

Review Article

TECHNICAL TOOLS, PSYCHOLOGICAL TOOLS, AND PERSUASIVE MEDIATION IN AN ACTIVITY SYSTEM, A VYGOTSKIAN JUSTIFICATION AND A THREE-DIMENSIONAL ACCOUNT OF TOOLS

Federico De La Colina Flores ^{1*}, Heriberto Rodriguez Frausto ², Tzitz de la Colina Garcia ³, Paul Alexis de la Colina Garcia ⁴

¹ Universidad Autonoma De Zacatecas, Unidad Académica De Medicina Veterinaria y Zootecnia, Zacatecas, Mexico

² Universidad Autonoma De Zacatecas, Unidad Académica De Medicina Veterinaria y Zootecnia, Zacatecas, Mexico

³ Colegio Edison A.C. Departamento De Administración Docente, Guadalupe, Zacatecas, México

⁴ Colegio Edison A.C. Departamento De Administración Docente, Guadalupe, Zacatecas, Mexico



ABSTRACT

This article clarifies how “tools” function as mediators in cultural-historical activity theory by integrating Vygotsky’s analytic distinction between tools and signs with an activity-system model that separates a general Tool element from a Persuasive tool element. We argue that the Tool node is best read as a Vygotskian technical tool complex whose functional primacy is outward-oriented transformation of objects and material processes, while the Persuasive tool node is best read as a Vygotskian psychological tool complex whose primacy is semiotic regulation of attention, valuation, interpretation, and coordinated action. Two cautions guide the proposal: Vygotsky’s distinction is not an ontological split between “material” and “symbolic,” and the decomposition is a modeling choice justified when persuasion, legitimacy, or alignment work is constitutive of the activity’s object. Building on Engeström’s systemic account of mediation, we show how technical tools couple to operations, divisions of labor, and repeatable production routines, whereas persuasive tools operate through genres, scripts, metrics regimes, and visual-semiotic artifacts that frame what counts as evidence and what actions appear reasonable. We further propose a three-dimensional account in which every tool—technical or psychological—has (i) a material dimension (carriers, infrastructures, access), (ii) a symbolic dimension (culturally organized meanings and values), and (iii) a pragmatic dimension (instrument-in-use formed through utilization schemes and instrumental genesis). Finally, we outline how distinguishing technical and persuasive tools improves diagnosis of contradictions (measurement–meaning, access–authority, skill formation) and supports expansive learning analyses in education, research, and professional practice. The framework is intended for welfare-oriented, ethically governed persuasion in veterinary work.

Keywords: Activity Theory, Vygotsky, Mediating Artifacts, Persuasive Tools

*Corresponding Author:

Email address: Federico De La Colina Flores (federcol@hotmail.fr), Heriberto Rodríguez Frausto (mvzhrf1958@hotmail.com), Tzitz de la Colina García (dollfreak74@gmail.com)

Received: 31 January 2026; **Accepted:** 28 February 2026; **Published** 18 April 2026

DOI: [10.29121/JISSI.v2.i1.2026.34](https://doi.org/10.29121/JISSI.v2.i1.2026.34)

Page Number: 128-132

Journal Title: Journal of Integrative Science and Societal Impact

Journal Abbreviation: J. Integr. Sci. Soc. Impact

Online ISSN: 3108-2165, **Print ISSN:** 3108-1959

Publisher: Granthaalayah Publications and Printers, India

Conflict of Interests: The authors declare that they have no competing interests.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors’ Contributions: Each author made an equal contribution to the conception and design of the study. All authors have reviewed and approved the final version of the manuscript for publication.

Transparency: The authors affirm that this manuscript presents an honest, accurate, and transparent account of the study. All essential aspects have been included, and any deviations from the original study plan have been clearly explained. The writing process strictly adhered to established ethical standards.

Copyright: © 2026 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.

INTRODUCTION

In cultural-historical and activity-theoretical traditions, the *tool* (or *mediating artifact*) is not an accessory to action but a constitutive element of how action becomes socially and historically organized. Your updated activity-system schema distinguishes (a) a general **Tool** element and (b) a **Persuasive tool** element. This document justifies reading the **Tool** element primarily as a *Vygotskian technical tool* and the **Persuasive tool** element as a *Vygotskian psychological tool*, while also arguing that *every* tool—technical or psychological—has **material, symbolic, and pragmatic** dimensions.

