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Transdisciplinary Research and the Gift Economy

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ABSTRACT

The notions of education and research, viewed through a transdisciplinary lens, emphasize collective knowledge creation and application across disciplinary boundaries. This approach mirrors gift economies, systems in which goods, services, or knowledge are exchanged without a formal expectation of direct repayment, emphasizing mutual support, generosity, and the strengthening of social bonds over competition or profit. In this context, research collaborators value a sense of shared purpose, fostering collaboration over competition to enhance group innovation and intellectual well-being.

Analogous to natural symbiotic systems, interdisciplinary communication and gift economies promote integration, collective self-actualization, and creative problem-solving. Similarly to interdisciplinary communication, gift economies also foster metacognition by encouraging reflection on the value of mutual exchange, empathy, and interconnectedness. Participants consider the impact of their contributions on others, deepening self-awareness and understanding of collaborative dynamics. This interchange, in turn, enhances learning and problem-solving skills.

This paper takes inspiration from the concept of gift economies, such as those adopted by indigenous societies and embedded in many natural systems. For example, food cooperatives and symbiotic plant networks illustrate relationships in which the motivation to produce springs not from a survival of the fittest mentality but from the theory that sharing itself has intrinsic value and supports group well-being. When applied to transdisciplinary education and research, the gift economy posits the idea that the whole of our collective knowledge exceeds the value of the sum of its isolated parts.

Keywords: gift economy, transdisciplinary learning, transdisciplinary research, mutuality, motivation theory, symbiosis

1. INTRODUCTION

The primary definition of *economy* refers to a system for producing and consuming resources. Entities participating in dominance-based systems generally stay in their own lanes, providing a particular commodity and vying for competition to reap material wealth in return for the effort. A gift economy instead values shared resources, setting a standard of practices based on the theory that all flourishing is mutual (Kimmerer, 2024) and the normative value of "storing my treasures in the belly of my brother" [1]. When applied to transdisciplinary education and research, the gift economy posits the idea that the whole of our collective knowledge exceeds the value of the sum of its isolated parts.

This paper examines the evidence that when research and learning aim at a collaborative goal to benefit society, additional advantages accrue to the individual learner or researcher, through deeper metacognition, expanded problem-solving skills, new incentives, and pattern-setting emotional rewards. These conclusions derive from analogs found in neurology, quantum physics, psychology, technology, education, and philosophy. The sum and symmetry of the examples suggest that opportunities to advance civilization multiply through transdisciplinary education and research to the extent that these processes value collective knowledge as a true gift, growing exponentially in relation to its manifold connections.

Many fields of human endeavor have elevated human understanding as a result of research in one field advancing progress in another. The approach itself represents a gift economy in which newly contextualized, multilateral learning outweighs the value of and avoids the limitations of theories tested in silos. Insights from various fields add layers to a mutualistic exchange. Diverse contributions strengthen adaptability and resilience, a concept which aligns with Ashby's First Law of Cybernetic. i.e., Requisite Variety: "Only variety can absorb variety." [2].

Historical tragedies such as the fall of Rome or the Stock Market Crash of 1929 demonstrate the theory that the continuous expansion of competitive hierarchies may prove less sustainable than a system of collaborative engagement or mutual assistance. [3] Rather that creating a house of cards, the bilateral expression of goodwill or the production of materials for benefits beyond self-interest not only supplies more participants with basic resources but, in the case of shared knowledge, also forges connections, enlarges understanding of new applications, and may prove essential in times of want.

For instance, the concept of a potluck has existed since the 16th century, but during the great Depression, potlucks, or bring-a-plate dinners became an especially useful method of ensuring that the no one went hungry. [4] Those with the means to do so brought a dish that would serve most of those in the larger group, while everyone contributed *something*. Early Twentieth Century anthropologists theorized about the expectations associated with the pot latch among indigenous Melanesian and Northwestern First Nations peoples. Their controversial findings—not necessarily those of contemporary tribal members—implied that the practice came about not only to exchange goods and to express the nobler aspects of character, but also to establish political hierarchy. [5] Conversely, a *potluck* relies upon each guest to contribute a gift that will benefit the whole gathering, without implicit expectation of recognition or reciprocity, making it a pure example of a gift economy.

The following example clarifies the concept. A natural disaster in the early 2000s left a neighborhood cut off from the larger community, with restricted access to stores and businesses. Residents on one street addressed the problem by sharing resources instead of hoarding them, for reasons beyond the expectation of influence or gain.

