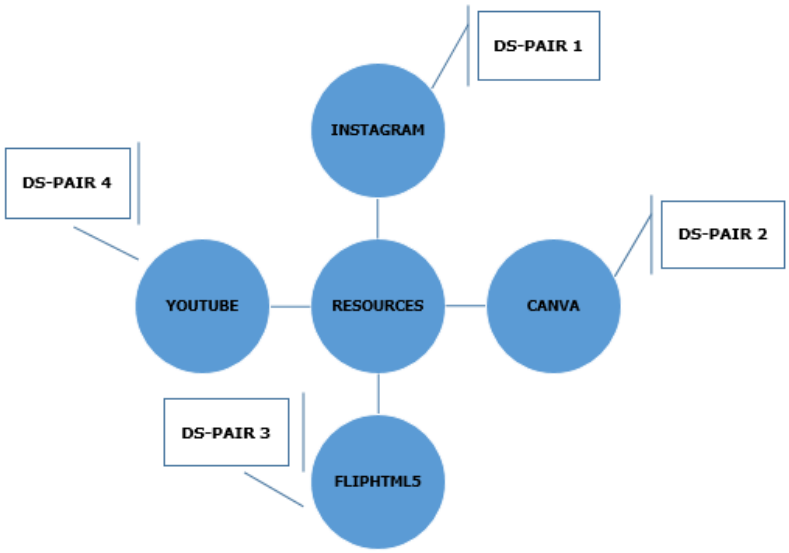

Figure 1: Resources used to build the DS.
Source: Investigative Data.

It is worth noting that the digital resources chosen by students in pairs 1, 2 and 3 were not used in their daily lives. Students were willing to learn to use these resources, as an opportunity for both personal learning and for making their DS more attractive, as illustrated in the following excerpt:

> *When presenting suggestions for possible digital resources for building DS, students were eager to learn about using new tools. The following statements were registered: "If I learn to use this site to make the book, I could use it for other school projects", and another student stated that "I always wanted to have a YouTube channel, and so I'll take advantage of this opportunity to learn how". The students reflected on the resources presented them, and most of them were interested in using tools with which there were not very familiar (FDR1).*

Each pair identified the digital resource that best exposed the learning process of the Investigation Group, and the didactic strategy used to mobilize reflections concerning learning (producing DS) enabled students to develop new skills relative to using digital technologies.

The students were challenged when choosing the resource since they could choose which way best engaged the reader and represented the pair's story relative to the group's formative research path. Even facing these challenges, the students were dedicated, as can be seen in statement E4: *"[...] what if I choose a way of building a narrative that no one likes, can I change it?"* (FDR1-E4). This concern, associated with authorship, is addressed very little when using traditional works, e.g., seminars, texts, reports, etc., as pointed out by Rodrigues (2017).

There were times for sharing partially finished DS versions during the meetings. These times were very important for allowing students to reflect on their production. Colleagues could contribute to expanding their knowledge, and were always concerned with being ethical when making their

considerations. At the end of the presentation, we noticed that the students were satisfied with the produced material, and with their paths taken, via reflection and production, something that is not provided for in traditional classes.

Similar to other collaborative teaching strategies, there must be moments for sharing what was built, so that students can make corrections, otherwise, DS may not follow the original proposals. Rodrigues (2020), supported by Xu, Park and Baek (2011), states that some of the main DS elements are flexibility (the reader and author have communication options, and non-linear reading constructions), universality (referring to the rapid and wide dissemination of narratives and their content), and interactivity (enabling knowledge building between subjects from different communities). We understand that these elements can also facilitate articulation among the six RRI axes through DS production.

Science teaching that was articulated with local student realities also favored DS construction, since students sought out information from different resources, and could reconsider the perceptions they had on topics from their daily lives, e.g., organizing the waste and recycling facility, and solid waste and recycling collection within the city.

