SCIENCE STORIES THROUGH A CULTURAL LENS
The effects of cultural framing of storytelling in the natural and social sciences

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Storytelling is a critical element for the effective communication of science in online videos. However, its effect is not consistent across different cultures. Here, we review and examine cultural framing of storytelling used to communicate science, including social science, in online teaching videos. We found that students from high-context cultures engage more with online videos than do students from low-context cultures but, nevertheless, do more poorly in tests that measure knowledge obtained. Our findings highlight the need to consider the cultural framing of storytelling – cultural science communication – when communicating science to audiences from different cultures.

Keywords: storytelling, science communication, education, cultural storytelling.

INTRODUCTION
Evidence is accumulating that storytelling can be one of the most effective means for communicating sciences (Joubert et al., 2019), be they traditional natural sciences (Collins et al., 2023) or social sciences (Smith et al., 2023). Given that the COVID-19 pandemic has resulted in a dramatic shift by many tertiary institutions to online teaching (Adedoyin & Soykan, 2020) using online videos (Lamsal, 2022; Praveena Daya et al., 2022), the type of storytelling used in such online videos for teaching sciences could potentially enhance students’ engagement and the effectiveness of teaching (Davis & León, 2018; García-Avilés & de Lara, 2018; Sherer & Shea, 2011).

The evidence to date on the effectiveness of online teaching, however, is mixed. For example, one study comparing online and in-class teaching in a medical college in India found that online teaching provides a more personalized learning environment for students. On the other hand, traditional in-class teaching can be a more effective means for students to improve their critical thinking skills (Hajhosseini et al., 2016). Challenges that can arise with online teaching include technological difficulties (Lamsal, 2022; Taskiran, 2022) but, most critically, issues from using content that is not specifically tailored for online delivery to meet the needs of the audience. That is, many education providers merely transfer traditional course content and materials into an online form (e.g., by simply recording lectures using Zoom and then uploading them to online platforms) without any attempt to optimize the content for the online environment by using techniques such as storytelling (Green et al., 2020; Taskiran, 2022). As a result, poorly designed
online courses typically suffer from high drop-out rates (Yang et al., 2013).

Research has demonstrated that the use of storytelling in online videos can increase understanding and learning about science topics (Davis et al., 2020), although that effect is not consistent across different cultures (Davis et al., 2022). Given the recent trend towards using online videos for teaching and communicating sciences, it is, therefore, important to determine how best to frame content in ways that are appropriate to the cultural backgrounds of target audiences in order to best enhance engagement and understanding (Finkler & León, 2019; Hornikx & le Pair, 2017; Vedder, 2015).

**Cultural Framing**

Storytelling using video can be a highly effective communication tool, with online on-demand videos rapidly becoming the most dominant means of communication, especially for those under 30 years of age (León & Bourk, 2018). Cultural differences influence the responses to emotional and rational appeals in communication, and these differences become especially apparent when comparing high-context and low-context cultures (Hall, 1976). High-context cultures (e.g., Māori, Chinese and Indian) rely more on emotive communication appeals and narrative elements such as the collective, while low-context cultures (e.g., UK, USA and Germany) rely more on rational appeals and narrative elements such as the individual (Usunier & Roulin, 2010; Vedder, 2015). Adapting content and storytelling to suit audiences of different cultural backgrounds may well benefit engagement and online learning experiences (Hornikx & le Pair, 2017). However, such multicultural dimensions to the use of storytelling for online teaching remain largely untested and their actual effects are unknown (Hornikx & le Pair, 2017; Milani, 2008).

Here we provide a preliminary proof-of-concept test of the impacts of cultural framing of storytelling in online videos about a social science (economics) depending upon whether students are from low-context or high-context cultures.

**PROOF-OF-CONCEPT TEST**

We produced two 2-minute videos about economics (the specific topic involved business aspects associated with New Zealand’s indigenous Māori culture) to be used in a first-year Business Studies paper at the University of Otago, New Zealand. The videos were identical except for their narrations. The narrator told the story in two different ways, which were intended to appeal to students from different cultural backgrounds: (i) the Low-Context Narration used a rational form of storytelling typical of individualistic cultures such as those predominant in the USA, UK, and Germany; and, (ii) the High-Context Narration used an emotive form of storytelling characteristic of collectivist cultures like Māori, and those that are predominant in China and India. The specific storytelling features used in the high-context narration and the low-context narration (Table 1) were based upon those identified by Würtz (2005).

