

Factors affecting the efficacy of short stories as science communication tools

Masoud Irani and Emma Weitkamp

Abstract

People become familiar with stories as sources of information in their childhood, and, while they have recently received interest as potential science communication tools, few studies have considered aspects of story quality on science communication. We postulate that quality is an important, if challenging, facet that should be considered when exploring the potential of short stories in science communication. This essay argues that quality should be a key consideration of those interested in studying or working with short stories for science communication purposes and presents criteria for the 'well-made' short story.

Keywords

Science and technology, art and literature; Science writing

DOI

<https://doi.org/10.22323/2.22020401>

Submitted: 13th September 2022

Accepted: 23rd February 2023

Published: 27th March 2023

Introduction

Issues like global warming, conservation, and artificial intelligence, raise complex questions around governance and policy which require public involvement [Hickel, 2016; Kaijser & Lövbrand, 2019; Martinez-Conde et al., 2019; Reinsborough, 2017]. Effective science communication can facilitate public engagement with the often complex science underpinning these societal issues. However, facts are often insufficient when it comes to engaging people [Dahlstrom & Scheufele, 2018; Davies, Halpern, Horst, Kirby & Lewenstein, 2019; Jones & Anderson Crow, 2017; Longnecker, 2016; Martinez-Conde & Macknik, 2017; McKinnon & Orthia, 2017], and communicators need new, creative tools and methods to promote engagement with scientific information.

As a form of art, literary fiction offers a novel way to communicate scientific knowledge [Fletcher, 2019; Illingworth, 2016; Negrete, 2005]. Fictional stories have attracted the attention of researchers and communicators because they can integrate cultural beliefs and traditions with scientific knowledge [Cormick, 2019; Davies et al., 2019]. Research suggests a wide range of potential benefits of using narrative approaches to science communication. These fall broadly into three areas:

engagement (interest), persuasion (or behavior change) and learning (or memory retention).

Previous studies on narratives suggest that transportation and identification with characters can increase engagement [Borrayo, Rosales & Gonzalez, 2017; de Graaf, Hoeken, Sanders & Beentjes, 2012; Finkler & Leon, 2019; Malcolm, 2012; Green & Donahue, 2008; Moyer-Gusé, 2008; Prince, 2003; Slater & Rouner, 2002].

Transportation occurs when 'all mental systems and capacities become focused on events occurring in the narrative' [Green & Brock, 2000, p. 701], while *identification with characters* refers to the process whereby a viewer takes on the role of a character in a story [Moyer-Gusé, 2008; Slater & Rouner, 2002]. Identification with characters may be one of the ways that stories can link scientific facts to people's daily experiences (including emotions) [Jose & Brewer, 1984; Joubert, Davis & Metcalfe, 2019; Mar & Oatley, 2008; Riedlinger et al., 2019; Weitkamp, 2019]. Interestingly, the engagement created through narratives has been reported to be a key factor in persuasion and changing the audience's attitudes, intentions, and behaviors [Dahlstrom, 2012; Kaplan & Dahlstrom, 2017; Slater & Rouner, 2002]. For example, fictional narratives have been shown to have the potential to influence people's attitudes and behaviors in environmental sustainability subjects [Bilandzic & Kalch, 2021].

Several scholars have suggested that stories can be mobilized to change attitudes and behaviors [Dahlstrom, 2014; Davies et al., 2019; Deighton, Romer & McQueen, 1989; Fletcher, 2019; Green & Donahue, 2008; Moyer-Gusé & Dale, 2017; Riedlinger et al., 2019; Slater & Rouner, 2002], though the results are inconsistent [Allen & Preiss, 1997; Appel, 2008; Appel, Richter, Mara, Lindinger & Batinic, 2011; Bekalu, Bigman, McCloud, Lin & Viswanath, 2018; Borrayo et al., 2017; Prentice, Gerrig & Bailis, 1997; Shen, Sheer & Li, 2015; Sun, Lee & Qian, 2019; Wheeler, Green & Brock, 1999], with findings ranging from scientific facts or data being more persuasive than their narrative versions, to conditional superiority of one format over the other in terms of persuasion, to narrative format being more persuasive than the scientific version. Also, a combination of narrative and non-narrative formats has been reported to have a higher potential than each separate format [Nan, Dahlstrom, Richards & Rangarajan, 2015]. Potential explanations for these contradictory findings are illustrated in Figure 1.

Research also suggests that stories can improve learning processes [Avraamidou & Osborne, 2009; Constant & Roberts, 2017; Kaplan & Dahlstrom, 2017; Lejano, Tavares-Reager & Berkes, 2013; Mar & Oatley, 2008] and enhance the duration of fact recall [Haven, 2007; Negrete & Lartigue, 2010]. For example, studies show that narratives can promote the retention of information acquired by audiences for longer compared with the same facts presented alone [Dahlstrom, 2012; Negrete, 2013, 2021; Lartigue, Negrete, Velasco & González Villarreal, 2016; Rios & Negrete, 2013].

Taken together, the aspects of enjoyment, persuasion and learning could make narratives a powerful medium for science communication. Yet, to date, there has been little exploration of the importance of the quality of narratives for science communication (regardless if the intended outcome is engagement, persuasion, or learning). The concept of quality in science communication is itself poorly defined [Fährnich, Weitkamp & Kupper, 2023; Olesk et al., 2021], raising questions about

Narrative factors	Science communication factors	Readers' factors
<ul style="list-style-type: none"> • Temporal framing (a present-oriented (vs. future-oriented) message works better in narratives) (Kim & Nan, 2016) • Causality (causality can increase the possibility of persuading otherwise resistant audiences) (Dahlstrom, 2012) • Level of transportation (higher transportation level enhances the possibility of persuasion) (Melanie & John, 2008) • Narrative length (longer narratives are more effective than shorter ones) (Shen et al., 2015) 	<ul style="list-style-type: none"> • Strength of facts (stories increase persuasion for weaker facts) (Krause & Rucker, 2020) • Intended behaviour (for example, narratives can be effective in persuading people to adopt preventive health behaviors, but had no effect in encouraging them to quit harmful behaviors like smoking) (Shen et al., 2015) 	<ul style="list-style-type: none"> • Familiarity of story setting (familiarity with story setting can enhance the persuasion possibility) (Melanie & John, 2008) • Format (different narrative formats like video, audio or written have different persuasion effect) (Shen et al., 2015) • Congruence with the reader's pre-existing knowledge (congruence can enhance persuasion) (Jones & Anderson Crow, 2017) • Individual differences (some people become more readily transported into a narrative world than others) (Melanie & John, 2008)