The RRI axis for public engagement is related to generating natural interactions between publications and the readers for whom the disseminated material was developed (Blonder, Zemler & Rosenfeld, 2016). In the fragments of speech transcriptions from videos for the two DS, one can see evidence for the presence of this axis:

> Have you ever stopped to thin*k about the consequences of your actions and what they lead to? […] The [School's name] gathered some people and talked about what they had studied regarding garbage, and what happens in the city. They are watching you. What can we tell you? (TDS-Double1)*
>
> *[…] activate the notification bell and stay tuned […] (TDS-Double4)*

In the excerpts, we found that the students sought to establish a dialogue with the public, asking them to follow their posts. According to Rodrigues (2017), if a narrative is to be seen and fulfill its impact role, there must be a relationship with other subjects via exposure/publication, which is also valid for working with RRI approaches.

DS integrate multiple resources, like images and videos, to help compose written texts, and this can favor a clearer understanding of scientific topics among the lay population, without ceasing to present information based on reliable sources, and bringing this information closer to local contexts. This contextualization characteristic of the narratives can generate more effective problem assimilation, as seen in Figure 2, from DS-pair1.

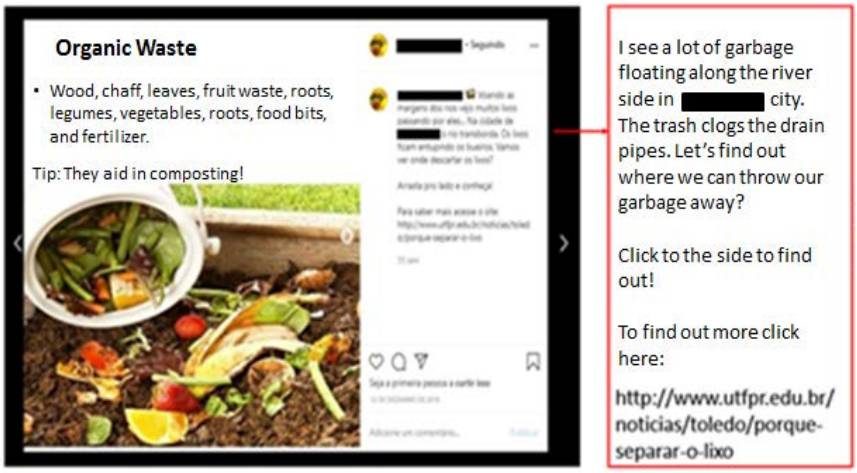

Figure 2: DS-Pair1.
Source: Investigative Data[1].

Based on this publication, one can see that Pair 1 approximates the context where students live, promoting public engagement, since approximately 70% of the students live in rural areas, and composting can be an alternative for soil enrichment. This is also exemplified by P2:

> *Just yesterday, a man was complaining about the garbage. I asked what kind of garbage it was... it was grass. The collection truck does not pick up this waste. Much of what the truck collects is leftover food and weeds. They take two employees to get the tractor... they grind everything. It's an extra expense. (T3 - P2)*

The DS from Pair 1 was articulated by P2 and indicates a reconstruction movement and new meaning knowledge for the students, that seek to engage the local population in the correct disposal of waste, and in the search for possible forms reuse, such as composting. For public engagement, students sought to hear from different voices that articulated the theme at their location. The students surveyed different participants from different sectors of society who contributed to the study. This axis indicates that students sought out strategies to expand the reach of their work within the community, and one option was to use websites and social networks to support building and disseminating the DS. This showed their concern for involving the population, enabling greater public engagement. We identified the potential of DS as a means for involving people in a work developed by students at each research stage and not only in the results.

The gender equality axis focuses on issues of equality between subjects, granting them equality opportunities, capacities, rights, and duties (Blonder, Zemler, & Rosenfeld, 2016). Unlike the other key RRI axes, gender equality was not specifically planned for discussion, during the Investigation Group meetings, since the working theme was garbage, in accordance with the student questions, research, and discussions with other participants and guests. This axis was included when the students were asked to research the theme as a homework assignment. When presenting their research results, one pair addressed the topic, and caught the attention of colleagues, as per the following excerpt:

[1] The original slides produced by the students were written in Portuguese. In this article, they have been translated into English.