<table>
<thead>
<tr>
<th>Feature</th>
<th>High-Context Narration</th>
<th>Low-Context Narration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>Inclusive language: use of “we” and “us”</td>
<td>Exclusive language: no reference to the viewer.</td>
</tr>
<tr>
<td>Referencing</td>
<td>Formal referencing: narrator refers to herself as “Dr” or “Associate Professor”</td>
<td>Informal referencing: narrator refers to herself using her first name only.</td>
</tr>
<tr>
<td>Context</td>
<td>Personal context: narrator gives anecdotes about her background and family history.</td>
<td>Impersonal context: narrator gives no personal details beyond those needed to establish her credentials.</td>
</tr>
<tr>
<td>Numeracy</td>
<td>Relative numeracy: use of relative terms such as “half” or “majority”</td>
<td>Precise numeracy: use of precise terms such as 50% or 60%.</td>
</tr>
<tr>
<td>Translation</td>
<td>Cultural priority: using Māori (cultural) words first with an English translation and thereafter using only the Māori word (e.g., kaitiakitanga).</td>
<td>English priority: using English words first with a Māori translation and thereafter using only the English word (e.g., guardianship).</td>
</tr>
</tbody>
</table>

Table 1. Storytelling features used to differentiate the High-Context Narration from the Low-Context Narration. Adapted from Würtz (2005) and Meyer (2014).
and Meyer (2014) as differing in their appeal to high-context and low-context cultures. The narrations otherwise contained the same factual information.

We tested whether the low-context and high-context narrations had differing effects depending upon whether students were from high-context or low-context cultures. The videos were presented to the students in the form of a survey, whereby students were randomly assigned to view either the video with the low-context narration (LC video) or the video with the high-context narration (HC video). After watching the video, the students completed a questionnaire, which sought their evaluations of the video through a series of multiple-choice questions about their levels of engagement, satisfaction, and their perceptions of the characteristics of the video; and four questions that tested whether they were able to correctly recall information presented in the video.

**Test Results**

Of 152 students who watched the video and completed the survey, 74 watched the HC video while 78 watched the LC video. There were slightly more female participants (57.9%) than males (42.1%) and the vast majority of the participants (97.4%) were under 25 years old. Based upon their ethnic groups, 39 (25.7%) of them were from high-context cultures (HC students), and 113 (74.3%) of them were from low-context cultures (LC students).

The HC students had significantly higher levels of engagement (mean = 1.97, SD = 0.78, n = 39) with the videos than did the LC students (mean = 2.33, SD = 0.89, n = 113) (ANOVA, F = 4.85, p < 0.05). While the scores of students from low-context cultures were unaffected by the type of narration, students from high-context cultures consistently rated the high-context narration more positively across...
all four measures (Figure 1). In sum, there was a
significant difference in reactions to the videos based
upon the cultural backgrounds of students and, while
the reactions of students from low-context cultures
were unaffected by the cultural framing of the videos,
there was a trend for students from high-context
cultures to view the video with the high-context
narration more positively.

The students were given a list of 13 attributes
that they could select to describe the video they had
watched (Figure 2). Students watching the HC Video
were significantly more likely to describe it as “emotional” than the LC Video (Chi-square test, $\chi^2 = 7.35, p < 0.01$), and this was regardless of their
cultural background (HC or LC Student). We had,
therefore, succeeded in our aim of producing more
emotive storytelling in the high-context video by
applying the features listed in Table 1 to the narration,
and this was recognized to a similar extent by both
high-context and low-context students. HC Students
were, however, significantly more likely to find the
HC Video narration informative (Chi-square test, $\chi^2 = 3.82, p = 0.05$), while tending to also regard the
LC Video narration as more authoritative (Chi-square
test, $\chi^2 = 2.20, p = 0.1$).

Our survey questionnaire included four questions
about specific content in the video for the purpose of
testing the short-term recall of information presented
in the video. After watching the video, LC Students
got significantly more correct answers (mean = 3.12,
SD = 1.04, n = 113) than did HC Students (mean = 2.64, SD = 1.25, n = 39) (ANOVA, $F = 5.66, P < 0.05$).
A two-way ANOVA revealed that neither the narration
type (HC or LC Video) nor any interaction between
the narration type and the participants’ cultural
backgrounds (HC or LC Students) had a significant
influence on the recall of information.