Two neighbors first went door to door, explaining what food remained in their pantries. The first night or two, they gathered 10 neighbors for a supper comprised of leftovers. Before long, each home had hosted an evening meal for the neighborhood on alternate nights, offering up whatever they had in their cupboards. Over the course of a month, they ate ice cream and peanut butter one night and carrots and crackers the next. The food stretched to provide more variety than if each had drawn only from their dwindling storehouse of goods. In this way, they all remained food secure until the crisis ended.

By that time, these neighbors had established not only social cohesion but creative patterns of interaction that prompted a series of new, supportive collaborations over the coming years. They helped one another prepare for the next natural disaster with shared supplies such as flashlights and ham radios. They collected data on one anothers' physicians and next of kin, in case of health emergencies. They built positive outlooks by mingling their vastly varied talents in singalongs and house concerts, and they regularly found ways to support one another to solve problems related to illness, loneliness, job stress, or want. If each neighbor had, rather, chosen a pattern of independent food collection, they may not have survived the original crisis and would have missed opportunities for the connections that occur in a gift economy. Instead, they developed collective habits that changed the way they approached life and neighborhood relationships for decades to come. In the catastrophic fires of January 2025, these neighbors still connected to ensure the safety of others. The close-knit network paid benefits twenty years after the first episode.

This scenario models the processes that occur in transdisciplinary communication, education, and research. The possibilities for problem-solving and impact expand with the number and types of connections employed among a group of diverse participants over time. Examples from multiple fields of research offer analogs for the accumulation of information or commodities in systems that benefit each individual, in part, by compiling the contributions of the group.

2. ANALOGS FOR THE GIFT ECONOMY

The following models, in particular, illustrate the effectiveness of such a system.

Fungal Networks

Long slender threads make up the body of fungi. These mycorrhizal hyphae feed phosphorous, nitrogen, and other minerals to trees that would otherwise struggle to extract essential nutrients from the soil. [6] Plantation planting—creating rows of seedlings of the same species and size—strips the soil of nutrients, while allowing mixed, biodiverse forests of wider-ranging indigenous species generates forest health. Native varieties surrounding a mother tree draw benefits from the span of roots touching one another in underground labyrinths. Nutrients pass from one root to the next to an extent not possible in a plantation of new trees spaced a short distance apart in furrowed trenches (Simard & Bingham, 2012). Those seedlings on dry ground, farthest from the center, benefit the most from the exchange. [7]

Striking similarities occur between the symbiotic network of connections that tether a healthy copse of trees compared with the pattern of nodal pathways and neural connections that nourish and expand our thinking and that broaden the scope of neurological processes.

Neurological Mapping

Human problem solving does not follow a linear path in the brain but calls for both creativity and analytical thinking. Fortunately, the brain's capacity for neuroplasticity enables networks of neural connections to dance between the right and left hemispheres, strengthened by periods of processing. [8] Metacognition and meditation can further affect brain waves, gray matter, amygdala response, dopamine and serotonin levels, and the activity of the prefrontal cortex. Studies show that thoughts introduced in the milieu of this neural gift economy, through meditation and metacognition, can influence altruistic purpose. [9]

Prosocial goal seeking enhances coding and communication in the brain, according to neurological studies. [10] Coherent correlations deepen when emotional triggers suggest a meaningful purpose for an action. For example, findings on altruistic giving indicate that other-directed thoughts engage several regions of the brain, especially within the anterior prefrontal cortex. [11] The results suggest that both emotional rewards and concern for others jointly motivate altruism. [12]

Meanwhile, the correlations between these neural responses raise interesting questions about how analytical and creative thinking enhance the motivation to seek and apply information. For example, we can consider what newly connected synapses in the frontal lobe prompt the mind to relate giving with problem-solving. We might theorize that the greater the number of connections surrounding transdisciplinary research, the greater the payoff for the reward centers of the brain. {13]

Technological Matrices

The images of the expansively linked systems in the forest or in the brain also have a correlate in the world of technology. In 2024, John J. Hopfield and Geoffrey Hinton received the Nobel Prize in Physics "for foundational discoveries and inventions that enable machine learning with artificial neural networks." They applied the laws of physics to identify and recreate patterns. Hopfield used physics to identify a material's atomic spin. His network matched nodes to energy levels. Hinton used this foundation to create a network measured by the Boltzmann machine. This method recognized characteristic elements in a data set and created new samples of the pattern on which a network was trained. The current rise of machine learning drew on the work of these two laureates. [14]

