LEARNING BODIES, STORYTELLING PROCESSES: TINKERING AND AUTHENTIC ASSESSMENT IN GENERATIVE EDUCATIONAL ENVIRONMENTS

CORPI CHE APPRENDONO, PROCESSI CHE NARRANO: TINKERING E VALUTAZIONE AUTENTICA NEGLI AMBIENTI EDUCATIVI GENERATIVI

Vincenza Barra
Università degli Studi di Salerno
vbarra@unisa.it

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ABSTRACT

In light of the transformations currently taking place in educational contexts, authentic assessment represents a crucial challenge in overcoming the transmissive and performance-based models that are still widespread. This paper offers a theoretical and practical reflection on the integration of Tinkering, documentation and educational corporeality, understood as embodied and situated forms of learning. Through the intertwining of constructivism, constructionism and Embodied Cognition, Tinkering is analysed as an active and inclusive methodology, but also as an assessment tool capable of enhancing the process, error, reflexivity and agency of the student. Documenting the bodily trajectories of learning, in gestures, artefacts and materials used, makes it possible to visualise the thought process as it unfolds and to promote transformative assessment. From this perspective, tinkering environments are generative and sustainable educational contexts, in which time, space and language hybridise to promote inclusion, personalisation and the shared construction of knowledge. The teacher, as director, observer and mediator, plays a central role in designing assessment practices capable of connecting experience, meaning and transformation.

Alla luce delle trasformazioni che attraversano i contesti educativi attuali, la valutazione autentica rappresenta una sfida cruciale per superare modelli trasmissivi e prestazionali ancora diffusi. Il presente contributo propone una riflessione teorico-pratica sull'integrazione tra Tinkering, documentazione e corporeità didattiche, intese come forme incarnate e situate di apprendimento. Attraverso l'intreccio tra costruttivismo, costruzionismo ed Embodied Cognition, il Tinkering viene analizzato come metodologia attiva e inclusiva, ma anche come dispositivo valutativo capace di valorizzare il processo, l'errore, la riflessività e l'agency dello studente. Documentare le traiettorie corporee dell'apprendimento, nei gesti, negli artefatti, nei materiali utilizzati, permette di rendere visibile il pensiero in divenire e di promuovere una valutazione trasformativa. In tale prospettiva, gli ambienti tinkerabili si configurano come contesti educativi generativi e sostenibili, in cui tempo, spazio e linguaggio si ibridano per favorire l'inclusione, la personalizzazione e la costruzione condivisa del sapere. Il docente, in qualità di regista, osservatore e mediatore, assume un ruolo centrale nella progettazione di pratiche valutative capaci di connettere esperienza, senso e trasformazione.

KEYWORDS
Tinkering**;** Authentic assessment**;** Embodied learning; Generative environments; Inclusion.
Tinkering; Valutazione autentica; Apprendimento incarnato; Ambienti generativi; Inclusione.

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Introduction

Educating in times of complexity, a period marked by increasingly rapid cultural, social, and technological changes, urgently requires a rethinking of the aims and practices of educational assessment. It is no longer just a matter of assessing knowledge or classifying performance, but of valuing learning processes, transversal skills, and students' evolutionary trajectories. Assessment, from a technical-administrative tool, is called upon to become a generative pedagogical device, capable of recognizing subjectivity, supporting motivation, and promoting self-regulation. In this perspective, the focus shifts from the final product to the process, from standardized measurement to the situated narration of the educational experience (Shepard, 2000).

In response to this need, Tinkering is a methodological approach that combines creativity, planning, and reflection, promoting embodied, situated, and relational learning. Rooted in Piagetian constructivism (Piaget, 1972), Papertian constructionism (Papert, 1993), and more recent studies on Embodied Cognition (Varela, Thompson & Rosch, 1991; Gomez Paloma, 2013), tinkering values the interaction between mind, body, and environment as the cornerstone of knowledge construction. The laboratory and experimental dimension of tinkering allows students to act, explore, make mistakes, and redesign, generating authentic experiences that lend themselves to being observed, documented, and evaluated in their complexity.

