intersections

Research Review

Learning Through Stories: Bringing Indigenous Muslim Wisdom into Science Education

December 1, 2024

In this article, we provide an overview of “The Art of Knowing” project, a pedagogical intervention and research project that utilizes Indigenous Muslim storywork as a foundation for an extracurricular elementary school science curriculum. Through our educational experiment [1], we intentionally designed a learning space that placed Muslim ways of knowing and learning at the center of classroom pedagogy for elementary school students. “The Art of Knowing” is inspired by Black freedom schools in the U.S., Indigenous education projects, and other approaches that center non-Eurocentric perspectives. Its goal is to allow Muslim children to see their communal, familial, and spiritual ways of knowing as central to the pedagogical and curricular project (not just displayed as decoration on the walls of their schools). This work occurs during a historical moment in which we see acute institutional silencing and politically motivated delegitimization of diverse voices and perspectives. For example, since 2021, 19 states have passed legislation limiting how race and racism can be discussed in public schools under the guise of “Anti-Critical Race Theory.”

Amidst the ongoing struggle to shape public discourse around injustice, we believe it is essential to begin the analysis by addressing one of the root causes. Addressing economic and political injustices in today’s world entails starting with “the cognitive injustice that exists at the core of the production of knowledge since the beginnings of the modern colonization of the world.”[2] Therefore, we incorporated social critiques of modernity and

coloniality into our curriculum design and pedagogical strategies. In so doing, we hoped to forward culturally revitalizing relationships between students, the knowledge they produce, and the world they explore around them. We provide an example of textual analysis of the story of Ḥayy ibn Yaqẓān[3], as a theory of knowledge within Muslim cultures and as a curricular and pedagogical tool.



Kimberly Farmer via Unsplash

Over two years, we designed and taught an extracurricular science class focusing on 'Muslim Ways of Knowing' at a local Muslim elementary school. The school aspires to craft a Muslim educational vision that extends beyond spiritual teachings. That aspiration resonated with our passion for exploring Muslim epistemologies and ancestral modes of understanding. We designed an extracurricular class where we met weekly for two hours with mixed-aged groups of 1-3 graders and 4-6 graders. By engaging the children with storywork, we explored "how we come to know" by asking questions about when, where, and why we trust various ways of knowing. We probed empiricism, or our physical senses, and how we can trust our senses, but also how our senses might lead us astray. Likewise, we investigated different categories like rational knowledge, transmitted knowledge, relational knowledge, and spiritual knowledge as ways of knowing ourselves and the world. Although our research study has concluded, our extracurricular class is ongoing, strengthening our connection with the school and its students.

What should we teach young people about who they are? What should we teach them about the society in which they live? How should they be taught these things? Such debates have animated public education since its inception in the United States. The ongoing genocide in

Gaza, Palestine heavily informed our approach. As we taught and iterated our curriculum, we bore in mind the ongoing attention, continued misinformation, and troubling censorship that has developed around the crisis. During this time, the school provided a space for students, teachers, and community members to share stories of loss, grief, and concern for their family members, loved ones, and community members suffering in Gaza and the West Bank.

What Informs Our Thinking

We situate our work in non-Eurocentric approaches to science education. Furthermore, our work appreciates multiple and culturally-situated ways of understanding science.[4] Eurocentric epistemologies in science education dominate scholarly research and funding globally, limiting the diversity of knowledge systems [5] and ignoring the cultural foundations of Western science.[6] The continuous erasure of knowledge from the Global South and the systematic exclusion of Arab and Muslim contributions to science [7] further reinforces this inequality in science education. Dominant norms in science education are rooted in colonial and racial histories. These histories aim to assimilate students and distance them from their lived experiences.[8]

> ***When we dare to expand the epistemological scope and embrace pluralistic scientific systems, the potential impact in the classroom is profound. Diverse ways of knowing can be valued and marginalized students can find their space in science.[9] In particular, Muslim epistemologies of science highlight the connections***