Machine learning has been defined as a subset of AI that uses a data-driven approach in which an algorithm explores patterns and relationships without being specifically programmed to do so. [15] The greater the amount of historical data, the more likely the algorithm will make accurate predictions about new data rather than generating hallucinations (fictitious information). Picture an artificial network with many layers of inputs; clearly these inputs will each offer gifts to the "brain" (the computer), to inform the response to a question or problem. Effective evaluations within the system require amply diverse data (a minimum of 20 observations). A more linear system, with fewer contributing data sets, lacks the resilience of this model. [16]

The quality of the content also matters. When a large inventory of neural connections unites around a standard of heterogeneous, fact-checked sources, the system's evaluations will prove more accurate, hallucinations will less likely occur, and clear answers will prevail. Metaphorically, we might say that the gift economy of many individual sources of intelligence, triggered by a singular motive, will contribute to the precision of the machine learning process. In this way, even a machine demonstrates the richness of working across disciplines and actors within a system. [17]

This theorem that *layered patterns feed coherence* also offers implications for transdisciplinary education and research. In the same way that the nervous system's structure develops to accommodate learning, later crosscurrents among synapses can fine tune the structure of that nervous system. Old patterns find new uses, and the brain continues to mature based on the coherence of inputs introduced by linguistics, framing, and causal open-ended questions, especially early in the educational process. [18]

Psychological Motivation

Research suggests that a gift economy can stoke both extrinsic and intrinsic motivation, as it expands access to goods or services (extrinsic) while simultaneously inspiring the accumulation of new ideas, joint achievements, and satisfying relationships (intrinsic). (Souders 2019). This principle also applies when the goods and services consist of learning or research. [19]

Psychologists identify eight major motivation theories. (More, 2025). In several of these theories, social cohesion and human connection play a major role. [20] For instance:

Maslow's Hierarchy of Needs (1943): A sense of belonging falls right in the center of Maslow's Hierarchy). His initial research theorized that after basic physical needs are met, social connections precede access to the more immersive aspects of creativity and learning. [21]

Frederick Hertzberg's Two-Factor Theory (1959): Hertzberg noted that beyond "hygiene" factors, such as salary, safety, etc., people seek deeper motivation based on a range of inspiration-based factors, including responsibility and a chance to make a meaningful impact. [22]

McClelland's Theory of Needs (1961): McClelland places the need for affiliation and relationship-building as the second of three basic human motivators. [23]

Self-Determination Theory (1977): Edward Ryan and Richard Deci described one of three primary human motivators as "relatedness." [24]

Full-Circle Learning Theory (2000): This theory holds that altruistic connection to a larger family of humankind motivates achievement, altruistic behavior, and the desire to learn. [25]

A gift economy of shared learning, then, taps the positive aspects of human motivation while disseminating a catalog of new knowledge.

Transdisciplinary Education and Research/Philosophy

Transdisciplinary groupings offer dimensionality to joint research. Compassion amplifies curiosity as participants contemplate the value of their multilateral findings. Their meditative practices and metacognition around a cause increase gray matter, shape perspective, and strengthen neuroplasticity. [26]

For a greater range of processing outcomes, educators choose to integrate socio-emotional non-science-based courses into STEM learning. (27) They reason that content and function offer a starting point, but cinching creative processes to a problem-solving quest enhances motivation as the learner consciously considers the potential impact of that solved problem on society. Integrative thinking can thus produce positive outcomes for both the system and the learner interacting with that system. Rather than compartmentalizing knowledge in a linear idea bank, a complex pattern of discoveries based on altruistic aims represents a gift economy, in which multiple players layer relevant ideas, diverse strengths and unifying goals, achieving a wealth of knowledge unavailable if garnered from just one source or through a linear process.