The centrality of the body in cognitive, emotional, and relational processes is one of the cornerstones of the tinkerable approach. Learning means acting with and through the body: touching, building, dismantling, orienting oneself in space, negotiating with others. In this context, didactic corporeality is not a methodological accessory, but an epistemological element that allows thought to be embodied and implicit cognitive strategies to be made visible (Shilling, 2017). Documenting students' bodily actions, in their gestures, postures, and chosen materials, allows for a deeper understanding of the processes of meaning, valuing the uniqueness and plurality of learning trajectories.

In the Embodied Cognition paradigm, the body is not only a vehicle for learning, but also an epistemic space in which knowledge is generated, structured, and manifested. As Merleau-Ponty (1945) points out, the body is not an object among objects, but the condition through which the world becomes knowable: inhabiting the body means inhabiting meaning. The educational experience, if lived in an embodied way, allows students to think with their hands, feel with their minds, and build with their bodies.

For Sheets-Johnstone (1999) as well, thought takes shape through movement: the dynamics of gesture, tactile repetition, and exploratory posture are cognitive acts in their own right, capable of producing intentionality, discovery, and symbolization. In this perspective, the body becomes an epistemic and narrative place, which restores visibility to implicit thought and allows the process to be documented not only in its outcomes but also in its living matter: what happens, is tried, corrected, and shared. Recognizing the body as a space of knowledge means repositioning the entire educational experience in a sensitive, situated, and relational dimension, opening up the possibility of an evaluation that listens to and interprets the movement of thought as it happens.

From an authentic assessment perspective, documentation is a privileged tool for giving meaning to the educational experience. Far from being limited to the collection of "products," documenting means giving narrative form to the process, following the evolution of thought, and welcoming error as a generative resource. Assessment thus becomes a dialogical act, based on shared reflection and the co-construction of meaning, in which students and teachers collaborate to make the invisible visible (Rinaldi, 2006). The physicality, materials, times, and spaces of learning are transformed into assessment traces, restoring centrality to experience and promoting a pedagogy of meaning.

This article aims to explore how tinkering can become a sustainable assessment tool, capable of integrating physicality, processuality, and generative environments within an inclusive and transformative approach. Through a theoretical-methodological framework and an analysis of documentation practices, we intend to show how assessment can be rethought as educational care and a lever for pedagogical citizenship. The key elements of authentic assessment in tinkering contexts will be investigated: the role of the teacher, observation tools, the centrality of space and time, the personalization of pathways, and the enhancement of student agency (Bandura, 2001). The contribution thus aims to outline a framework for the design of assessment practices capable of supporting situated, plural, and meaningful learning.

1. From summative assessment to transformative assessment: authentic experience as situated, narrative, and reflective practice

Traditionally, educational assessment has taken on a summative and certifying function, focusing on the assessment of knowledge after learning has taken place. This approach has generated forms of selection, classification, and standardization

that often undermine the complexity of individual paths, reducing learning to a performance (Shepard, 2000). In opposition to this logic, authentic assessment is proposed as a transformative practice, capable of restoring value to the process and accompanying the evolution of the learner.

It is not configured as a final moment, but as an integrated and continuous dimension of the educational path, capable of supporting self-regulation, intrinsic motivation, and awareness (Black & Wiliam, 1998). In this sense, assessment is no longer equivalent to judging, but to understanding, accompanying, and generating meaning in a dialogue between teacher and student. Authentic assessment becomes a relational and situated device, closely intertwined with the construction of shared meanings.

The concept of authentic assessment was formalized by Grant Wiggins (1990), who highlighted its epistemological and educational value. According to the author, an assessment can be considered authentic when it requires students to perform meaningful tasks, contextualized in reality, that require the application of complex knowledge, the resolution of open-ended problems, decision-making, and the production of artifacts. From this perspective, what matters is not only what one knows, but how one knows how to use what one knows.

Wiggins insists on consistency between learning objectives, assigned tasks, and assessment criteria, with a view to transparency and student accountability. The idea of “performance-based assessment” is thus integrated with laboratory and collaborative practices, in which knowledge is manifested in action, reflection, and documentation of processes.