Figure 1. Factors affecting persuasiveness of narratives.

what we mean by quality. Is it some objective feature that can be analyzed? Drawing from educational studies, Klassen [2009], for example, proposes 10 elements needed for a 'good' science story, which must contain: event-tokens, the narrator, narrative appetite, past time, the structure, agency, the purpose, the role of the reader, the effect of the untold and irony. While he argues that all of these elements (with the possible exception of irony) should be present, he does acknowledge that judging quality may also require us to consider our objectives (in terms of education or communication) and the perceptions of the reader. Although not explicitly listed as quality criteria, other studies have focused on the importance of the plot goal and crafting of the central information, along with the sufficiently detailed and engaging characters [Haven, 2007]. Specifically in relation to science stories, Broemmel, Rearden and Buckner [2021] argue that the accuracy of scientific information should be considered. This proved contentious in the study conducted by Fähnrich et al. [2023]; accuracy was considered an important quality criteria but one which might be mitigated depending on the intentions of communication, with some arguing that achieving the desired effect might be most important. In a study of group reading as a tool for pain relief, Billington, Humphreys, Jones and McDonnell [2016] suggest intellectually and emotionally demanding texts are most effective, pointing to readers' motivations as an important consideration.

This brings us to the reader and whether quality can exist independently of the reader. Roland Barthes argues for the importance of pleasure and ecstasy, both states achieved by *readers* [Rivière, 2008]. Barthes argues pleasure arises when the reader 'is in control and feels comfortable with the text' while ecstasy arises 'when the reader is destabilized and caught in the whirlwind of the text' [Rivière, 2008, p. 56]. Similarly, Hopper [2006] lists reader outcomes as an important facet of any judgement on the quality of a text and several of the criteria proposed by Haven [2007] speak to reader-related outcomes, such as being memorable, meaningful and relevant. Thus any discussion of quality cannot be divorced from a consideration of the goals of both reader and writer.

These features suggest that using the common definitions and structures of stories such as ABT (And, But, Therefore) [Olson, 2015] or Rise-Fall formulas [Cormick, 2019; Reagan, Mitchell, Kiley, Danforth & Dodds, 2016] will not necessarily produce an enjoyable and engaging story. This essay argues for greater emphasis on the quality of stories, whether used in science communication practice or research. We outline the key features of a short story emphasizing those we argue are most important to science communication. We then develop criteria for a well-made (high-quality, engaging) science story. Finally, these criteria are used to analyze an existing work with a view to providing suggestions for science communicators and researchers working with short stories.

Features of a short story

According to Le Guin, fiction is ‘... an active encounter with the environment by means of posing options and alternatives, and an enlargement of present reality by connecting it to the unverifiable past and unpredictable future’ [Le Guin, 1989, pp. 44–45]. Short stories are a form of prose fiction, defined by their length [Burroway, 1996; Hawthorn, 2005; Malcolm, 2012]. But, length is ambiguous (how short should it be, how many words?) [Malcolm, 2012; Reid, 2017], and other features must be considered. Edgar Allan Poe proposes that a tale’s perusal should last from a half-hour to one or two hours, at one sitting [Hawthorn, 2005; Malcolm, 2012; March-Russell, 2009]. But, there are short stories whose reading takes more than two hours (at least for some people), and some people can sit for longer than others [Reid, 2017]. However, it does point to the need for succinctness.

According to Merriam-Webster, a short story is ‘an invented prose narrative shorter than a novel usually dealing with a few characters and aiming at unity of effect and often concentrating on the creation of mood rather than plot’. While this practical description reflects the main aspects of a short story, other factors are important. In his 1842 review of Nathaniel Hawthorne’s *Twice-Told Tales*, Poe suggests that *the unity of effect or impression* is the most significant and essential factor to consider for a short prose tale [March-Russell, 2009; Reid, 2017]; it is created by ensuring that all elements of the story focus on creating the desired effect in the reader. According to Poe, this unity is necessary to capture life’s most profound impressions of transient experiences and moments [March-Russell, 2009]. Although the unity of effect is a quality that can be shown in most well-made short stories [Hills, 1977], there are great stories (like many of Chekhov’s stories or Gogol’s ‘The Overcoat’) which are appealing, mainly because they lack this single effect [Reid, 2017]. Thus, a lack of unity of effect does not always mean a poor quality story. It is also interesting to note that when a single effect exists in a story it can influence other story features. For example, if a short story is aimed at depicting the consequences of ignorance about climate change, it can influence the writer’s choice about the story’s features such as time and location (maybe a region suffering from the consequences of climate change in the future), characters that can help the story’s purpose (for instance, environmental scientists or activists, and hapless people living in bad conditions), etc.

A moment of crisis, when revelation happens to the story’s main characters or the reader itself, is considered by some essential, but for others it is unnecessary [Burroway, 1996; Reid, 2017]. In some stories, one of the main characters finally faces these moments of truth (like Joyce’s ‘Araby’), while in many others, it is only the reader who perceives these revelations (like Joyce’s ‘Clay’) [Reid, 2017]. Also,

stories may lack any moment of crisis (like Hemingway's 'A Clean, Well-lighted Place') [Reid, 2017].

Plot is important for short stories, as for longer narratives, but the concept of the plot is more flexible than Aristotle's traditional view of having a beginning, a middle, and an end [Reid, 2017]. The plot's role in the short story is not to interest the reader but to move characters through action to provide events and incidents which are in accordance with the whole story [Hills, 1977]. Therefore, different patterns of plots can be adopted to craft successful stories, provided that the plot's actions contribute to the story. As a result, there are many modern plotless short stories (like John Barth's 'The Night-Sea Journey'), or stories in which the end and the beginning are the same (like Patricia Griffith's 'Nights at O'Rear's'), or stories showing only a state of affairs rather than a sequence of events (like most of Chekhov's stories) [Reid, 2017].