The following case study illustrates the point. In one classroom, a student's parent passed away from leukemia. The learner responded by withdrawing from social interaction, no longer interested in participating in group activities. Rather than shuttle textbook exercises to the student throughout the learning unit, the team of educators aimed at triggering positive neurological processes through transdisciplinary service-learning experiences, to aid cognition and inspire healing through applied learning while also engendering benefits beyond the classroom. The unit they designed looked like a latticework of content areas and learning-style strategies with a unifying theme. The learning unit raised engagement by challenging students to seek answers to important questions. [28]

The teachers assigned each member of the cohort a writing assignment, charging them to each construct a persuasive letter to the National Institute of Health (NIH), submitting new research questions that had not yet been answered in regard to the causes and cures for cancer, especially leukemia. This process challenged the learners to build on the foundations of prior scientific research and to envision new hypotheses on which to base their questions. Statistical data informed the students' research. Collaborating with scientists, they made their priorities for research known. Hope lived in the presumption that this esteemed institution of experts would share and pursue their stated research goals. Students commented that they had made a meaningful contribution to that year's health research on leukemia. The process did not end there.

To embed creativity and compassion into the biological concepts, the educators presented slides of healthy cells, enlarged under a microscope. The students each created an abstract watercolor painting of one of the healthy cells and mounted it. They also learned to perform an original song about the value of asking collective questions whose answers reap solutions for society's dilemmas, such as identifying the criteria for improving the health of cells.

During one stage of the field work, the students met with health care providers in an oncology ward of a local hospital. They reframed their cancer hypotheses in a series of speeches, thanking the staff for their efforts to save lives through science and compassion. The students then hung their healthy-cell watercolors in the oncology ward's waiting room, to positively influence the subconscious thoughts of cancer patients. Finally, they sang the "Questions" song to honor the teary-eyed oncologists, who expressed gratitude for this acknowledgment and for this new altruistic partnership with a generation of young scholars.

This story describes just a few of the highlights of the learning unit. In this example, intentionality served as the hyphae connecting all aspects of learning. Without that thread fusing relevant concepts with a tangible purpose, through experiments, collaborations, and creative artifacts, the compartmentalized segments of the unit may not have coalesced to create a transformative effect.

The leukemia unit presented an altruistic context as the impetus for research and, thus, promoted psychological healing and new motivation for one student. By the culmination of the unit, the participants had designed constructivist knowledge products as well as ideas for solutions to human suffering. Based on surveys taken at the time, they experienced an expanded sense of purpose as they contributed to the wellness of a larger community. The socio-emotional benefits inclined the grieving learners toward future research pursuits and assuaged the depression, based on reports from the remaining parent.

A five-year study involving independent assessments and surveys indicated higher rates of cognitive function and increased motivation when the transdisciplinary projects strode a clear path toward altruistic impact. Assessors also noted a sense of hope and resilience lacking in peers enrolled in learning programs that favored silo-based learning practices. [29]

Not surprisingly, the one student whose loss inspired this multi-phased project emerged far more emotionally grounded, according to his remaining parent. He began to interact with others in new social contexts and problem-solving collaborations. The project brought satisfaction not only in terms of addressing unanswered scientific questions but in seeking answers that would benefit all humanity. Next, he and his classmates participated in a gift economy through problem-solving alliances with students in distant regions. They shared their unique perspectives while applying diverse applications for improving health, equity, and food security. These "wisdom exchange" projects united students from disparate cultures to see through a broader lens, comparing creative solutions to positive change [30].

Transdisciplinary educators such as these infuse STEM learning projects with processes emerging from divergent disciplines. They introduce objectives that apply not only scientific knowledge, but also diverse creative processes related to linguistic understanding, musical perception, historical reflection, and other veins of analysis, for a more profound impact that honors diversity of thought. This learning process often addresses an altruistic goal, perhaps related to health or hunger or climate change or social cohesion.

A complex and coherent network served as the substrate in the example of the leukemia learning unit. The teachers deliberately scaffolded 13 or more activities within each learning unit, to stimulate a variety of cognitive and socio-emotional processes in the brain. Participants' unique learning styles gave each one the sense that their particular strength added to the gift economy. Transdisciplinary research in adult learning models, similarly and theoretically, not only offers a range of data sets to inform conclusions but also draws on the unique contributions of each participant. [31]

Researchers have identified 15 types of thinking [32]. Together, these neuronal relationships manifest the link between thought and emotion. Cognitive approaches include critical thinking and reasoning, reflective thinking, deductive and inductive reasoning, creative thinking, systematic reasoning, deliberative, analogic, divergent, convergent thinking, and more (Sabater, 2022). Based on these patterns, when researchers from tangential fields respond to a research challenge within their milieu - especially a problem with implications for the common good - they not only integrate unique strands of content knowledge but also layer their perspectives and ways of thinking, feeling, theorizing or knowing. [33]