In more recent perspectives, authentic assessment has been further enriched by situated and narrative approaches, which recognise the value of context, physicality and language in the construction of learning (Bruner, 1996; Vygotsky, 1978). From this perspective, assessment means collecting, reading, and interpreting traces of the student's actions: artifacts, conversations, gestures, postures, strategies, and narratives. Documentation becomes an assessment tool, capable of making thinking visible and promoting metacognitive reflection (Rinaldi, 2006).

This establishes a dialogical conception of assessment, in which the teacher is not only the observer but also the one who constructs a shared interpretation of the experience together with the student. This paradigm is based on listening, reciprocity, and pedagogical intentionality: assessment is an ethical act that implies educational responsibility.

One of the fundamental elements of authentic assessment is the recognition of error as a resource. In a system that promotes learning through trial and error, as

in Tinkering, error is not failure, but a generative step, an opportunity to rethink strategies and build awareness (Resnick & Rosenbaum, 2013). In this context, the timing of assessment is no longer chronological and linear, but kairological and processual, adhering to the rhythms of thought and subjective trajectories (D'Aprile, 2018).
Metacognition takes on a central role: documenting the journey, re-reading the experience, and explaining the choices made means activating reflective skills that enhance autonomy and self-regulation (Flavell, 1979; Aiello et al., 2017). From this perspective, authentic assessment is a sustainable and generative practice, capable of restoring dignity and depth to the educational process.

2. Tinkering as an evaluative device between artifacts, processes and reflection

In the tinkering context, assessment is rooted in doing, becoming a continuous act of observation, documentation, and reflection. Unlike traditional assessment, which takes place after the fact, assessment in tinkering occurs during the action: while building, experimenting, making mistakes, and reworking. The artifact produced—whether it is a model, a circuit, or a structure—is not the end goal, but the medium through which thought takes shape and becomes visible (Papert, 1980; Resnick, 2017).
Assessment in tinkering is therefore oriented on three levels: the product (the object created), the process (the strategies, choices, mistakes), and metacognitive reflection (the awareness acquired). This threefold focus makes it possible to go beyond the logic of performance and value learning in all its phases, including the most hidden or 'imperfect' ones, which often escape standard assessment grids.
A distinctive aspect of Tinkering, in terms of assessment, is the centrality of the body as an instrument of thought and action. Hand movements, posture during work, choice of materials, and spatial arrangement are bodily signs of deep cognitive processes (Varela et al., 1991; Shilling, 2017). From this perspective, educational physicality becomes the object of educational observation: documenting gestures and interactions allows us to restore complexity to the act of learning.
Assessment thus opens up to the interpretation of elements that are often overlooked: persistence in error, tension in concentration, the rhythm of action, the relationship with objects and with others. These dimensions, if adequately documented, allow us to construct a comprehensive narrative of the learning

process, capable of recognizing the uniqueness of the subject and the plurality of expressive languages (Gardner, 1993; Gomez Paloma, 2013).

In Tinkering, documenting is evaluating. Documentation is not limited to recording events, but represents an intentional process of observation, selection, and narration that transforms experience into shared knowledge (Rinaldi, 2006). Through photographs, videos, logbooks, oral or digital narratives, it is possible to build dynamic archives of the learning process, involving students, teachers, and—potentially—families as well.

Documentation activates processes of metacognition and self-regulation, as it allows students to see themselves in action, review their progress, and grasp the transformations. At the same time, it provides teachers with a basis for evidence-based formative assessment, which goes beyond subjective intuition to construct well-founded and dialogical judgments (Black & Wiliam, 2009).

To translate these principles into concrete practices, assessment tools consistent with the tinkerable approach can be used. Among these, digital or paper portfolios allow for the collection of significant traces of experience (artifacts, reflections, photographs, recordings), offering a process-oriented and personalized view of learning (Barrett, 2007).