> *The student cited data from the National Movement of Recyclable Material Collectors, noting that 70% of all workers were female. Students were perplexed by this data and began asking questions about the reason for this (FDR2).*

Student 6 stated that, if this movement seeks rights for recyclable material collectors, then this data is relevant for discussion. All the colleagues agreed. This point is also articulated by the scientific education axis, since they sought to evaluate the sources, arguing about the information presented with an analytical posture, inherent to scientific practices. The students raised several hypotheses for the information, for example, women who are abandoned by their husbands, and who cannot find other work, search for an immediate way of securing their livelihood at the home. This highlighted something that may be linked to the role of women as providers. The students then asked themselves whether the same was true for their city and whether it was compatible with the information brought to class. Student 4 highlighted:

> *We need to talk to the cooperative staff here to see if the same is true of our city, to see the difficulties the people who work there face. Don't you think? (T2-E4)*

Given E4, we can see that the "investigative spirit" was present in the discussion since the students felt the need to discover if the research information could be corroborated based on the data from their city. They sought to better understand and reflect during the discussion, again articulating the scientific education axis.

We noticed that a dedicated space for active speech in the Investigation Group dynamics enabled students to express their concerns on the subject. The discussion on the information obtained regarding the issue of gender ended up sparking student reflection on an issue close to home that they had not thought of until then. This led them to analyze and to better understand their world and local reality. It is worth noting that the students were not obligated to place RRI axes in their DS, but did address gender equality, which may be an indication that they were impacted by this issue, exemplified by DS-Pair4 when E7 stated: "[...] one piece of information was that women play a very significant role in garbage collection [...]" (DS-Pair 4).

The large number of women who worked as recyclable material collectors made the students take notice, and directed them to approach this theme in a DS. One pair was responsible for conducting an interview to gather more information. The students obtained real data from the city, explained by E5: "[...] all seven women who work in the city's recycling association are responsible for sustaining their households with this income" (FDR3). Given this information, the students compared the reality of the city with the research material, presenting a new analysis on the issue of gender equality during the partial DS presentation, and this is a process specific to scientific practice.

During the partially finished DS presentation from this pair, scientific knowledge articulation was observed, since data from their local city provided evidence for the students' statements. Rodrigues (2017), highlights that in a narrative composition, the subject portrays their experiences in the way that they understand their own reality. The DS prepared by the pairs were built based on their questions, seeking out data to understand their reality so that, based on these data, they could reflect on their own experiences as the authors of the DS.

We can see that the gender equality axis was present in most DS, showing that this reflects in the way that knowledge and discussions are perceived by students. This axis was made evident only after presenting the partially finished DS version from Pair 4, which discovered this issue during their research process. This was possible given the characteristics of DS as a didactic strategy, which specifies that the information was shared and reflections were made during the DS production process, and not merely after it is finished (Rodrigues, 2017).

The scientific education axis is related to all produced knowledge that in some way seeks solutions to society's problems, or simply results in benefits to the environment (Vocht, Laherto & Parchmann, 2017; Blonder, Zemler & Rosenfeld, 2016; Bardone, Burget, Saage & Taaler, 2017; Tassone, Mahony, McKenna, Eppink, & Wals, 2017). During the data analysis phase, we observed that the scientific education axis was present in the DS produced by the students.

We observed that during DS development on the “garbage” theme, scientific knowledge was built from reflections and criticisms relative to environmental and social issues. Rodrigues (2017), points out that DS show the subject's cognitive construction, establishing a dialectic relationship between the subject of study and the constituent elements for their personal narrative formation and learning. We can infer that the entire process, in a way, favors developing effective scientific education, as shown in Figure 3.