3. A PHILOSOPHICAL TREATISE

Quantum physicists describe the distinction between classic physics and quantum physics as a philosophical one (Schwartz, 2005), steeped in the explicit recognition that science is "what we can know," rather than defining a physical world beyond the minds of those who tap into a project or engineer an experiment. Human experience thus colors the essential ways in which we regard a theory and its applications. [34]

Einstein clarified this concept, stating, "The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking." [35] Thus, the number of options for disrupting old patterns of thought with new ideas depends upon the variety of approaches inherent in the minds of the research team. While all participants share a common quest for illuminating conclusions, the transdisciplinary process itself adds to the gift economy. Their perspectives become relevant through the fusion of each discipline's findings and through a multiplicity of inputs based on each researcher's neural uniqueness (e.g., one researcher's convergent, experience-based approach may lay a foundation for collaborator's divergent, original reaction to the data; together, they crack the code or break the mold.

Philosophical movements since the early 20th century reinforce this vital need for an integrative research approach spanning multiple disciplines. Alfred North Whitehead, the father of process theory, declared the urgency of "coming to see the world as a web of interrelated processes of which we are integral parts, so that all of our choices and actions have consequences for the world around us." [36]

4. CHART OF ANALOGS

The health and coherence of an ecosystem, whether technological, ecological, neurological, psychological, or philosophical, portends benefits from multiple variegated connections. In the chart of analogs, corollary patterns appear in Figures 1 - 4.

5. CONCLUSION

The notions of education and research, in the transdisciplinary context, impel participants to transcend boundaries and prioritize layered knowledge based on collaboration over competition. Just as a human brain or an artificial brain or a plant network teems with nodal connections, the collective brain trust also feeds on a cornucopia of thought patterns and specific understandings based on multiple experiences and areas of focus. Further research in new fields of study may uncover additional fractal patterns that convey the advantages of symbiotic systems with complex, mosaic sets of values. From the existing examples, one may conclude that education and information synchronized across disciplines, at its best, can foster ground-breaking collaborations and contributions, as well as producing psychological rewards and incentives when the new information advances the greater good. In summary, transdisciplinary research reaches its zenith when it performs in the context of a consummate gift economy.

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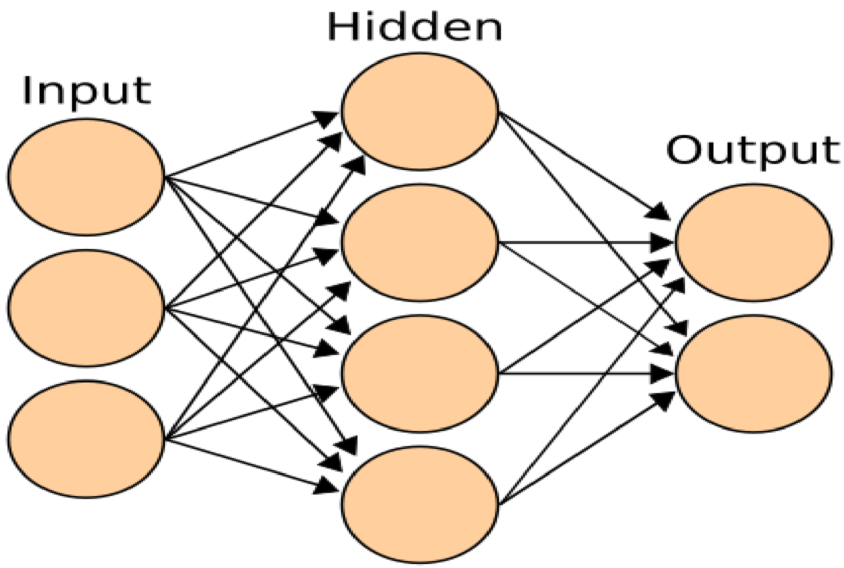
CHART OF ANALOGS