Assessment rubrics, if co-constructed with students, promote transparency of objectives, understanding of criteria, and the possibility of self-assessment. Furthermore, the use of co-assessment and peer review promotes shared responsibility and cooperative learning, transforming assessment into a dialogic and democratic practice (Andrade & Brookhart, 2019). In tinkerable environments, these tools can be easily integrated into laboratories, helping to create a generative assessment climate in which the student is the protagonist and not the object of judgment.

3. Tinkerable environments and educational sustainability: the context as a third educator

The educational environment, too often reduced to a mere backdrop for teaching, takes on an autonomous and generative pedagogical function in Tinkering. Inspired by the experience of the schools in Reggio Emilia and the vision of Loris Malaguzzi (1996), the environment is considered the “third educator,” alongside adults and peers. In tinkerable contexts, space is flexible, transformable, and stimulating: mobile desks, accessible materials, collective and individual work areas, analog and digital tools coexist to promote autonomy, curiosity, and personal expression.

Time also takes on a different quality: no longer rigid and segmented, but relaxed, iterative, and project-based, capable of embracing uncertainty and adapting to the rhythms of learning. Tinkering requires qualitative time (D'Aprile, 2018), in which experience can settle, be rethought, documented, and shared. From this perspective, space and time are no longer constraints, but pedagogical devices that participate in the construction of knowledge.

Educational action in tinkerable contexts is based on situated learning (Lave & Wenger, 1991), in which knowledge is not transmitted but constructed through interaction with materials, tools, and other subjects. In these environments, agency is not only that of the individual, but distributed among bodies, artifacts, and context (Barab & Roth, 2006): each element participates in the generation of meaning.

Students are called upon to make decisions, manage their own path, and deal with open-ended problems. This fosters the development of an active and reflective subjectivity, capable of acting in the world with awareness. The tinkerable environment is thus configured as an ecological space for learning, in which responsibility is not imposed from above but emerges from the relational and project-based dynamics that are established among the participants.

One of the most significant features of the tinkerable environment is its multimodal accessibility. In line with the theory of multiple intelligences (Gardner, 1993), these contexts value a plurality of languages: verbal, visual, bodily, spatial, and material. Each student can express their thoughts and construct knowledge according to their cognitive and sensory inclinations.

This linguistic openness also represents an opportunity for inclusion. Students with disabilities, learning difficulties, or different cultural backgrounds can find in tinkering an alternative, more direct, concrete, and expressive way of accessing knowledge. The use of manipulable materials, the possibility of documenting in different ways, and cooperation within the group make the tinkerable laboratory an inherently inclusive environment (Aiello & Sibilio, 2017; Morsanuto, Ludovisi & Cassese, 2022).

In an era of schooling marked by standardization, the urgency of performance, and a culture of results, Tinkering proposes a pedagogy of slowness and personalization. The opportunity to pause, reflect, and modify a project in progress restores the individual's right to their own cognitive time. This approach is consistent with the idea of a sustainable curriculum (Sterling, 2001), understood not as a prescriptive sequence of content, but as a flexible environment that adapts to the developmental, cognitive, and relational needs of students.

Sustainability, in education, also means avoiding the erosion of meaning, ensuring paths that generate meaning and not just results. In this sense, Tinkering offers itself as an educational space-time in which learning is also inhabiting, feeling, choosing, and transforming. It is a curriculum that includes the body, emotions, cooperation, doubt, and discovery.

4. Generative assessment practices: teaching observation between flexibility, intentionality and care

In Tinkering, the teacher takes on a profoundly transformed role: from transmitter of content to director of the educational context. Observation becomes the primary assessment tool, not as a neutral observation, but as an intentional and interpretive act that requires pedagogical sensitivity. Observing means being able to grasp the details of the process: material choices, moments of doubt, decisive gestures, emotional expressions. It is participatory observation, in which the teacher suspends judgment in order to understand, listens in order to evaluate, and collects clues in order to generate meaning (Rinaldi, 2006).

This practice requires specific professional training: the pedagogical gaze is constructed through reflection, sharing among colleagues, and systematic documentation. The teacher thus becomes a researcher of the context (Mortari, 2007), capable of reading what is happening in order to support plural and situated learning.