Characters are also important for engagement: character features (identification with character, liking, perceived similarity and parasocial interaction) can increase engagement and may enhance the persuasive potential of stories [Moyer-Gusé, 2008; Weitkamp, 2019]. Here the writer's skills in creating believable characters with whom the audience can identify comes to the fore. For example, in James Patrick Kelly's science fiction short story 'Rat', the main character, Rat, is an extraordinary rat, who smuggles a forbidden addictive drug, has betrayed and murdered people before, and kills all to become the richest rat in the city. However, the reader follows him and feels empathy for him.

Other features of short stories can be found in many storytelling books and workshops, such as setting, point of view and frame technique. These features are more about technical contexts and highlight the importance of experience and honed writing skills in storytelling. Discussing them is beyond the scope of this work.

Considerations for science short stories

Short stories offer opportunities and challenges to the science communicator and science communication researcher interested in comparing communication formats. From a practical perspective, short stories are less information dense than many journalistic formats. This means that the short story takes longer (or more words) to convey the same information as, say a news story (or indeed a scientific abstract) [Haven, 2007]. For the science communication researcher interested in comparing the potential of different genre as science communication tools, this presents a problem. For example, to avoid substantially different text lengths, in their study of the effectiveness of fictional narratives in communicating science as compared to other text formats, Negrete and Lartigue reduced the length of Primo Levi's 'Nitrogen' and Anatoly Denieprov's 'Crabs take Over the Islands' (by deleting some parts of the stories) [Negrete & Lartigue, 2010]. However, shortening existing stories runs the risk of eliminating essential features of the story and may not create the same overall effect on the reader [Weitkamp, 2019]. An alternative is to craft original stories specifically for research purposes, though quality becomes a key consideration here.

Short stories, through their use of setting and characters, can place science in familiar contexts, enabling readers to make connections with everyday life. This

may be particularly useful for communicators wishing to explore the impacts of science on daily life, or to encourage people to adopt healthy or environmentally-friendly lifestyles. This ability to place science in context is taken a step further in the science fiction genre. Science fiction is one of the most successful and influential literary genres, affecting people's understanding and image of science and technology [Hauptman & Steinmüller, 2018; Steinmüller, 2003]. Le Guin called this genre 'the mythology of modern world' [Le Guin, 1993, p. 68] because it '... does use the mythmaking faculty to apprehend the world we live in, a world profoundly shaped and changed by science and technology, and its originality is that it uses the mythmaking faculty on new material' [Le Guin, 1993, p. 70]. It is rooted in the 'what if...' scenario [Cox, 2005; Hauptman & Steinmüller, 2018] and thus it always has the potential to offer new imaginations and perspectives, and an engaging storyline. Questions like 'what if robots ruled the world? What if people radically altered their attitude to travel? What if people could travel to distant galaxies? What if people ignore climate change?...' potentially offer engaging approaches to stories exploring new ideas, explanations of current scientific facts, or predictions of some human-caused trends, etc. Many short stories exploring scientific themes are also rooted in 'what if...' scenarios, and they can engage their audience via representing a new world (based on a different view, an undiscovered scientific explanation for an issue, a futuristic prediction and so on). We argue that short stories which place science in familiar contexts and ask 'what if...' questions offer opportunities to the science communicator/researcher but ONLY if quality is also considered.

In the context of science communication, placement of scientific information and science communication outcomes might also be important considerations. We consider the central placement of scientific information an essential component of a well-made science story. Central placement, however, does not mean that the scientific message or fact should be explicit. A good story does not ram home its message, but gently, sometimes mysteriously, leads the reader. Instead, it means that *all* the elements of the story should revolve around the scientific message; all should contribute to its explanation, believability etc. Again, the importance of science within the story should not lower the story's enjoyment and thus engagement; it should be integral and work in concert with other necessary factors, such as plot and characters. How can we judge and how can we make well-made stories?

Formulae and techniques alone will not make a quality story. According to Hills, the excellence (the extent of being well-made) of a short story can be demonstrated by considering the internal relationships of different parts and the relationship of parts to the whole story [Hills, 1977]. Hills points out that the excellence of a story depends on the kind of interrelationships, on the harmony and effectiveness of them — not on their number, and that in a fine short story, different parts of the story work harmoniously and effectively together to create the story's excellence. In our science communication context, this necessarily includes the core underpinning science. Using Henry James and Poe's notions, Hills further states that in a well-made story, every part works with other parts, and the parts are so interwoven that they are inseparable. Therefore, to demonstrate the excellence or quality of a story, the inseparability of its different parts must be shown, including the integral role of scientific information. In other words, in a well-made short story, there is no role or place for material that does not contribute directly or

indirectly to the work's single and unique effect or the work's whole actual meaning [Hills, 1977] — science cannot be simply overlaid or added as didactic content, it must be necessary to the meaning of the work. This offers a particular warning to researchers seeking to shorten texts in the interests of creating comparable length texts: if all features are essential, how can any words be stripped out without affecting the story's effects?

In addition to the abovementioned inseparability and single effect, in a science communication context a well-made short story should represent something (such as a feeling, a view or an issue) new to the reader/listener or present a new angle or perspective related to the research being communicated. Readers are important here. As Le Guin [2004] points out 'a story is a collaboration between the teller and the audience, writer and reader' [p. 230]. The strength of great stories is that they engage their readers, transporting them to another place [Green & Brock, 2000; Green & Donahue, 2008], and this, as with other forms of science communication, means the writer needs to consider for whom they are writing. Le Guin [2004] suggests three stages of writing: in the 'approach' stage consider your potential audience and any constraints this might impose on e.g. language. Next comes the writing stage, when audience and aesthetics are set aside and the rough story crafted. Here Le Guin advises you to 'trust' the story. In the third stage, revision and rewriting, audience is again front and center, as 'clarity – impact – pace – power – beauty...' are revisited [Le Guin, 2004, p. 233].

As a final point, a poor-quality story will not grab the reader, nor will the reader identify with under-developed characters. Quality is important. A science communicator or researcher wishing to create short stories will either need to develop their knowledge and experience as a storyteller or seek help from a skilled writer, likely one who is interested in science. Figure 2 shows the features that can lead to a well-made short story for science communication studies.