FIGURE 1: Artificial Neural Network

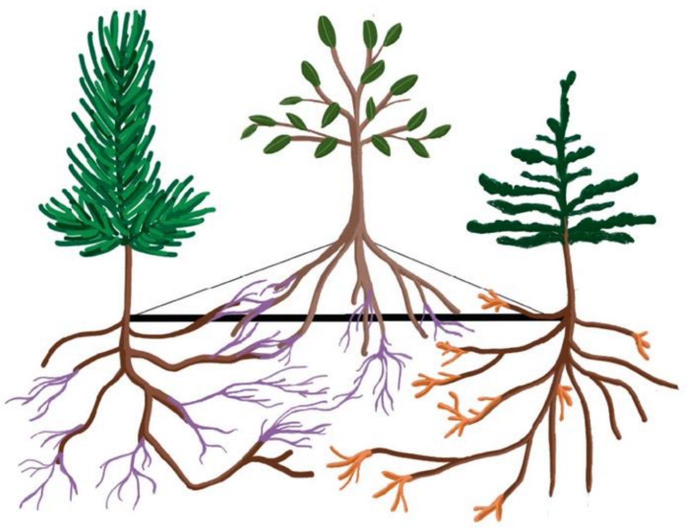


Connections in an artificial neural network mirror those in the brain, to support machine learning.

FIGURE 2: Human Neural Network

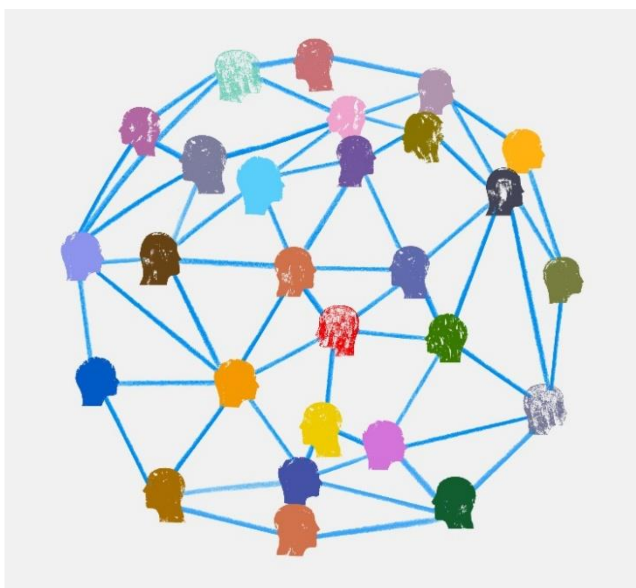
Complex nodal linkages connect the right and left brain, more so in humans than in other animals. Advanced learning and cognition are distinctions of this complexity.

FIGURE 3 Mycorrhizal Network



Through the underground network in a plant community, a tree may be nutritionally bonded to as many as 47 nearby specimens, creating exchanges especially vital to those trees striving to survive at the fringes of the forest (Simard, Bingham, 2012).

FIGURE 4 Transdisciplinary Research Network



The symbiotic pathways and possibilities embedded in the transdisciplinary research process illustrate Ashby's First Law of Cybernetics.