Authentic assessment, in a tinkerable environment, is a dialogic and cooperative process that actively involves students in constructing the meaning of their own learning. Teachers do not assess "on" someone, but together with someone. Documentary evidence (artifacts, recordings, reflections, photos) becomes discursive material, which is read, interpreted, and commented on with the student in a relationship of shared educational responsibility (Fiorucci, 2019).

This co-construction of meaning has a strong ethical value: it recognizes the student as a competent subject, capable of reflecting on their own actions and participating in the assessment process in an informed manner. In this way, agency and self-reflection are promoted, which are central elements in the formation of critical, autonomous, and responsible citizens (Bandura, 2001; Deci & Ryan, 1985).

Being a tinkerable teacher means knowing how to design generative contexts in which objectives, materials, languages, and spaces are consistent and flexible. Teaching is never rigid or completely predefined: it is based on a fluid pedagogical approach that takes into account the unexpected, dialogue, error, and

transformation. Teachers facilitate, stimulate, reformulate, but above all, they take care of the context, understood as a relational, cognitive, and symbolic space (Ellerani & Patera, 2021).
In this framework, assessment is not ancillary but internal to the teaching design. Each phase, from design to documentary feedback, is designed to be assessable and formative, so as to enhance subjective paths without reducing them to standard measures.
Tinkering profoundly questions teaching professionalism, calling for a critical and creative repositioning. In order to design sustainable educational environments and authentic assessments, teachers must overcome the paradigm of transmission and embrace a reflective and design-oriented stance (Schön, 1983). This implies the development of observational, narrative, evaluative, and collaborative skills, which are built over time through action research practices and professional communities.
In tinkerable contexts, the evaluating teacher is also a witness to the process, a documentarian of learning, and a mediator of meaning. Their role is not only technical, but also political and transformative: educating through evaluation means creating the conditions for learning with freedom, responsibility, and depth. Evaluation understood in this way supports the subject and renews the meaning of school as a space of possibility.

Conclusions

Assessing to generate beyond performance: future prospects from a systemic perspective

The theoretical and methodological path outlined in this paper has shown how Tinkering is not only an innovative teaching methodology, but also a systemic pedagogical vision capable of redefining the coordinates of teaching and assessment. The intertwining of physicality, documentation, and authentic assessment allows us to rethink educational action in a situated, relational, and transformative way, restoring value to the process, to error, to reflexivity, and to the plurality of languages.
In the tinkering paradigm, authentic assessment takes the form of a generative practice: no longer a measurement of performance, but a recognition of the journey. It allows us to value students' subjectivity, support their agency, and promote deep, embodied, situated learning. From this perspective, assessment means giving shape to the meaning of what we do, build, and experience in the

educational context. The tinkerable laboratory, as an open and flexible space, becomes a privileged place for carrying out an assessment that does not classify but cares.

The documentation of educational corporeality represents a turning point in the concept of assessment. It allows us to bring to light and make visible what often escapes traditional criteria: motivation, resilience, collaboration, creativity, and adaptation. Documenting means recognizing the educational value of what happens, narrating the process as a place of learning, reflecting on the experience to give it meaning. In this way, assessment connects to personal and collective transformation, and the school redefines itself as a generative environment, capable of including, inspiring, and nurturing growth.

In order for tinkering to have a profound impact on educational practices, a systemic rethinking of the curriculum, teacher training, and school organization is necessary. The challenge is to move from isolated workshops to a generative, flexible, and sustainable curriculum that integrates assessment, design, and documentation into a unified whole. This also implies a new idea of school time and space that is more open, democratic, and pluralistic. Teachers are called upon to take on the role of mediators of meaning, promoters of dialogic and inclusive assessment practices. In this sense, tinkering represents a powerful lever for renewal: a pedagogy that makes the body, doing, thinking, and documenting the constituent elements of human, meaningful, and transformative learning.

References

Aiello, P., Di Gennaro, D. C., Sibilio, M., & Zollo, I. (2017). Il concetto di autodeterminazione in una prospettiva semplessa: Possibili implicazioni per l'agire didattico dei docenti. Educational Reflective Practices, 1, 96–109.