Deconstructing a well-made short story

Kurt Vonnegut's '2BR02B' [1962] is an example of well-made science fiction short story, representing the characteristics discussed above (i.e., shortness, representing something new, having inseparability of different parts and unity of effect). The story revolves around Hamlet's most famous soliloquy, 'To be or not to be...'. The story happens in a future time when there are 'no prisons, no slums, no insane asylums, no cripples, no poverty, no wars. All diseases were conquered. So was old age. Death, barring accidents, was an adventure for volunteers. The population of the United States was stabilized at forty-million souls...' [Vonnegut, 1962, p. 59], and for every child to be born, someone should volunteer to die. This is indeed something new and intriguing (a peaceful world in the future with voluntary death) to the reader, though it can also be attributed to a common concept such as the struggle for death and life. This story also sets up a 'what if' scenario that both holds the story together and drives it forward.

This struggle becomes more intense when we become aware that Mr. Wehling will have triplets and only has found one volunteer (his grandfather) to die. Before the birth, two volunteers must show up or the father must choose between the triplets (this is the crisis around which this story revolves). All parts of the story address

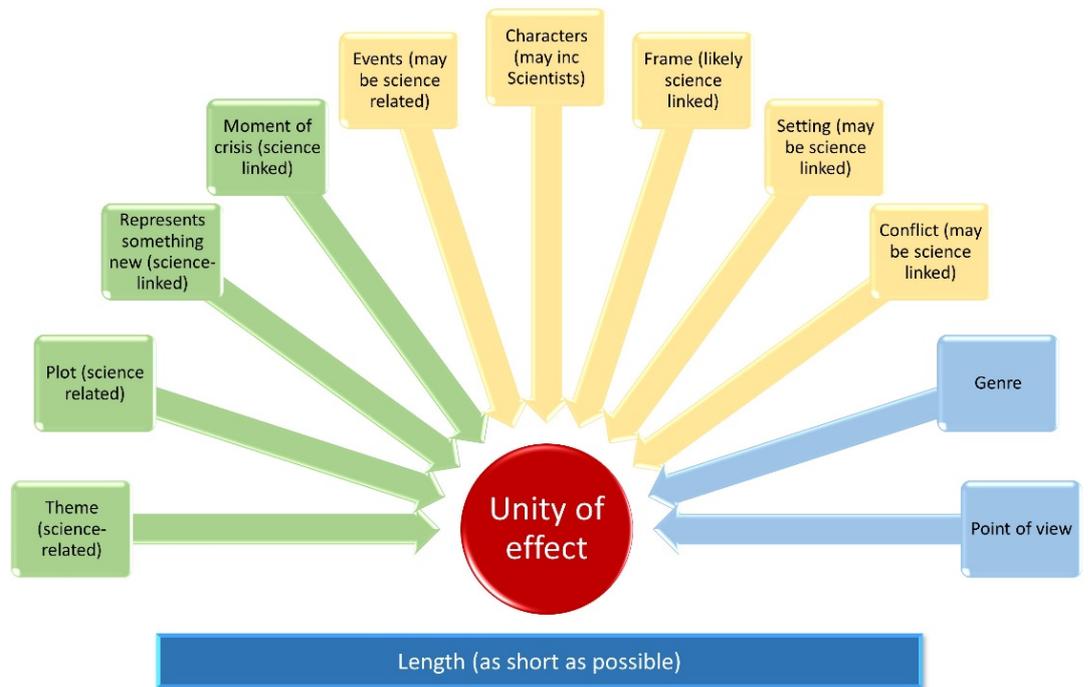


Figure 2. Diagram highlights the way in which different elements of a story contribute to the overall unity of effect. For science communication purposes, science will likely be an important feature for those elements in green boxes. Yellow boxes highlight elements where science content may feature when a story is developed for science communication purposes. Blue boxes are features which are independent of science content. In addition to creating an overall unity of effect, stories crafted for science communication (research) should be as short as possible. We argue that ‘representing something new’ helps increase engagement and is a key area where science content/context is likely to feature. For other elements of this figure which were unexplained in the text, a brief explanation is provided (in alphabetical order): *conflict* is the struggle in which the characters are engaged. It can be external (e.g. between the villain and the hero) or internal (when characters are having struggles with themselves) [Prince, 2003]. According to Hills ‘... a *frame* structure will usually have a relation to the story’s whole meaning. The technique involves setting a story inside another story that enhances it, or the other way around — or both ways...’ [Hills, 1977, pp. 110–111]. An *event* is a change of state which can be an action or an act (like when the change is made by a character as in ‘David threw a stone at the dog’) or a happening (when the change is not made by a character as in ‘the weather became snowy’) [Prince, 2003]. *Genre* is a group of texts, like science fiction or gothic fiction. They have defining features or genre makers, such as technical criteria, kinds of characters, settings and events the audience expects to find in them [Davies, Halpern, Horst, Kirby & Lewenstein, 2019; Malcolm, 2012]; science stories can be created in a wide range of genre. *Point of view* is the way a story is narrated, and there are different point-of-view methods including The First Person method [Hills, 1977]. *Setting* as Hills puts it ‘... implies location in time, time of day as well as historic time, and such matters as the weather out of doors or the temperature in the room where it all happens — all of these factors are customarily included in the term “setting”.’ [Hills, 1977, p. 158]. A *theme* represents the story’s key values and meaning, or what it has to say, a story’s ‘world’. A theme shows the writer’s perception of life [Hills, 1977]. There may be other technical features which can be drawn upon to enhance the overall unity of effect.

the conflict between life and death, which is explored through the question ‘what if humans were immortal’. This focus on life, death and immortality ensure the different elements of the story are inseparable and contribute to a unique effect. For example, the mural on which the painter (one of the story’s main characters who

prepares a mural for the hospital's waiting room) works reflects the story's message as it depicts '... a very neat garden. Men and women in white, doctors and nurses, turned the soil, planted seedlings, sprayed bugs, spread fertilizer.' and 'Men and women in purple uniforms pulled up weeds, cut down plants that were old and sickly, raked leaves, carried refuse to trash-burners,' [Vonnegut, 1962, p. 60] which illustrates the conflict between life and death, having one group in white giving life and the other group in purple taking it. The hospital orderly's conversation with the painter and his words are again in line with the story's central concept. We see that the hospital orderly comes down the corridor, singing a 'popular song':

'If you don't like my kisses, honey,
Here's what I will do:
I'll go see a girl in purple,
Kiss this sad world toodle-oo.
If you don't want my lovin',
Why should I take up all this space?
I'll get off this old planet,
Let some sweet baby have my place."
[Vonnegut, 1962, p. 60]

The orderly, through this song, states that death and life exist together and one must die for another to replace them. Next, we have 'The orderly looked in at the mural and the muralist. "Looks so real" he said, "I can practically imagine I'm standing in the middle of it."

