Quantum Degrees of Formality in Learning Facilitation: Interrogating the Space Between Formal and Informal Learning

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Abstract: When we re-conceptualize the role of the teacher as a facilitator of learning, while also accepting that a hybridization of formal and informal learning elements leads to a vibrant educational experience, then a new form of learning begins to emerge. Schrödinger's "Cat Paradox" serves as the basis of our understanding of quantum mechanics, in which an atom may contain a positive or negative charge until it has been directly observed. Within an educational environment, the accepted elements of informal learning; collaboration, approximation, discovery, and construction of learning; all tend to occur without being spoken of. We may then consider the term quantum learning, where these covert learning processes are undertaken then made overt so they may be fully exploited.

Résumé : Lorsque l'on repense le rôle de l'enseignant comme celui d'un facilitateur d'apprentissage, tout en reconnaissant qu'une hybridation des éléments d'apprentissage formels et informels favorise une expérience éducative enrichissante, une nouvelle forme d'apprentissage émerge. Le « paradoxe du chat » de Schrödinger est à la base de notre compréhension de la mécanique quantique : un atome peut porter une charge positive ou négative jusqu'à ce qu'elle soit observée directement. Dans un contexte éducatif, les éléments reconnus de l'apprentissage informel – collaboration, approximation, découverte et construction des connaissances – se produisent généralement de manière implicite. On peut alors envisager le terme d'apprentissage quantique, où ces processus

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d'apprentissage latents sont mis en œuvre puis explicités afin d'être pleinement exploités.

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Informal learning is often conceptualized as learning that occurs in the absence of an educator, whereas formal learning is typically characterized by structured instruction under the guidance of an educator (Allsup, 2016). However, this dichotomy oversimplifies the nature of learning processes. It is possible for a learner to engage in structured, sequential instruction through self-directed study—such as progressing through a method book—without direct teacher involvement, which would still align with traditional definitions of formal learning. Conversely, informal learning can occur within formal educational settings, even in the presence of an instructor, if the learning process is self-directed and exploratory in nature.

Reconceptualizing the role of the teacher as a facilitator rather than a direct instructor allows for a broader understanding of informal learning. In this capacity, the teacher functions as a resource rather than a primary source of knowledge transmission, enabling students to scaffold and supplement their own learning. This aligns with constructivist perspectives, which emphasize the importance of learners actively constructing knowledge based on prior experiences and personal discovery (Piaget, 1950; Vygotsky, 1978). However, while constructivism acknowledges the role of external experiences in shaping understanding, informal learning involves a more self-directed process in which students derive meaning autonomously, integrating both their prior knowledge and newly encountered material. A complete absence of formal instruction, however, may be detrimental to skill acquisition, particularly in domains that require structured guidance and expert feedback (Esola, 2022). Certain competencies necessitate direct teacher-student engagement to ensure mastery of foundational skills before learners can effectively navigate independent exploration (Bruner, 1966). Thus, we argue that an optimal learning environment strikes a balance between formal and informal approaches, allowing students to engage with structured learning when necessary while maintaining the flexibility to guide their own

educational trajectories. In such a model, learners dynamically transition between formal and informal modes of learning, utilizing formal instruction to acquire essential competencies while leveraging informal learning to deepen understanding and personalize their educational experience.

Even yet, this term "informal" contains a significant level of preconception that may lead one to devalue an informal education. Merriam-Webster (n.d.) defines informal as "marked by the absence of formality or ceremony", which then implies a hierarchy of value for the formal and informal. In particular, this label which has been assigned to the learning styles of folk and popular musicians will inevitably serve in the devaluation of these music styles and their cultural backgrounds within our Western music and American cultural paradigm. While it is certainly important to acknowledge that elements of informal learning such as collaboration, approximation, discovery, and construction of knowledge are native to folk and popular music, would the acknowledgement and prescription of these traits in the classroom create a formalization of such learning and therefore create the need for new terms of description?

When we take this reconceptualization of the role of the teacher as a facilitator of learning, while also accepting that a hybridization of formal and informal learning elements leads to a vibrant educational experience, then a new form of learning begins to emerge. In 1935, Edwin Schrödinger presented his "Cat Paradox" in which an atomic decay that may *or* may not occur within an hour would release a toxin into a box and leave the cat trapped in this box in both a living and perished state until it has been directly observed (Trimmer, 1980, p. 328). Due to the quantum nature of the atom, until it is observed, both realities must be accepted as truth. This paradox serves as the basis of our understanding of quantum mechanics, in which an atom may contain a positive *or* negative charge until it has been directly observed, and until that point it remains in quantum entanglement where all possibilities are simultaneously true. Let's lean on our experience as educators and imagine a typical classroom environment. Within this environment, the accepted elements of informal learning (Green, 2008); collaboration, approximation, discovery, and construction of learning; all tend to be experienced as a part of the learning process rather than defined as a product or outcome (Kolb, 1984), often referred to as *covert learning*. Once such learning is acknowledged by the facilitator, or made *overt*, a formalization of these learning

processes occurs. Such a scenario where space is made for these covert learning processes to be undertaken before being acknowledged so they may be fully exploited, I recommend hereby be referred to as *quantum learning.* The proposed curricular tools may be considered in pursuit of a more democratic classroom as proposed by Dewey (1916) and with the goal of creating opportunities for learning *with* rather than *for* our students as proposed by Freire (1970).