CULTURAL FRAMING OF STORIES FOR
SCIENCE COMMUNICATION

While research has shown that digital storytelling
can be a useful teaching tool for providing access
to culturally distinct perspectives (Grogan et al.,
2021), to our knowledge, our proof-of-concept test
is the first time in which storytelling that provides
distinct cultural perspectives has been tested against
the cultural background of audiences when it comes
to the online communication of either natural or
social sciences. Given the preliminary nature of our
manipulations, there are encouraging suggestions
for further research and ways to improve online
communication by altering the cultural framing of
storytelling based upon the cultural identities of the
audience.

Vedder (2015) noted high-context cultures rely on
an emotive communication style in contrast to the
rational communication style preferred by low-context
cultures. Videos have the potential to create empathy
and emotional connection between an audience and
the storyteller (Grogan et al., 2021), and we were successful, through the framing of the storytelling alone, in producing a video (HC video) that was perceived as more emotive by audience members irrespective of their cultural backgrounds. While those from low-context cultures showed no preference for the emotive storytelling of the HC video, those from HC cultures displayed a persistent pattern of preferring the emotive storytelling of the HC video compared to the rational storytelling of the LC video. Storytelling that elicits emotions would seem to have great potential when it comes to communicating with high-context cultures for the purposes of teaching (Walan & Enochsson, 2019).

Despite this, students from high-context cultural backgrounds performed significantly worse on information re-call tests than did students from low-context cultures regardless of the type of narration used in the videos. Clearly, this does not result from a lack of engagement with the online videos, as our results showed that high-context students were significantly more engaged with the videos than were their low-context counterparts. It could be that emotive storytelling alone is not the most appropriate means of engagement for high-context students when it comes to learning. For example, Davis et al. (2020; 2022) found that while entertaining storytelling helped engage some parts of the audience viewing online videos about climate change, it decreased their sense of its seriousness. Something similar could be operating here, whereby even though high-context students may have been more engaged by the HC Video, they were less likely to regard it as authoritative and, therefore, less likely to take notice of the information it contained. Yet, that would not account for HC Students performing more poorly than LC Students when watching the video with the low-context narration.

Another possibility is that while emotive storytelling in videos can be engaging (Adnan & Redzuan, 2016; Chen & Wang, 2011), perhaps a key feature required for learning in high-context cultures – which are typically more socially oriented (Kim et al., 1998; Richardson & Smith, 2007) – is missing? If so, it could be that the environment and interactions that take place around viewing online videos is important for creating cross-cultural understanding and, thereby, moving high-context students from engagement to learning (Bair et al., 2022; Dunn & Cherup, 2021). It would be good to test whether using a delivery mechanism for online videos about science that enhances social interaction amongst the audience (e.g., allowing likes, shares and commenting as per social media platforms like YouTube) leads to better outcomes for students (Buzzetto-More, 2015).

Whatever the explanation, our review and proof-of-concept test show that there are definite differences in the ways that audiences from high context and low context cultural backgrounds react to the type of storytelling used in online videos about factual subjects like the sciences and social sciences and, most concerning, how well they can recall the communicated information afterwards. We suggest strongly that not only is more research in this area warranted, but it is also absolutely necessary – otherwise inequities in educational and learning outcomes for people of different cultural backgrounds are likely to persist.

There are also important implications for the use of storytelling in science communication generally. High-context and low-context cultural preferences are key elements of cross-culture differences (Xia et al., 2021), suggesting that stories and storytelling need to be re-imagined within new geographies and cultural frames (Cameron, 2012). A new approach to storytelling for science communication is needed, a form of cultural science communication, that uses storytelling as a means by which different cultures create, assimilate, and communicate knowledge (Hartley, 2015). Without such a new model for telling science stories, we risk devaluing the effectiveness of science communication and restricting access to knowledge about science for large parts of the world’s population.

REFERENCES


Finkler, W., & León, B. (2019). The power of storytelling and video: A visual rhetoric for science communication. *Journal of Science Communication, 18*(05), A02. https://doi.org/10.22323/1.1805020


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