> ***between the spiritual and the material worlds. Exploring them opens the door to non-Western perspectives on science that allow teachers and students a fuller range of scientific exploration.***

When given this kind of freedom, students can engage with important scientific issues and resolutions only visible through culturally specific orientations to science knowledge.[10]

Ḥayy ibn Yaqẓān as a Theory of Knowledge

Before delineating our curriculum and pedagogy, we provide a brief overview of the story of Ḥayy as a theory of knowledge within Muslim cultures. *Ḥayy ibn Yaqẓān* is an Arabic philosophical tale written by the 12th-century Andalusian scholar Abū Bakr Ibn Tufayl (1109-1185 AD) [11]. The story is about a child who grows up in isolation on a remote island, learning and understanding the world through his engagement with the natural world. The story, rooted in Islamic ontological and epistemological views, presents nature as an open book of divine beauty, open to multiple interpretations. The novel begins by offering two possible origins for Ḥayy—one rooted in spontaneous biological generation on a mythical island and the other in Ḥayy being a royal castaway from a neighboring island. Allowing both possibilities to exist in the story allows the reader to engage both allegorical and philosophical interpretations while accommodating different perspectives.

Benjamin Behre via Unsplash

Ḥayy was raised by a nurturing deer on the island. As a result, he attempts to mimic the

animals in his life. Through this process, he discovers the power of his physical body and the manipulation of tools in the material world. By scientifically exploring his environment, he discovers the use of fire and engages animals as helpers. Growing older, Ḥayy cares for his deer mother as she ages, and her death is devastating for him. At her passing, he uses his knowledge to explore the essence of life and begins to recognize that life is not simply bound by the materiality of the bodies. He continues to study the natural world in its decay and renewal, deducing the existence of a Creator. Looking to the heavens, Ḥayy emulates celestial bodies and ascribes anthropomorphic characteristics to them, which he then attempts to emulate. For example, in observing the moon and the sun, he recognizes how they nurture life on the planet. Through observation, he strives to take on their characteristics of stewardship of the earth and its living beings, purity, and meditation to witness the Creator. At the age of fifty, Ḥayy attains harmony with nature. At his spiritual peak, another human, Absal, arrives on the island seeking a spiritual and physical retreat from the human world. Absal teaches Ḥayy human language and culture while learning spiritual insights from him. Ḥayy goes to the human world with Absal. Though initially welcomed and celebrated on Absal's island, Ḥayy's deeper teachings are rejected by those who prefer literal understandings of religion, prompting him to return to his original island with Absal to continue their spiritual quest.

An illustration by Karima Solberg from Ibn Tufayl's Story of Hayy ibn Yaqzan shows him with his adoptive "mother," a doe.
(Source)

By analyzing Ḥayy's journey of knowledge, our students examined the multiple ways of knowing the world that he utilized, their impact on his relationship with his world, and how these ways of knowing complemented one another. The curriculum we designed around

Ḥayy's story explored the entanglement of empirical, rational, spiritual and transmitted knowledge in Ḥayy's life. In their classroom activities, students discussed how Ḥayy made sense of his empirical engagement with the natural world through rational knowledge. They also gained an understanding of how rational knowledge guided his spiritual journey towards understanding himself as a part of an organic and living universe. Together, we reflected on the way Ḥayy's spiritual knowledge guided his empirical knowledge away from a utilitarian approach and towards an ethical relationship with his environment. As Ḥayy finally encountered human society, his lifetime of developing these different modes of knowledge – empirical, rational, and spiritual – allowed him to validate and evaluate the transmitted knowledge of traditional religion for himself.

The story of Ḥayy offers a way of understanding, learning about, and studying the natural world, grounded in Islamic philosophies emphasizing the plurality of ways of knowing and their interdependence [12]. The story also illustrates that humanity's relationship with the natural world is mediated and determined by how it epistemologically approaches it. Hayy's empirical and rational knowledge led to his dominance over his environment. This was not seen as a triumph or a happy ending in the story. It was presented as a stage that Hayy had to grow out of to learn his place and find ways to coexist with other species and beings. The story illustrates how "humans realize their humanity fully only when they reach ecological consciousness." [13] The story presents knowledge as a journey toward Divine love accomplished through an ethical relationship with the world. It highlights the transformative nature of knowledge, illustrating how it is relationally rooted in lived experiences and makes possible a dialogue between philosophy, science and religion.