In search of an effective set of strategies to bring experienced learning into a structured classroom environment, we will distill the elements of Green's (2008) Informal Learning prescription that serve the facilitation of learning and apply these elements to Kolb's (1984) analysis of the experiential learning models brought forth by Dewey, Lewin, and Piaget. Then, the new experiential learning model we present may be applied to the pursuit of a more student-centered, culturally-responsive, or democratic classroom environment.

Though this is founded upon the work of scholars in music education, the anticipated findings will create a framework for educators of all disciplines to make their classrooms and curricula more dynamic and responsive to each individual student. When we as educators have a strong understanding of how approximation, discovery, collaboration, and construction occur in a covert manner and are then able to make these elements overt, we will validate a broader spectrum of ways of knowing and learning that our students experience. This work intends to exploit what can be learned from music and arts education research to develop in our general understanding of teaching and learning.

Defined Elements of Informal Learning

Considering this work within the context of American popular music is difficult as the scope of Green's original study is limited to London and Hertfordshire, England (Green, 2008), and continued works on informal learning in music fail to consider the musicianship of artists in some traditionally Black American genres, stating "I avoided interviewing rap artists, DJs or musicians involved in purely or largely synthesised/sampled fields of production, for reasons of focus as already explained. Musicians in such fields do not go about acquiring their musical skills and knowledge in the same ways as each other, or in the same ways as, say, rock musicians" (Green, 2017, p. 10).

Despite these limitations of Green's study, we believe that we can distill the learning processes described in the stages of *informal learning* to the following ideas:

- ***Discovery***: Green's (2008, p.25) prescribed learning model rests on the idea of *"'dropping pupils into the deep end"*, in which said pupils listen to and attempt to copy their favorite music, a stage which is repeated and reinforced by the application of skills or knowledge that has been *discovered.* We would like to emphasize, as Allsup (2003, p. 35) described "that 'the action of discovery' is a material process of democracy."

- ***Approximation***: In the follow-up to the action of "*dropping pupils into the deep end"* we find stages 2 "*modelling aural learning with popular music*" and 4 "*informal composing*" in which students attempt to create a product very similar to that which they just heard at the level of skill to which they are personally capable. Burstein & Powell (2019, p. 39) describes this as the action of *approximation*, "an approach through which teachers modify performance expectations to accommodate developing students' needs."

- ***Construction/constructivism***: Throughout each of the steps Green describes, knowledge is constructed upon that which is gained in the previous step and that which is already known through prior knowledge of the pupil, following the description by Dewey (1916, p. 76) that "education is a constant reorganizing or reconstructing of experience."

- ***Collaboration***: Essential to stages 4 "*informal composing"* and 5 "*modelling composing"* is the act of making music with a peer, or doing the act of learning in a social context. Such a use of *collaboration* to turn the unknown into the known, or the chaotic into the recognizable has also been observed by Allsup (2003), Clements (2008), and Wayman Davis (2018).

It is the position of our work that the role of a teacher is not one which should prescribe a particular method for learning, but instead act as a facilitator of these learning processes.

Experiential Learning Framed as Overt and Covert Processes

David Kolb's 1984 book distilling the works of Lewin, Dewey, and Piaget into one concept of *experiential learning* defines learning as "*the process whereby knowledge is created through the transformation of experience"* (Kolb, 1984, p. 38). Within this definition are noted aspects of the learning process including an emphasis on the process of the learning rather than outcomes, knowledge as a transformation process which is continuously created and recreated, and learning as a transformational experience in both its objective and subjective forms (Kolb, 1984). As we conceptualize the process in which these transformations turn into concrete learning, we may refer to the repeated occurrence of these transformations as *convergences.*

Let's consider these convergences of covertly experienced learning into overtly demonstrated knowledge through Kolb's (1984) *Characteristics of Experiential Learning:*

- **Learning Is Best Conceived as a Process, Not in Terms of Outcomes** (Kolb, 1984, p. 26): Prioritizing the process of learning over the outcomes means we are placing a priority on the ways in which knowledge is generated, and considering those ways to be constantly formed and reformed through experience (Kolb, 1984, p. 26). Therefore, it is an invisible, or *covert*, set of skills which we are prioritizing, one which we cannot directly manipulate but instead hope to nourish through repetition of critical thinking processes.