Andrade, H., & Brookhart, S. M. (2019). Classroom assessment & grading that work. Pearson.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. Annual Review of Psychology, 52(1), 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Barab, S. A., & Roth, W. M. (2006). Curriculum-based ecosystems: Supporting knowing from an ecological perspective. Educational Researcher, 35(5), 3–13. https://doi.org/10.3102/0013189X035005003

Barrett, H. (2007). Researching and evaluating digital storytelling as a deep learning tool. In C. Crawford et al. (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference (pp. 647–654). AACE.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7–74. https://doi.org/10.1080/0969595980050102

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. Educational Assessment, Evaluation and Accountability, 21, 5–31. https://doi.org/10.1007/s11092-008-9068-5

Bruner, J. (1996). La cultura dell'educazione. Feltrinelli.

D'Aprile, G. (2018). Poetica del tempo educativo. Pedagogia Oggi, 16(2), 71–86.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. Springer. https://doi.org/10.1007/978-1-4899-2271-7

Ellerani, P., & Patera, S. (2021). Il modello pedagogico-didattico ecosistema espansivo delle scuole: una ricerca culturale sulle pratiche quotidiane dei docenti. Formazione & Insegnamento, 19(2), 163–180.

Fiorucci, A. (2019). La funzione docente nello sviluppo e nella promozione di una scuola inclusiva. Formazione, lavoro, persona, 20, 79–90.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. American Psychologist, 34(10), 906–911. https://doi.org/10.1037/0003-066X.34.10.906

Gardner, H. (1993). Multiple intelligences: The theory in practice. Basic Books.

Gomez Paloma, F. (2013). Embodied cognitive science: Atti incarnati della didattica (Vol. 1). Edizioni Nuova Cultura.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge University Press.

Malaguzzi, L. (1996). The hundred languages of children. In E. C. Edwards, L. Gandini, & G. Forman (Eds.), The hundred languages of children: The Reggio Emilia approach to early childhood education (pp. 3–10). Ablex.

Merleau-Ponty, M. (1945). Phénoménologie de la perception. Gallimard.

Mortari, L. (2007). Ricercare e riflettere. La formazione del docente professionista. Carocci.

Morsanuto, S., Ludovisi, F., & Cassese, F. P. (2022). Progettazione didattica inclusiva, nella scuola primaria, attraverso la fotografia. Italian Journal of Special Education for Inclusion, 10(1), 351–368.

Papert, S. (1980). Mindstorms: Children, computers, and powerful ideas. Basic Books.

Papert, S. (1993). The children's machine: Rethinking school in the age of the computer. Basic Books.

Piaget, J. (1972). Psychology and epistemology: Towards a theory of knowledge. Penguin.

Resnick, M. (2017). Lifelong kindergarten: Cultivating creativity through projects, passion, peers, and play. MIT Press.

Resnick, M., & Rosenbaum, E. (2013). Designing for tinkerability. In M. Honey & D. Kanter (Eds.), Design, make, play: Growing the next generation of STEM innovators (pp. 163–181). Routledge.

Rinaldi, C. (2006). In dialogue with Reggio Emilia: Listening, researching and learning. Routledge.

Schön, D. A. (1983). The reflective practitioner: How professionals think in action. Basic Books.

Sheets-Johnstone, M. (1999). The primacy of movement. John Benjamins Publishing.

Shepard, L. A. (2000). The role of assessment in a learning culture. Educational Researcher, 29(7), 4–14. https://doi.org/10.3102/0013189X029007004

Shilling, C. (2017). The body: A very short introduction. Oxford University Press.

Sterling, S. (2001). Sustainable education: Re-visioning learning and change. Green Books.

Varela, F. J., Thompson, E., & Rosch, E. (1991). The embodied mind: Cognitive science and human experience. MIT Press.

Vygotskij, L. S. (1978). Mind in society: The development of higher psychological processes (M. Cole et al., Eds.). Harvard University Press. (Opera originale pubblicata nel 1934)

Wiggins, G. (1990). The case for authentic assessment. Practical Assessment, Research & Evaluation, 2(2). https://doi.org/10.7275/ffb1-mm19