Teaching the Art of Knowing

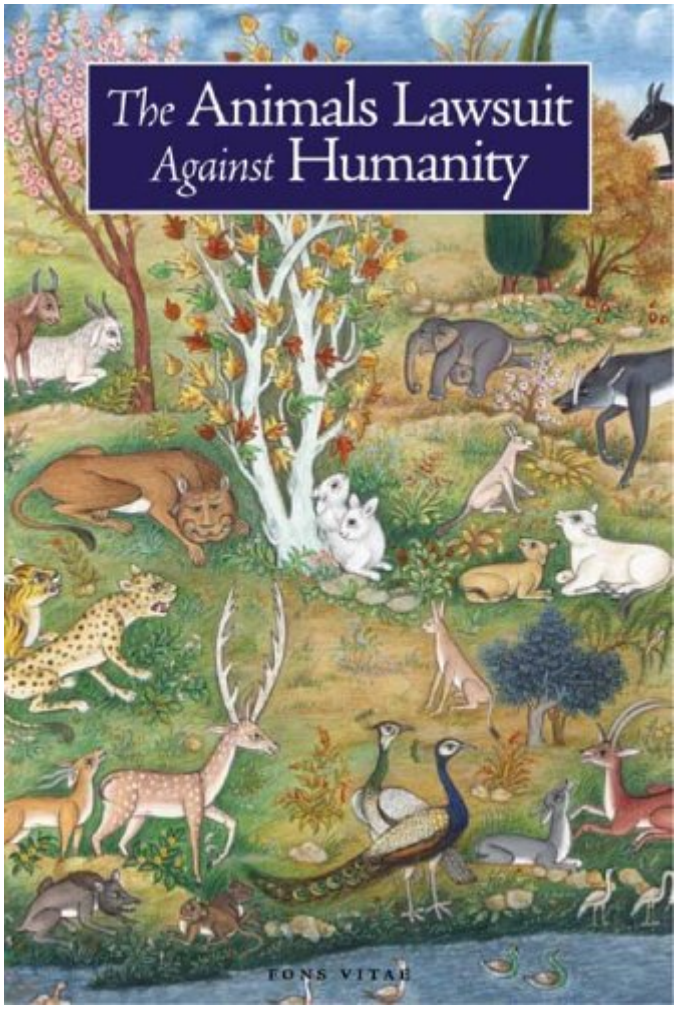
Through storywork, we designed curricular units to reflect on the interdependence of

different ways of knowing and how knowledge shapes our actions toward, and engagement with, the world around us. After engaging students with Ḥayy's life journey, we developed a series of lessons to explore the various ways of knowing presented in the story. This exploration was guided by Ḥayy's theory of knowledge as integrative, plural and interdependent. Drawing from the story of Hayy, we designed activities that encouraged students to engage with philosophical questions. Using additional literary artifacts like "Hey Little Ant" [14] and "I am a Rock,"[15] children contemplated the nature of life and our ethical responsibility towards all living things. Integrating contemporary experiences and narratives into the curriculum, we introduced the students to the story of Yellowstone National Park[16] examining "how the wolves change rivers"[17] and revitalize the diversity of life in the park. Through our exploration, we discussed the notion of habitats being alive and reflected on how a web of relationships impacts the balance and life of a physical place. Questioning popular narratives around wolves in relation to the role of wolves in Yellowstone Park, we examined how our perspectives shape not only what we know, but also how we act. To investigate the concept of perspective, we invited students to read and artistically engage with the poem, "The Blind Men and the Elephant."[18]