- **Learning Is a Continuous Process Grounded in Experience** (Kolb, 1984, p. 27): It is irresponsible as an educator to assume that there are any moments in which our pupils are not learning. So long as consciousness and experience are continuous, so is the process by which our pupils learn. As this constant flux of new ideas and old ideas made new again flows within our pupils (what we will eventually discuss further as *entanglements*), we must be sensitive to how our curricular actions influence these experiences.

- **The Process of Learning Requires the Resolution of Conflicts Between Dialectically Opposed Modes of Adaptation to the World** (Kolb, 1984, p. 29): Lewin identifies the conflicts of

concrete experience and abstract concepts as well as observation and action, Dewey identifies the conflict of impulse and reason, Piaget identifies the accommodation of ideas and assimilation of experience into conceptual structures, all of which Freire wraps up in his concept *praxis*, or "action-reflection on the world, on reality" (Freire, 1974, p. 24). The praxis of our work will hinge on the dialectic opposition of the covert (informal) and the overt (formal) in an educator's curricular undertakings.

- **Learning Is an Holistic Process of Adaptation to the World** (Kolb, 1984, p. 31): Learning is not a special province of human functioning, but rather an undertaking of the integrated function of the entire organism. Therefore, all experiences which an individual is subjected to must be considered as moments of learning, and it rests as the responsibility of the teacher to bring these entangled moments of experience into a concrete and repeatable piece of curriculum.

- **Learning Involves Transactions Between the Person and the Environment** (Kolb, 1984, p. 34): Learning is not a personal, internal process, but instead a series of actions and reactions between environmental stimuli and the individual. Therefore, we as developers of curriculum must consider what environmental stimuli we provide, intentionally and unintentionally, and how our pupils may interact with such stimuli when undergoing a learning experience. This process of transactions between environment and individual may be further encompassed in our proposed concept of *convergences.*

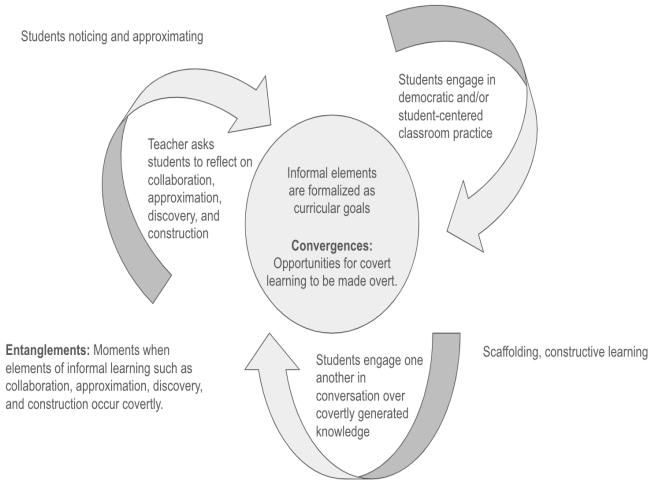
- **Learning Is the Process of Creating Knowledge** (Kolb, 1984, p. 36): Knowledge is the result we seek from the transaction between the social and the personal, or the transaction between objective and subjective experiences. Therefore, in developing an experiential model for learning we must consider that which is for certain and that which may or may not have occurred. It is at this nexus that we find our basis for the term of *quantum learning*. As we make these repeated transactions between that which is certain and that which we will not know for certain until it is expressed, we find a direct parallel with Edwin Schrödinger's "cat

paradox" (Trimmer, 1980, p. 328) which has served as the foundation of our understanding for quantum physics and quantum mechanics, in which we know for certain that a particle contains a charge, but the charge of a particle is not certain until a measurement is made.

Conceptual Framework

Figure 1.

Illustration of Quantum Learning Experiential Model



Note. The term *quantum learning* may be supported by *entanglements* which lead to opportunities for *convergences*, made plural to signify a multitude of occurrences in any given curricular period that may happen independently but simultaneously.

The proposed model for *quantum learning* involves the repeated undertaking of the following knowledge-gathering sequence:

1. **Outside learning occurs through a series of entangled experiences**

   The constant flux of new ideas and old ideas made new again through actions such as collaboration, approximation, discovery, and construction create knowledge.

2. **Students are engaged in curricular experiences that resolve conflicts, make adaptations, and make transactions between the learner and the environment**

   Knowledge created interacts with elements of the students' environment that are both intentionally and unintentionally created, including critical thought, reflection, and democratic action.

3. **Convergences occur in which informal (covert) elements are formalized (overt) as curricular goals**

   The educator or facilitator makes a curricular action that brings knowledge gathered through experience into the classroom environment.