"What makes you think you're not in it? said the painter. He gave a satiric smile. "It's called 'The Happy Garden of Life,' you know" [Vonnegut, 1962, p. 60] which indirectly says that anyone (even those who are not depicted as people in the mural) are in the mural (just as seedlings and plants) dealing with life and death.

Dr. Hitz (the hospital's chief obstetrician with a white uniform) who is an expert in childbirth and Mrs. Duncan (a gas chamber hostess clothed in purple) whose job is to make people comfortable when she kills them, represent life and death. The painter himself has a similar struggle for living or dying as we see in the end of story 'The painter pondered the mournful puzzle of life demanding to be born and, once born, demanding to be fruitful... to multiply and to live as long as possible — to do all that on a very small planet that would have to last forever.' and 'all the answers that the painter could think of were grim. Even grimmer, surely, than a Catbox, a Happy Hooligan, an Easy Go. He thought of war. He thought of plague. He thought of starvation.' [Vonnegut, 1962, p. 65] and then when he decides to kill himself he does not have the nerve and calls the famous number '2BR02B' to have a comfortable death. And finally, the story's title '2BR02B' (which is 'to be or not to be') represents the story's central message. '2BR02B' not only has the general features of a short story (it has a plot, compelling characters, a moment of crisis, shortness, etc.), but the unity of effect and 'newness' of the concepts explored make this a well-made story.

Conclusive remarks and future directions

Science-themed short stories have great potential in both science communication practice and research. However, we have argued that their ability to engage readers is crucially dependent on quality. Who amongst us has not picked up and put down in dismay the poorly crafted story (whether short or novel)? Intrinsically, we know the importance of quality, but just because we can identify the poor quality story, does not mean we can all rise to the challenge of crafting a well-made one. We have sought to set out facets of narrative that contribute to the quality of stories, but we urge those interested in working with this format to consider carefully how best to proceed. Research into the potential of short stories for science engagement is needed, but care must be taken to ensure that such studies really do test the potential of stories in science communication by ensuring they work with well-made stories, stories with the most potential to engage readers.

We argue that well-made short stories are flexible tools for both science communication research and practice. They can be told in different ways (by deciding how to use plot, point of view, moment of crisis, time, etc.) for different ends or to test different ideas. These features can be used to create a high-quality story that will convey a message, emotion, experience or unique view about an issue. This means that writing or telling a fine short story can be a challenging, time-consuming task that needs knowledge about features and techniques of storytelling and enough experience and passion to create them.

For the researcher, finding the time and expertise to create such stories is problematic. Yet stories may not exist which match the themes they seek to explore in their research. These challenges may explain why there are so few studies in which a quality short story is used. This challenge is not insurmountable; though finding professional writers able to deliver such stories may not be easy. More studies on well-made scientific short stories (original or adopted) are needed to fully understand their potential in different contexts of communication.

While we advocate for the use of fine narratives in research and communication, considering the quality and structure of stories should not be at the expense of the scientific aspects. Quality and care are needed in relation to scientific content, just as much as story crafting, or readers may misunderstand the science inside the story. It is a double-edged work! We argue that where original stories are used, quality can be assured in two ways:

- a) Using a combination of scientists and writers to create the most effective and appropriate scientific stories
- b) Before embarking on a story-based project, consider what training is available for those involved in creating storied works

The first option is more plausible and may be more effective, and science communication experts may already be using such combinations in different interdisciplinary fields and works. The second suggestion, however, is something uncertain and depends on the skills of science communicators and researchers involved. For those with an inclination to storytelling, knowing the features and techniques needed to create well-made stories, is a start, but is not sufficient. Fine stories cannot be made in a short time, nor can they be created without effort.

Taken together, well-made short stories are potentially practical tools that have a role in both science communication practice and research. They have brevity, making them desirable for researchers, communicators, and the target audience. In addition, they may be more engaging, persuasive, and memorable ways of conveying scientific messages than common narratives used in health and science communication studies and initiatives, thus leading to more unified and positive results.

Conflict of interest The authors declare no conflict of interest.

Funding The authors received no financial support for the research, authorship, and/or publication of this article.

