

Incorporating Both-Ways Thinking about Time into the Science Curriculum: Aboriginal and Torres Strait Islander histories and cultures cross-curriculum priority in the Australian Curriculum: Science

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ACARA (2019) recognises two distinct needs in the Australian curriculum:

- “Aboriginal and Torres Strait Islander students can see themselves, their identities and their cultures reflected in the curriculum of each of the learning areas, can fully participate in the curriculum and can build their self-esteem” (p.5)
- The Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority is designed for **all students** to engage in reconciliation, respect and recognition of the world’s oldest continuous living cultures.” (our emphasis, p. 5)

Michie, Hogue and Rioux (2018) compare a number of characteristics of Western and Indigenous worldviews, and make the point that each characteristic could seemingly be interpreted in two different ways depending on which lens, Western or Indigenous, is being used.

1. Each characteristic can be considered as a binary pair, where each member of the pair is in opposition to the other.
2. The pairs can be considered as endpoints so that the space between represents a continuum of interpretation that varies with an individual’s worldview. This means that the binary pair is no longer in conflict but complement each other.

This paper illustrates how the two interpretations of time, linear time and cyclical time, can be presented as a topic in both Western and Indigenous science education, and how they can complement each other.

The question becomes: How is space created in the curriculum for both Indigenous and Western perspectives of the scientific concepts (e.g. seasons) being taught? It is suggested that the following three pedagogical approaches, Indigenous perspectives, Both-Ways approach, and Both-Ways approach with epistemic insight, promote increasingly the inclusion of Indigenous knowledge and ways of knowing:

Way of inclusion	Features	Explanation	Suitable activities relating to seasons: Students...
Indigenous perspectives	Stereotypic or tokenistic knowledge, or a caricature	Superficial understanding of Indigenous knowledge	<ul style="list-style-type: none"> • discuss local seasonal variations and relate them to the Western seasonal calendar • search for Indigenous seasonal calendars on the internet and other sources
Both-Ways approach	Knowledges may be in conflict	Two ways of knowing: Indigenous (local) science compared with Western (universal) science	<ul style="list-style-type: none"> • compare variations in their Western seasonal calendar with those in their local Indigenous seasonal calendar • discuss observable seasonal features, including bird migration and plant flowering and fruiting
Both-Ways approach with epistemic insight (<i>epistemic insight = knowledge about knowledge</i>)	Knowledges are complementary	Two ways of knowing: making use of both Indigenous (local) and Western (universal) science	<ul style="list-style-type: none"> • discuss the benefits of organising their local Indigenous calendar as a cycle • investigate why Indigenous seasonal calendars vary from place to place, including languages which are in close proximity • discuss how Indigenous seasonal knowledge has been used to inform Western science, particularly botany, zoology, ecology and meteorology • analyse how both knowledge traditions complement each other

While teachers may generally utilise Indigenous perspectives as initial ways to engage with Indigenous knowledge, they should also explore possibilities of including the Both-Ways approach with and without epistemic insight.

ACARA. (2019). Australian Curriculum: Science Aboriginal and Torres Strait Islander Histories and Culture cross-curriculum priority. Australian Curriculum, Assessment and Reporting Authority. <https://www.australiancurriculum.edu.au/f-10-curriculum/cross-curriculum-priorities/aboriginal-and-torres-strait-islander-histories-and-cultures/>

Michie, M., Hogue, M., & Rioux, J. (2018). The application of Both-Ways and Two-Eyed Seeing pedagogy: Reflections on engaging and teaching science to post-secondary Indigenous students. *Research in Science Education*, 48(6), 1205-1220.