The first two pages of a manuscript containing the text of Ibn Tufayl's Hayy ibn Yaqzan, Ms. Istanbul, Ayasofya 04807-001 – Süleymaniye Manuscript Library Directorate, Istanbul (Source)

Examining empirical and rational knowledge and the role of perspective and affect in shaping these ways of knowing (and the actions and behaviors generated by them), we engaged fables from *Kalila and Dimna* [19], a collection of animal fables translated into Arabic by Ibn al-Muqaffaʿ (756/760 AD) from a Persian translation of the Sanskrit-language Panchatantra. To explore the concept of transmitted knowledge and ways to evaluate and

validate information received from various sources, we introduced students to the tradition of Islamic Hadith transmission [20], exploring the established criteria within this thousand-year tradition as well as concepts like authority, reliability and number of reporters, chain of transmission, proximity to events, and nature of the text. We engaged students in activities like “Broken Telephone” to experience the impact of the medium of transmission, the transmitter’s memory, and the transmission chain on shaping the message conveyed. Connecting to the Hadith tradition served as a foundation for developing general criteria for evaluating transmitted knowledge that students are exposed to in their daily lives in their interaction with books, people, and online content. Like Ḥayy in his encounter with knowledge coming from human society, students employed rational, empirical and spiritual forms of knowledge to evaluate information presented to them by others. Ḥayy’s story culminates with him realizing his interconnectedness with and responsibility towards all living beings. We also concluded our curriculum by emphasizing ecological consciousness, introducing the story of *The Animals’ Lawsuit Against Humanity* ***[21]*** which also takes place on a mythical island. Students engaged in a dramatized debate between humanity and other inhabitants of Earth through this classical 10th-century Arabic treatise by “Brethren of Purity.”[22] They examined the impact of humans on the island’s ecological balance and creatively articulated their counterarguments in the debate through visual art and performance.



Fons Vitae; Illustrated edition (April 1, 2005)

What We Are Learning Through This Work

In addition to developing and teaching “The Art of Knowing,” we have begun to examine data collected throughout our teaching, including a corpus of approximately 34 hours of audio and video recordings, teaching and research memos, and student-produced classroom artifacts. Specifically, we have asked what happens when students can draw on culturally and individually located knowledge resources and systems. To answer this question, we focus on moment-to-moment interactions, including students’ engagement with each other, the teachers, and knowledge resources (both those provided by the curriculum and those

the students bring with them). In our preliminary reading of the data, we paid particular attention to three excerpts of audio/-video data. We examined these three in depth because they engaged with alternative ways of knowing and included salient negotiations of knowledge. Initial analysis identified a noticeable increase in students' confidence in their individually and culturally situated knowledge resources, and a developing sense of both individual and collective "epistemic responsibility" or ethical attunement to the necessity to evaluate or inspect knowledge claims.[23] These findings were evident in students' repetitive "friendly challenges[24]" indicative of an understanding that the traditional framings and stances, including those of the teachers', are inspectable.

This sense of responsibility showed up in various ways. For example, during an activity in which students debated the "aliveness" of things and beings, one student continuously interjected the idea that cell phones were "the worst best thing," indicating his awareness of the complexity of its nature; a complexity that our pedagogical design did not initially allow for exploration of. In another instance, students challenged the framing of the question, "*How do we usually think about wolves on a scale of good to bad*?" Through "friendly challenges", they repeatedly drew attention to the contradictions in how we are conditioned to perceive lions and wolves despite their similarities. These types of interactions occurred frequently, and as we became more attuned to them, we created more space to allow students to engage in conversations through their own framing and knowledge systems and to draw on the knowledge resources they brought with them from their home and cultural lives.