References

- Allen, M. & Preiss, R. W. (1997). Comparing the persuasiveness of narrative and statistical evidence using meta-analysis. *Communication Research Reports* 14 (2), 125–131. doi:[10.1080/08824099709388654](https://doi.org/10.1080/08824099709388654)
- Appel, M. (2008). Fictional narratives cultivate just-world beliefs. *Journal of Communication* 58 (1), 62–83. doi:[10.1111/j.1460-2466.2007.00374.x](https://doi.org/10.1111/j.1460-2466.2007.00374.x)
- Appel, M., Richter, T., Mara, M., Lindinger, C. & Batinic, B. (2011). Whom to tell a moving story? Individual differences and persuasion profiling in the field of narrative persuasion. In *PERSUASIVE '11: Proceedings of the 6th International Conference on Persuasive Technology: Persuasive Technology and Design: Enhancing Sustainability and Health*. doi:[10.1145/2467803.2467809](https://doi.org/10.1145/2467803.2467809)
- Avraamidou, L. & Osborne, J. (2009). The role of narrative in communicating science. *International Journal of Science Education* 31 (12), 1683–1707. doi:[10.1080/09500690802380695](https://doi.org/10.1080/09500690802380695)
- Bekalu, M. A., Bigman, C. A., McCloud, R. F., Lin, L. K. & Viswanath, K. (2018). The relative persuasiveness of narrative versus non-narrative health messages in public health emergency communication: evidence from a field experiment. *Preventive Medicine* 111, 284–290. doi:[10.1016/j.ypmed.2017.11.014](https://doi.org/10.1016/j.ypmed.2017.11.014)
- Bilandzic, H. & Kalch, A. (2021). Fictional narratives for environmental sustainability communication. In F. Weder, L. Krainer & M. Karmasin (Eds.), *The sustainability communication reader: a reflective compendium* (pp. 123–142). doi:[10.1007/978-3-658-31883-3_8](https://doi.org/10.1007/978-3-658-31883-3_8)
- Billington, J., Humphreys, A. L., Jones, A. & McDonnell, K. (2016). A literature-based intervention for people with chronic pain. *Arts & Health* 8 (1), 13–31. doi:[10.1080/17533015.2014.957330](https://doi.org/10.1080/17533015.2014.957330)
- Borrayo, E. A., Rosales, M. & Gonzalez, P. (2017). Entertainment-education narrative versus nonnarrative interventions to educate and motivate Latinas to engage in mammography screening. *Health Education & Behavior* 44 (3), 394–402. doi:[10.1177/1090198116665624](https://doi.org/10.1177/1090198116665624)
- Broemmel, A. D., Rearden, K. T. & Buckner, C. (2021). Teachers' choices: are they the right books for science instruction? *The Reading Teacher* 75 (1), 7–16. doi:[10.1002/trtr.1998](https://doi.org/10.1002/trtr.1998)
- Burroway, J. (1996). *Writing fiction: a guide to narrative craft* (4th ed.). New York, NY, U.S.A.: Harper-Collins.

- Constant, N. & Roberts, L. (2017). Narratives as a mode of research evaluation in citizen science: understanding broader science communication impacts. *JCOM* 16 (04), A03. doi:[10.22323/2.16040203](https://doi.org/10.22323/2.16040203)
- Cormick, C. (2019). Who doesn't love a good story? — What neuroscience tells about how we respond to narratives. *JCOM* 18 (05), Y01. doi:[10.22323/2.18050401](https://doi.org/10.22323/2.18050401)
- Cox, A. (2005). *Writing short stories: a Routledge writer's guide*. doi:[10.4324/9780203962626](https://doi.org/10.4324/9780203962626)
- Dahlstrom, M. F. (2012). The persuasive influence of narrative causality: psychological mechanism, strength in overcoming resistance, and persistence over time. *Media Psychology* 15 (3), 303–326. doi:[10.1080/15213269.2012.702604](https://doi.org/10.1080/15213269.2012.702604)
- Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences* 111 (supplement_4), 13614–13620. doi:[10.1073/pnas.1320645111](https://doi.org/10.1073/pnas.1320645111)
- Dahlstrom, M. F. & Scheufele, D. A. (2018). (Escaping) the paradox of scientific storytelling. *PLoS Biology* 16 (10), e2006720. doi:[10.1371/journal.pbio.2006720](https://doi.org/10.1371/journal.pbio.2006720)
- Davies, S. R., Halpern, M., Horst, M., Kirby, D. & Lewenstein, B. (2019). Science stories as culture: experience, identity, narrative and emotion in public communication of science. *JCOM* 18 (05), A01. doi:[10.22323/2.18050201](https://doi.org/10.22323/2.18050201)
- de Graaf, A., Hoeken, H., Sanders, J. & Beentjes, J. W. J. (2012). Identification as a mechanism of narrative persuasion. *Communication Research* 39 (6), 802–823. doi:[10.1177/0093650211408594](https://doi.org/10.1177/0093650211408594)
- Deighton, J., Romer, D. & McQueen, J. (1989). Using drama to persuade. *Journal of Consumer Research* 16 (3), 335–343. doi:[10.1086/209219](https://doi.org/10.1086/209219)
- Fährnich, B., Weitkamp, E. & Kupper, F. (2023). What constitutes “good” science communication in a wired world? Thoughts from a Delphi study on science communication quality online. *Public Understanding of Science*. To appear.
- Finkler, W. & Leon, B. (2019). The power of storytelling and video: a visual rhetoric for science communication. *JCOM* 18 (05), A02. doi:[10.22323/2.18050202](https://doi.org/10.22323/2.18050202)
- Fletcher, J. M. (2019). *Travelling towards 2050: climate change, storytelling and the future of travel* (Ph.D. Thesis, University of Otago, Dunedin, New Zealand). Retrieved from <http://hdl.handle.net/10523/8923>
- Green, M. C. & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology* 79 (5), 701–721. doi:[10.1037/0022-3514.79.5.701](https://doi.org/10.1037/0022-3514.79.5.701)
- Green, M. C. & Donahue, J. K. (2008). Simulated worlds: transportation into narratives. In K. D. Markman, W. M. P. Klein & J. A. Suhr (Eds.), *Handbook of imagination and mental simulation*. doi:[10.4324/9780203809846](https://doi.org/10.4324/9780203809846)
- Hauptman, A. & Steinmüller, K. (2018). Surprising scenarios. Imagination as a dimension of foresight. In R. Peperhove, K. Steinmüller & H.-L. Diemel (Eds.), *Envisioning uncertain futures: scenarios as a tool in security, privacy and mobility research*. doi:[10.1007/978-3-658-25074-4_4](https://doi.org/10.1007/978-3-658-25074-4_4)
- Haven, K. F. (2007). *Story proof: the science behind the startling power of story*. Westport, CT, U.S.A.: Libraries Unlimited.
- Hawthorn, J. (2005). *Studying the novel*. London, U.K.: Bloomsbury Academic.
- Hickel, J. (2016). The true extent of global poverty and hunger: questioning the good news narrative of the Millennium Development Goals. *Third World Quarterly* 37 (5), 749–767. doi:[10.1080/01436597.2015.1109439](https://doi.org/10.1080/01436597.2015.1109439)
- Hills, R. (1977). *Writing in general and the short story in particular: an informal textbook*. Boston, MA, U.S.A.: Houghton Mifflin.