Figure 3: DS-Pair1.
Source: Investigative Data

Given the post in Figure 3, we can see that students made statements using terms they found during the research process, e.g., “toxic waste”, which until then had not been used. In this post, the students also indicated a resource for consultation, should one want to learn more on the topic, thus encouraging learning about one’s local environment, and the society wherein one lives, not based on mere curiosity, but on need. In fact, we observed this during all phases of DS development.

In addition to building student knowledge, DS brought citizens closer to scientific themes, since students posted their narratives on social networking sites, and easy-to-share sites, with elements that attract different audiences, and presented different material, like scientific texts, explanatory videos, and games. Reis (2006, p. 180, Bold added by the authors of this study), states that “[...] in societies where scientific themes hold a growing share of media publications, scientific education should promote understanding its processes, its achievements, and its arduous struggles [...]”. Therefore, it is important for schools to have spaces for discussions with society, whether in meetings or via publications from the school.

The scientific education axis allows one to analyze science education development, which was, in this case, related to environmental education, from an RRI perspective. It is important to highlight that, different sectors of the community can reflect DS themes produced by students, which are not created using traditional teaching strategies, like lectures and traditional tests.

The open-access axis is related to the fact that the entire DS elaboration process seeks ways to publicize the information, and that the RRI approach seeks to promote openness and constant transparency (Vocht, Laherto, & Parchmann, 2017). Students involved in Investigation Group, and in DS construction chose to develop these using social networking sites, or open public sites. All DS were made available for consultation, and each pair of students looked for ways to make their narrative accessible, as exemplified by E2: "On Instagram our friends can follow our project stuff" (FDR1). Santos and Almeida (2020), reinforce that social networks used in teaching and learning processes can contribute to establishing links between formal and informal scenarios of knowledge acquisition. We highlight Pairs 1 and 4, which used global social networks like YouTube and Instagram. These networks allow thirteen-year-olds to register for free use and access.

For the DS to transmit the information to people in the community, the students looked for programs and presentation forms that preserved the identities of these people, and this is associated with the ethical axis. To develop the DS, students felt challenged to seek and use resources that provided open-access, respecting advertising ethics. To publicize the interview, Pair 3 used resources that allowed them to show a worker without exposing who they were via an animation. Rodrigues (2020) states that DS allow students to use different languages to compose a representation of the knowledge construct, like images, audio from interviews, generated new material, and videos.

The ethical axis arises from manifestations of ethical thinking when observations refer to internal dimensions related to values and principles, and to observations of ethical behavior, when these refer to actions and conducts expressed when these proposed activities are carried out, as well as in preparing DS and presenting them. Consumerism was one of the relevant topics developed by the students, which entails how it affects the world. This theme gave rise to reflections, drawing the attention of the readers of the DS to their own responsibility for the welfare of the planet. Figure 4, taken from Pair 1's DS, illustrates this:

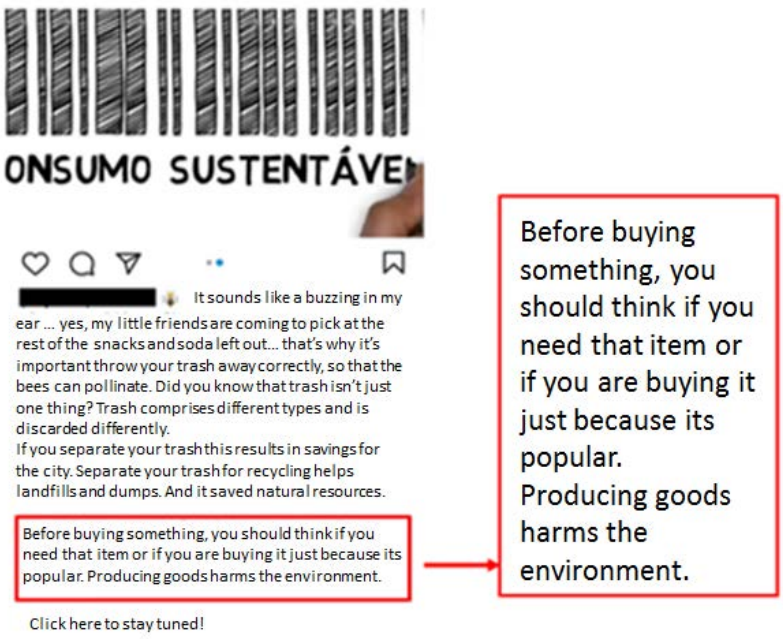

Figure 4: DS-Pair1.
Source: Investigative Data.