Through the integration of concepts of knowledge inspired by Muslim storywork, including *Ḥayy ibn Yaqzan,* with culturally sustaining pedagogies, we have demonstrated an approach to fostering classroom spaces where students are not only empowered to engage with

knowledge critically but also to recognize and appreciate diverse ways of understanding the world. Our initial findings suggest that this approach not only enhances students' confidence in their cultural knowledge resources but also nurtures a collective sense of responsibility to critically evaluate taken-for-granted knowledge systems. Framing our curriculum through the story of *Ḥayy ibn Yaqzan* as a theory of knowledge and inviting in different classical and modern narratives exemplifies the Islamic commitment to storytelling as pedagogy.[25] By drawing on historical and contemporary stories that challenge Eurocentric narratives, we have created a learning environment where Muslim children can see their cultural and spiritual identities and lives reflected and valued in their education.



Student Art from the Art of Knowing Class

* *The cultivation of this learning environment occurs through a deeply collaborative effort in conversation with the school community and with all team members contributing equally to the teaching, research, curriculum development and writing.*

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Footnotes

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[1]Gutierrez and Jerow, "Social design experiments: Toward equity by design."

[2] Barreto, "Epistemologies of the South and Human Rights: Santos and the Quest for Global and Cognitive Justice." 397.

[3] Ibn Tufayl, “Ḥayy Ibn Yaqzan: A Philosophical Tale.”

[4] Bang & Medin, “Cultural processes in science education: Supporting the navigation of multiple epistemologies.”

[5] Barreto, “Epistemologies of the South and Human Rights: Santos and the Quest for Global and Cognitive Justice.”

[6] Harding, “Is science multicultural?: Postcolonialisms, feminisms, and epistemologies.”

[7] Lyons, “Islam through Western eyes: From the Crusades to the War on Terrorism.”

[8] Kayumova, “Equity and justice in science education: Toward a pluriverse of multiple identities and onto-epistemologies.”

[9] Jones, “Toward a Tribal Critical Race Theory in Education.”

[10] Bang & Medin, “Cultural processes in science education: Supporting the navigation of multiple epistemologies;” Inwood & Taylor, “Creative approaches to environmental learning: Two perspectives on teaching environmental art education;” MacMath & Hall, “Indigenous education: Using the science of storywork to teach with and within instead of about Indigenous peoples;” Molley et.al, “Using historical and political understanding to design for equity in science education;” Tzou et.al, “Storywork in STEM-art: making, materiality and robotics within everyday acts of indigenous presence and resurgence.”

[11] Ibn Tufayl, “Ḥayy Ibn Yaqzan: A Philosophical Tale.”

[12] Hawi, “Islamic Naturalism and Mysticism. A Philosophic Study of Ibn ṭufayl’s ḥayy bin Yaqẓān.”

[13] Diagne, “Open to Reason: Muslim philosophers in conversation with the Western tradition.”

[14] Hoose, et. al., “Hey, Little Ant.”

[15] Adams &Wharnsby, “Colours of Islam.”

[16] Smith & Bangs, “Reintroduction of Wolves to Yellowstone National Park: History, Values, and Ecosystem Restoration.”

[17] YouTube “How Wolves Change Rivers.”

[18] Saxe, John Godfrey. “The blind men and the elephant.”

[19] Ibn al-Muqaffaʿ et. al, “Kalīlah and Dimnah: Fables of Virtue and Vice.”

[20] Brown, “Hadith: Muhammad’s Legacy in the Medieval and Modern World;” Davidson, “Carrying on the Tradition: A Social and Intellectual History of Hadith Transmission across a Thousand Years.”

[21] Laytner et. al., “The Animals’ Lawsuit against Humanity: A Modern Adaptation of an Ancient Animal Rights Tale.”

[22] Goodman & McGregor, “The Case of the Animals Versus Man Before the King of the Jinn.”

[23] Heller, “Embodying Epistemic Responsibility: The Interplay of Gaze and Stance-Taking in Children’s Collaborative Reasoning.”

[24] Dacher Keltner and Daniel T. Cordaro, “Understanding Multimodal Emotional

Expressions", in The Science of Facial Expression (Oxford University Press, 2015).

[25] Bin Muhammad, "Tracing the Tracts of Qaṣaṣ: Towards a Theory of Narrative Pedagogy in Islamic Education."

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