- Hopper, R. (2006). The good, the bad and the ugly: teachers' perception of quality in fiction for adolescent readers. *English in Education* 40 (2), 55–70. doi:[10.1111/j.1754-8845.2006.tb00791.x](https://doi.org/10.1111/j.1754-8845.2006.tb00791.x)
- Illingworth, S. (2016). Are scientific abstracts written in poetic verse an effective representation of the underlying research? *F1000Research* 5, 91. doi:[10.12688/f1000research.7783.3](https://doi.org/10.12688/f1000research.7783.3)
- Jones, M. D. & Anderson Crow, D. (2017). How can we use the 'science of stories' to produce persuasive scientific stories? *Palgrave Communications* 3, 53. doi:[10.1057/s41599-017-0047-7](https://doi.org/10.1057/s41599-017-0047-7)
- Jose, P. E. & Brewer, W. F. (1984). Development of story liking: character identification, suspense, and outcome resolution. *Developmental Psychology* 20 (5), 911–924. doi:[10.1037/0012-1649.20.5.911](https://doi.org/10.1037/0012-1649.20.5.911)
- Joubert, M., Davis, L. & Metcalfe, J. (2019). Storytelling: the soul of science communication. *JCOM* 18 (05), E. doi:[10.22323/2.18050501](https://doi.org/10.22323/2.18050501)
- Kaijser, A. & Lövbrand, E. (2019). Run for Your Life: embodied environmental story-telling and citizenship on the road to Paris. *Frontiers in Communication* 4, 32. doi:[10.3389/fcomm.2019.00032](https://doi.org/10.3389/fcomm.2019.00032)
- Kaplan, M. & Dahlstrom, M. (2017). How narrative functions in entertainment to communicate science. In K. Hall Jamieson, D. M. Kahan & D. A. Scheufele (Eds.), *The Oxford handbook of the science of science communication*. doi:[10.1093/oxfordhb/9780190497620.013.34](https://doi.org/10.1093/oxfordhb/9780190497620.013.34)
- Klassen, S. (2009). The construction and analysis of a science story: a proposed methodology. *Science & Education* 18 (3–4), 401–423. doi:[10.1007/s11191-008-9141-y](https://doi.org/10.1007/s11191-008-9141-y)
- Lartigue, C., Negrete, A., Velasco, E. & González Villarreal, F. (2016). Photocomic narratives as a means to communicate scientific information about use, treatment and conservation of water. *Modern Environmental Science and Engineering* 2 (12), 800–808. doi:[10.15341/mese\(2333-2581\)/12.02.2016/006](https://doi.org/10.15341/mese(2333-2581)/12.02.2016/006)
- Le Guin, U. K. (1989). *Dancing at the edge of the world: thoughts on words, women, places*. New York, NY, U.S.A.: Grove Press.
- Le Guin, U. K. (1993). *The language of the night: essays on fantasy and science fiction*. New York, NY, U.S.A.: HarperPerennial.
- Le Guin, U. K. (2004). *The wave in the mind: talks and essays on the writer, the reader, and the imagination*. Boston, MA, U.S.A.: Shambhala.
- Lejano, R. P., Tavares-Reager, J. & Berkes, F. (2013). Climate and narrative: environmental knowledge in everyday life. *Environmental Science & Policy* 31, 61–70. doi:[10.1016/j.envsci.2013.02.009](https://doi.org/10.1016/j.envsci.2013.02.009)
- Longnecker, N. (2016). An integrated model of science communication — more than providing evidence. *JCOM* 15 (05), Y01. doi:[10.22323/2.15050401](https://doi.org/10.22323/2.15050401)
- Malcolm, D. (2012). *The British and Irish short story handbook*. Chichester, U.K.: Wiley-Blackwell.
- Mar, R. A. & Oatley, K. (2008). The function of fiction is the abstraction and simulation of social experience. *Perspectives on Psychological Science* 3 (3), 173–192. doi:[10.1111/j.1745-6924.2008.00073.x](https://doi.org/10.1111/j.1745-6924.2008.00073.x)
- March-Russell, P. (2009). *The short story: an introduction*. Edinburgh, U.K.: Edinburgh University Press. Retrieved from <https://www.jstor.org/stable/10.3366/j.ctt1g09xbt>
- Martinez-Conde, S., Alexander, R. G., Blum, D., Britton, N., Lipska, B. K., Quirk, G. J., ... Macknik, S. L. (2019). The storytelling brain: how neuroscience stories help bridge the gap between research and society. *The Journal of Neuroscience* 39 (42), 8285–8290. doi:[10.1523/jneurosci.1180-19.2019](https://doi.org/10.1523/jneurosci.1180-19.2019)