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6. REFERENCES

1) R.W. Kimmerer, **The Serviceberry**. Scribner. New York. 2024.
2) R. Ashby, An Introduction to Cybernetics, 1958.
3) E. Andrews. Eight reasons why Rome fell. **History Classics,** Updated September 5, 2023; Original: January 13, 2014, Retrieved January 3, 2025.
4) F. Martin, "Potluck Meal Innovation Due to Depression: Guests Chip in With Part of Dinner", Chicago Tribune. January 27, 1933. Retrieved January 9, 2025; Potluck. (2024, December 23). *Wikipedia*. https://en.wikipedia.org/wiki/Potluck
5) M. Harkin,"Potlatch in Anthropology", **International Encyclopedia of the Social and Behavioral Sciences.** Neil J. Smelser, N.J & Baltes, P. B. (Eds). vol 17, pp. 11885-11889. Oxford: Pergamon Press.
6) S. Simard, M.A. Bingham, K. Beilor, K., "Mychorrhizal networks and what they feed; British Mycological Society: Mechanisms, ecology and modelling. **Fungal Biology Review** 2012.
7) H. Feng, et al., "Advances in mechanisms of nutrient exchange between mycorrhizal fungi and host plants." **National Library of Medicine**. Oct. 2019, retrieved Jan 5, 2025. https://pubmed.ncbi.nim.hih.gov
8) B. Arrowsmith-Young, "5 Key Principles of Neuroplasticity, " **Arrowsmith Blog**, January 13, 2023. https://www.arrowsmith.ca/blog.
9) S.K. Iwamoto, et al., "Mindfulness Meditation Activates Altruism," **Scientific Reports**, April 16, 2020.
10) Ibid.
11) D. De Toit, **Wits University Medical Press** (medicalpress.com/news), Sept 9, 2021, retrieved Jan 5, 2025.
12) Ibid.
13) Ibid.
14) N. Elmehed, **Nobel Prize Outreach 2024.** https://www.nobelprize.org, retrieved Jan. 5, 2025.
15) Supraja, "Analytics Insight", June 20, 2024; **Machine Learning Data Science**, May 2024. Geeks for Geeks
16) Ibid.
17) Ibid.
18) N.M. Seel, "Skill Development," Encyclopedia of the Scineces of Learning. Springer, Boston MA. https://doi.org/10.1007/978-1-4419-1428-6_5728.; S. Ackerman, National Library of Medicine, Washington DC: National Academies Press (US); 1992.
19) B. Souders, "20 Most Popular Theories of Motivation in Psychology", **Positive Psychology**. November 5, 2019.
20) A. More. "Theories of Motivation: 8 Most Popular Theories You Must Know. **DSM**, downloaded January 18, 2025.
21) A.H. Maslow." A theory of human motivation", **Psychological Review***, 50* (4); 370–396. 1943. https://doi.org/10.1037/h0054346.
22) F. Herzberg, B. Mausner, B Snyderman (1959). **The Motivation to Work** (2nd ed.). John Wiley.Publishing.
23) D.C. McClelland, D.C. (1961). **The achieving society.** Van Nostrand, 1961; APA Psychnet. https://psucnet.apa.org; K. Serhat, "McClelland's Three Needs Theory: Power, Achievement, and Affiliation", **Education Library**. Oct. 17, 2022.
24) D. O'Hara, "The intrinsic motivation of Richard Ryan and Edward Deci**", American Psychological Association**, 2017. (apa.org)
25) T. H. Langness, **Why We Learn** (Reading Supplement), Full-Circle Learning. 2020. p. 52-65.; J. Platt, "Humanitarian Education Systems and Resilient Identities: A Full-Circle Learning Independent Assessment at Year 30", Full-Circle Learning Annual Report, 2023.
26) P.C. Dagnino, J.A. Galadí, E. Càmara, G. Deco, A. Escrichs, "Inducing a meditative state by artificial perturbations: A mechanistic understanding of brain dynamics underlying meditation," **Network Neurosc**i. 2024 Jul 1;8(2):517-540. doi: 10.1162/netn_a_00366. PMID: 38952817; PMCID: PMC11168722.
27) J. A., Ramaley, "Communicating and Collaborating Across Disciplines," **ASC Higher Educatio**n, November 27, 2017. . Retrieved from https://ascnhighered.org/ASCN/posts/192300.html)
28) T. H. Langness, **Habits of Humanitarians**, p. 245-284; 293. 2005. www.fullcirclelearning/educators/curricula/Habits of Humanitarians.
29) T. H. Langness, **Why We Learn** (Reading Supplement), Full-Circle Learning. 2020. p. 52-65.
30) Platt, J. Humanitarian Education Systems and Resilient Identities: A Full-Circle Learning Independent Assessment at Year 30. **Full-Circle Learning Annual Report**, 2023. www.fullcirclelearning.org. Retrieved January 9, 2025.
31) T. H. Langness, Fostering Future Leaders, **Full-Circle Learning**, 2006, p. 15-34. www.fullcirclelearning.org – educator – curricula.
32) V. Sabater, "15 Types of Thinking and their Characteristics, Neuroscience and basic psychological processes", **Exploringyourmind.com,** Sept 26, 2022, retrieved January 5, 2025.
33) Ibid.
34) J.M. Swartz, J.M., et al. "Quantum physics in neuroscience and psychology; a neurophysical model of mind-brain interaction. Philosophical Transactions B." **The Royal Society Publishing**. June 29, 2005. 1309-1327.
35) A. Einstein, **The Ultimate Quotable Einstein**. Princeton University Press. 2010. P. 483.
36) A. N. Whitehead, **Handbook of Whiteheadian Process Thought**, Frankfurt / Lancaster, Ontos Verlag Publisher: Process Thought X1 & X2, 2008. (695 p. + 726).
37) D. Premack, "Human and animal cognition: Continuity and discontinuity", **National Library of Medicine**, August 2007. 23; 104 (35); 13861-13867.doi: 10.1073/pnas.0706147104