Considering Kolb's (1984, p. 26) idea that learning is constantly formed and reformed through experience, this model need not necessarily be prescribed as a step-by-step process, instead each pillar in the sequence can be assumed to be happening constantly so a facilitator may better engage students' prior knowledge, constructed knowledge, and critical thought. In this way, educators are encouraged to prioritize student needs and readiness, using their observations and assessments to determine which pillar requires emphasis at any given moment, ensuring that learning remains responsive, meaningful, and developmentally appropriate.

Recommendations for Use

Prior research affirms that a constant flux of formally, informally, overtly, and covertly generated knowledge is swirling about a classroom at any given time. Yet, learning that has been labeled as "informal" is subject to an implied hierarchy that leads to its devaluation in curriculum, particularly as it has been assigned to disciplines and ways of learning commonly associated with marginalized communities in the United States (Green, 2017). Common sense also leads us to recognize that covertly generated knowledge tends to be difficult to bring forth and acknowledge in a curriculum. It is anticipated that further study will provide specific and situation-oriented examples that may be used to develop a set of recommendations for practice across all curricular disciplines. As we come to recognize and respond to entanglements in our students'

learning, we will be able to acknowledge a wider breadth of learning experiences and create convergences.

Ideas for ways of creating convergences

Though we hope to uncover in our studies further strategies for applying experiential knowledge to learning, or creating *convergences*, here are some preliminary strategies that may suit your own classroom environment:

- *Calling on students' prior knowledge*: Allowing students to engage their prior knowledge in a learning scenario will affirm to them that observed or discovered knowledge is useful in the determination of further learning. This may look like a prompt at the beginning of class, a review of material previously used, or intermittent provocation for prior knowledge throughout the unfolding of a lesson.

- *Scaffolding as partner and group work*: Students taking the opportunity to engage with or rely upon the experienced knowledge of a peer or facilitator will allow them to engage in content that they may not otherwise have the resources for, while also allowing the student who is engaged with to affirm and reinforce the learning in which they have already engaged. This may include intentionally planned partner and group work, or may take place as the teacher encourages conversation during and between learning activities.

- *Student-led learning discussions*: When we allow students to unfold a discussion or learning experience on their own accord, we as facilitators find the opportunity to uncover and exploit learning that the students reveal to us. This may include lessons that students create in collaboration with the teacher, or lessons where the teacher defines a structure but allows content to take shape through student choice.

- *Reflection and repetition*: Providing the opportunity for students to first reflect upon the process by which they found an answer or solution, then repeating the same problem or process with the insight which has been provided by their own reflection and the contributions of others. This repetition will allow for students to apply that which was previously covert to be applied with intention. Repetitions may occur within a lesson, daily, weekly, or monthly at the

teacher's discretion.

The exploration of quantum learning as a dynamic interchange between formal and informal educational processes reinforces the necessity of rethinking traditional pedagogical models. As educators, we are compelled to ask: *In what ways do we set guidelines and boundaries for student learning, and to what extent do we allow students to set their own?* (Burstein, 2016, p. 180). These questions are not merely theoretical; they challenge us to confront our roles in shaping learning environments that are both structured and responsive, deliberate yet flexible. By recognizing that knowledge is continuously constructed through entangled experiences, we can create spaces where students' prior knowledge and lived experiences are not only acknowledged but celebrated as integral to their educational journeys. Further, quantum learning, as conceptualized in this work, invites a re-examination of how experiential knowledge is fostered, validated, and integrated within curricular frameworks. The model's emphasis on covert learning processes becoming overt through intentional pedagogical interventions aligns with Kolb's (1984) assertion that learning is a continuous process grounded in experience. This iterative cycle of discovery, approximation, construction, and collaboration not only enriches the learning process but also democratizes it, echoing Dewey's (1916) call for education that is participatory and inclusive.

The implications of this work extend beyond music education, offering a versatile framework for educators across disciplines to foster environments where informal learning is not subordinate to formal instruction, but rather an essential component of a holistic educational experience. *How do our students' outside engagements with a subject aid in the approximation of delineated meanings within the classroom?* (Burstein, 2016, p. 182). This question compels us to consider the breadth of influences that shape learning and the ways in which our pedagogical choices either facilitate or hinder the integration of these diverse experiences.

As we move forward, the challenge lies in operationalizing the quantum learning model within diverse educational contexts. What strategies will best support the convergence of informal and formal learning processes? How can educators effectively scaffold these processes while honoring the individuality of each learner's journey? The preliminary strategies outlined herein—engaging prior knowledge, fostering collaborative learning, encouraging student-led discussions, and emphasizing reflective practice—offer

a foundation for further inquiry and application. Ultimately, the concept of quantum learning serves as a call to action for educators to embrace complexity, cultivate adaptability, and foster environments where all forms of knowledge are valued. In doing so, we not only enhance student learning outcomes but also contribute to a more equitable and inclusive educational landscape.

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