- Martinez-Conde, S. & Macknik, S. L. (2017). Finding the plot in science storytelling in hopes of enhancing science communication. *Proceedings of the National Academy of Sciences* 114 (31), 8127–8129. doi:[10.1073/pnas.1711790114](https://doi.org/10.1073/pnas.1711790114)
- McKinnon, M. & Orthia, L. A. (2017). Vaccination communication strategies: what have we learned, and lost, in 200 years? *JCOM* 16 (03), A08. doi:[10.22323/2.16030208](https://doi.org/10.22323/2.16030208)
- Moyer-Gusé, E. (2008). Toward a theory of entertainment persuasion: explaining the persuasive effects of entertainment-education messages. *Communication Theory* 18 (3), 407–425. doi:[10.1111/j.1468-2885.2008.00328.x](https://doi.org/10.1111/j.1468-2885.2008.00328.x)
- Moyer-Gusé, E. & Dale, K. (2017). Narrative persuasion theories. In P. Rössler, C. A. Hoffner & L. van Zoonen (Eds.), *The international encyclopedia of media effects*. doi:[10.1002/9781118783764.wbieme0082](https://doi.org/10.1002/9781118783764.wbieme0082)
- Nan, X., Dahlstrom, M. F., Richards, A. & Rangarajan, S. (2015). Influence of evidence type and narrative type on HPV risk perception and intention to obtain the HPV vaccine. *Health Communication* 30 (3), 301–308. doi:[10.1080/10410236.2014.888629](https://doi.org/10.1080/10410236.2014.888629)
- Negrete, A. (2005). Fact via fiction: stories that communicate science. In N. Sanitt (Ed.), *Motivating science: science communication from a philosophical, educational and cultural perspective* (pp. 95–102). doi:[10.13140/RG.2.1.5110.1207](https://doi.org/10.13140/RG.2.1.5110.1207)
- Negrete, A. (2013). Constructing a comic to communicate scientific information about sustainable development and natural resources in Mexico. *Procedia — Social and Behavioral Sciences* 103, 200–209. doi:[10.1016/j.sbspro.2013.10.327](https://doi.org/10.1016/j.sbspro.2013.10.327)
- Negrete, A. (2021). Remembering rhythm and rhyme: memorability of narratives for science communication. *Geoscience Communication* 4 (1), 1–9. doi:[10.5194/gc-4-1-2021](https://doi.org/10.5194/gc-4-1-2021)
- Negrete, A. & Lartigue, C. (2010). The science of telling stories: evaluating science communication via narratives (RIRC method). *Journal Media and Communication Studies* 2 (4), 98–110. Retrieved from <http://hdl.handle.net/11401/8049>
- Olesk, A., Renser, B., Bell, L., Fornetti, A., Franks, S., Mannino, I., ... Zollo, F. (2021). Quality indicators for science communication: results from a collaborative concept mapping exercise. *JCOM* 20 (03), A06. doi:[10.22323/2.20030206](https://doi.org/10.22323/2.20030206)
- Olson, R. (2015). *Houston, we have a narrative: why science needs story*. doi:[10.7208/chicago/9780226270982.001.0001](https://doi.org/10.7208/chicago/9780226270982.001.0001)
- Prentice, D. A., Gerrig, R. J. & Bailis, D. S. (1997). What readers bring to the processing of fictional texts. *Psychonomic Bulletin & Review* 4 (3), 416–420. doi:[10.3758/bf03210803](https://doi.org/10.3758/bf03210803)
- Prince, G. (2003). *A dictionary of narratology*. Lincoln, NE, U.S.A.: University of Nebraska Press.
- Reagan, A. J., Mitchell, L., Kiley, D., Danforth, C. M. & Dodds, P. S. (2016). The emotional arcs of stories are dominated by six basic shapes. *EPJ Data Science* 5, 31. doi:[10.1140/epjds/s13688-016-0093-1](https://doi.org/10.1140/epjds/s13688-016-0093-1)
- Reid, I. (2017). *The short story*. doi:[10.4324/9781315308791](https://doi.org/10.4324/9781315308791)
- Reinsborough, M. (2017). Science fiction and science futures: considering the role of fictions in public engagement and science communication work. *JCOM* 16 (04), C07. doi:[10.22323/2.16040307](https://doi.org/10.22323/2.16040307)
- Rivière, M. (2008). *Barthes*. Penrith, U.K.: Humanities-Ebooks.
- Riedlinger, M., Massarani, L., Joubert, M., Baram-Tsabari, A., Entradas, M. & Metcalfe, J. (2019). Telling stories in science communication: case studies of scholar-practitioner collaboration. *JCOM* 18 (05), N01. doi:[10.22323/2.18050801](https://doi.org/10.22323/2.18050801)

- Rios, P. & Negrete, A. (2013). The object of art in science: science communication via art installation. *JCOM* 12 (03), A04. doi:[10.22323/2.12030204](https://doi.org/10.22323/2.12030204)
- Shen, F., Sheer, V. C. & Li, R. (2015). Impact of narratives on persuasion in health communication: a meta-analysis. *Journal of Advertising* 44 (2), 105–113. doi:[10.1080/00913367.2015.1018467](https://doi.org/10.1080/00913367.2015.1018467)
- Slater, M. D. & Rouner, D. (2002). Entertainment-education and elaboration likelihood: understanding the processing of narrative persuasion. *Communication Theory* 12 (2), 173–191. doi:[10.1111/j.1468-2885.2002.tb00265.x](https://doi.org/10.1111/j.1468-2885.2002.tb00265.x)
- Steinmüller, K. (2003). The uses and abuses of science fiction. *Interdisciplinary Science Reviews* 28 (3), 175–178. doi:[10.1179/030801803225005067](https://doi.org/10.1179/030801803225005067)
- Sun, Y., Lee, T. K. & Qian, S. (2019). Beyond personal responsibility: examining the effects of narrative engagement on communicative and civic actions. *Journal of Health Communication* 24 (6), 603–614. doi:[10.1080/10810730.2019.1643954](https://doi.org/10.1080/10810730.2019.1643954)
- Vonnegut, K. (1962). 2BR02B. *Worlds of IF* 11 (6), 59–65. Retrieved from https://archive.org/details/1962-01_IF
- Weitkamp, E. (2019). Narrative, drama, and science communication. In D. R. Gruber & L. C. Olman (Eds.), *The Routledge handbook of language and science*. doi:[10.4324/9781351207836-19](https://doi.org/10.4324/9781351207836-19)
- Wheeler, C., Green, M. C. & Brock, T. C. (1999). Fictional narratives change beliefs: replications of Prentice, Gerrig, and Bailis (1997) with mixed corroboration. *Psychonomic Bulletin & Review* 6 (1), 136–141. doi:[10.3758/bf03210821](https://doi.org/10.3758/bf03210821)

Authors

Masoud Irani is a young writer and researcher living in Tehran, Iran. He is interested in science communication and in using a combination of art and science to communicate scientific issues. He has published some short stories and poems in different magazines and journals such as Chelcheragh and Consilience and has written several stories and poems which will be published in the future. He got his Master's degree in Tissue Engineering from Amirkabir University of Technology and he is currently doing research about the roles and effects that stories and poems can have in science communication research and practice.



masoud.irani1990@gmail.com

Emma Weitkamp is Professor of Science Communication at the University of the West of England, Bristol U.K. She teaching science communication at undergraduate, postgraduate and doctoral level. Her research interests centre on science communication through arts, particularly drama and narrative modes of communication, including cartoons and comics.



emma.weitkamp@uwe.ac.uk

How to cite

Irani, M. and Weitkamp, E. (2023). 'Factors affecting the efficacy of short stories as science communication tools'. *JCOM* 22 (02), Y01. <https://doi.org/10.22323/2.22020401>.



© The Author(s). This article is licensed under the terms of the Creative Commons Attribution — NonCommercial — NoDerivatives 4.0 License. ISSN 1824-2049. Published by SISSA Medialab. jcom.sissa.it