In Figure 4, we can see that students report on the importance of consuming only what is necessary and that this complements the video inserted into the DS. Excerpts from other DS also indicated that students sought, playfully and through images, to attract reader attention to civic

responsibility.

According to Costa, Rosa and Souza (2020), understanding and using ethical thinking implies recognizing that different people have different points of view when facing a situation that requires a certain decision. We observed that, during the discussions for developing the DS, the students scored the work of their colleagues, to motivate them and complement what was being produced and problematized in the shared narratives. Although the comments did not offer philosophical or in-depth considerations towards the issues being studied, it is important to emphasize that the students (all teenagers) creating the DS showed receptiveness to the comments from their colleagues. The notes from the students sought to better clarify the DS of their colleagues. This demonstrates that the students spontaneously took on responsibility for everything that was being built. The cooperation provided when the partially finished DS were presented was essential for improving each meeting, both in terms of the content and the technologies used. According to Freire (2019), dialogue makes human beings meet and recognize themselves as humans. Dialogue conquers the world and results in individual and joint freedom. No human being owns the world, just as no human being can be prohibited from saying so.

Through collective reflections made in the Investigation Group based on the presentations of partially finished DS, the students showed that text authorship must be identified, and associated with the creative work itself, as exemplified by E3: *"people, it's the same thing... can you imagine someone printing our* narrative and giving it to the teacher?" (FDR2-E3). We can see that students understood that the research process is laborious and that using information without citing authorship devalues work and is unethical.

This points towards the open-access axis since students sought to share their ideas, questions and arguments on the topic of "garbage" with the public. Visibility and the need for publication is one of the criteria that underlies both RRI and ND in the co-author construction. Rodrigues (2017, p.109), points out that "[...] in the digital context, the meaning of writing is expanded, and thereby expands on the meaning of authorship, and enhances possibilities for co-authorship, either via symbolic diversity or via the breadth of the construction/dissemination of texts within a network". We also reinforce digital mediums as facilitating collaborative production, since some parts of the digital storytelling were produced at home by students.

In the governance axis, RRI seeks to achieve a governmental structure that considers its collaborative role in society among different groups, flexibly addressing practices that already exist in its management role, to enable necessary adaptations to unforeseen events that may arise during research and innovation development (Matta & Furlani, 2020). For the students, interactions with municipal authorities in the Investigation Group discussions contributed to a deeper knowledge of the topic. Given the presence of government representatives, students could respectfully take a stand on issues, demonstrating that ethics were present in their actions, as described in the field diary, recording questions made to local government representatives:

> *What do you do when you receive complaints that brush waste was not collected with the garbage? You have to be careful when orienting angry people sometimes, right? (FDR3-E4)*
>
> *You put information on the internet about what you are already doing. You could make a way for people to say what they still need, right?! Just like in our conversation. (FDR3-E2)*

When analyzing the excerpts, one can see the relevance of having a space for community participation in actions. In the conversation circle, which is a moment for making contact with government officials, we observed student confidence in making statements, and communicating with citizens of the city about the information that was researched, discussed and collected, making considerations that instigated even more discussion.

Although the interviewed citizens expressed their points of view, exemplifying how the garbage problem was present in their daily lives too, they did not want to participate in the conversation circle. We can infer that, either consciously or unconsciously, citizens may not have felt very engaged when conversing directly with the government in searching for improvements.

As we have seen, RRI seeks to collaboratively develop science and technology between various characters in society to seek out solutions to problems. Interactions between students and community guests, political sectors, and the University, beyond being enlightening, were highlighted in the DS compositions to better understand the problem. Our study indicates that DS can record the reflections and learning processes of students, based on the problems they identified, and were important for reshaping their perceptions. DS promoted a student posture of responsibility surrounding what they had built since they felt the need to verify the research information locally.

During the statements at the DS presentations, the students reflected on citizen responsibility for solving community problems. In the governance axis analysis, we saw student engagement and engagement from others who contributed to the Investigation Groups, and who took the opportunity to give their input on the problem. After publishing the finalized DS, these digital elements helped raise awareness among other students, who used the games contained in the DS, articulating the RRI axes, and promoting scientific openness and understandability among society.

IV. Final Considerations

This study showed that DS allowed students to develop reflections and critical thinking skills with respect to city problems, considering various perspectives of their local reality with a theoretical basis. The students were immersed in research, bringing the classroom closer to and intervening with society. The six RRI axes were developed and articulated using the DS and were mediated by creatively using technological resources. We understand that using technologies can favor access to school actions, contributing to spreading information and reflections based on informative stories.

Based on the analyses carried out in this study, we can state that DS can be applied as a didactic strategy to organically and dynamically integrate the six RRI axes. During the presentations of the partially finished DS, the subjects directly or indirectly assumed the position of authorship and were encouraged to think and seek out ways for transforming the problem of the work proposal. Voices are thus articulated, engaging others in a real process.

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Les Narratives Digitals com a metodologia per articular l'estructura dels eixos de eecerca i innovació responsables

Resum

Aquest estudi busca identificar els principis de la Recerca i Innovació Responsable (RIR) per a la producció de Narracions Digitals (ND) a Grups de Recerca (GR) entre estudiants brasilers d'educació bàsica, a partir de temes sociocientífics. Aquest estudi va utilitzar la investigació qualitativa. El camí metodològic va consistir a desenvolupar activitats de ND encaminades a promoure i integrar habilitats de RIR a través de la construcció de GR per part dels estudiants. Les dades es van recopilar mitjançant un diari de camp, enregistraments de vídeo de les reunions del GR i les mateixes ND. Observem que els eixos de RIR són abordats directament i indirectament per les ND, i semblen estar articulats principalment per elaborar i presentar les narratives dins del GR. Amb l'estratègia d'integrar es ND a les pràctiques de RIR, els estudiants van prendre una postura investigativa que va acostar les activitats escolars a canvis reals a la societat. Comunicar la producció dels estudiants durant i després de completar la ND va reforçar l'articulació entre RIR i ND.

Paraules clau

Narratives digitals; Investigació i Innovació Responsable (IIR); Ensenyament de les ciències; Tecnologies de la informació i la comunicació (TIC).

Las Narrativas Digitales como metodología para articular la estructura de los ejes de Investigación e Innovación Responsables

Resumen

Este estudio busca identificar los principios de la Investigación e Innovación Responsable (IIR) para la producción de Narraciones Digitales (DS) en Grupos de Investigación (GI) entre estudiantes brasileños de educación básica, a partir de temas sociocientíficos. Esta investigación utilizó la investigación cualitativa. El camino metodológico consistió en desarrollar actividades de IG encaminadas a promover e integrar habilidades de RRI a través de la construcción de SD por parte de los estudiantes. Los datos se recopilaron mediante un diario de campo, grabaciones de video de las reuniones del GI y los propios DS. Observamos que los ejes de RRI son abordados directa e indirectamente por DS, y parecían estar articulados principalmente al elaborar y presentar las narrativas dentro del GI. Con la estrategia de integrar el SD a las prácticas de RRI, los estudiantes tomaron una postura investigativa que acercó las actividades escolares a cambios reales en la sociedad. Comunicar la producción de los estudiantes durante y después de completar el DS reforzó la articulación entre RRI y DS.

Palabras clave

Narrativas digitales; Investigación e Innovación Responsable (IIR); Enseñanza de las ciencias; Tecnologías de la Información y la Comunicación (TIC).

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