Two cautions guide the argument.

Vygotsky's distinction between tools and signs is analytical, not an ontological partition in which artifacts are “only material” or “only symbolic.” Later socio-cultural research repeatedly shows hybridization and mutual embedding of the technical and the semiotic [Cole \(1996\)](#), [Wertsch \(2007\)](#).

Splitting “Tool” and “Persuasive tool” in an activity system is therefore best treated as a modeling decision that increases explanatory power for your particular object of analysis—especially where persuasion, legitimacy, or alignment work are central to the activity's outcomes.

VYGOTSKY'S TOOL-SIGN DISTINCTION AS A THEORY OF MEDIATION

TECHNICAL TOOLS: OUTWARD-ORIENTED MEDIATION

Vygotsky's early instrumental approach distinguishes tools from signs by the direction and target of their mediating function. Technical tools are classically oriented toward transforming external objects and material processes: they extend human capacity to act upon the world, reorganizing the relation between subject and object through a culturally accumulated means of production [Leont'ev \(1978\)](#), [Vygotsky \(1978\)](#).

This outward orientation does not imply “mere physicality.” Even the most mechanical implement carries socially sedimented ways of acting—proper uses, norms of competence, and historically accumulated designs. Still, the primary analytic emphasis is that technical tools mediate labor on the object (e.g., instruments, infrastructures, software-as-production systems, lab devices, machines).

PSYCHOLOGICAL TOOLS: INWARD- AND RELATION-ORIENTED MEDIATION

Psychological tools (often glossed as signs and sign-systems) mediate action by reorganizing attention, memory, categorization, and planning; they are means of mastering psychological functions and coordinating conduct through culturally provided semiotic systems [Vygotsky \(1978\)](#). As summarized in the Vygotskian tradition, psychological tools include “language; various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes, diagrams, maps, and mechanical drawings; and all sorts of conventional signs” [Wertsch \(2007\)](#).

A crucial expansion for your model is that psychological tools operate not only “inside the head” but within **social relations**, because higher mental functions are formed in and through interaction (interpsychological) before being reorganized as intrapsychological processes [Vygotsky \(1978\)](#), [Wertsch \(2007\)](#). In other words, psychological tools are intrinsically suited to activities where the object includes alignment, legitimacy, adherence, commitment, meaning, or coordinated interpretation.

MAPPING THE ACTIVITY-SYSTEM “TOOL” ELEMENT TO VYGOTSKIAN TECHNICAL TOOLS

Engeström's activity system explicitly positions tools/mediating artifacts as the mediational means through which the subject engages the object and produces outcomes [Engeström \(1987\)](#). Within this tradition, “tools” are frequently treated as an umbrella category that includes both technical and semiotic mediators. Your proposal gains clarity by disaggregating that umbrella.

JUSTIFICATION FOR READING TOOL AS VYGOTSKIAN TECHNICAL TOOL

Functional primacy in production and transformation. In an activity system, the Tool node commonly names what the subject uses to materially transform the object (produce, build, measure, compute, treat, manufacture). This aligns with Vygotsky's tool as a means of outward action [Vygotsky \(1978\)](#).

Compatibility with divisions of labor and operations. Technical tools couple tightly with operational routines, skill distributions, and standardized procedures that activity theory analyzes as the “how” of work under specific conditions [Engeström \(1987\)](#), [Leont'ev \(1978\)](#).

Design and capacity as constraints/enablers. socio-cultural analyses emphasize that mediational means enable and constrain action—often in ways that are not reducible to individual intention [Wertsch \(1998\)](#). This constraint/enablement perspective fits especially well with technical tools as infrastructures and production instruments.

In short: the Tool element can be modeled as the technical-tool complex that mediates the subject-object relation by shaping what transformations are possible, efficient, legitimate, repeatable, and scalable.

MAPPING “PERSUASIVE TOOL” TO VYGOTSKIAN PSYCHOLOGICAL TOOLS WHAT “PERSUASIVE TOOL” ADDS ANALYTICALLY

The term persuasive tool flags a family of mediators whose immediate function is not to transform the physical object, but to transform **interpretation, commitment, coordination, consent, and shared orientation** toward the object—often by shaping how the community understands problems, risks, priorities, evidence, or value.

This makes persuasive tool a good candidate for a Vygotskian **psychological** tool because:

it is primarily semiotic (language, narrative, classification, visualization, argument forms).

it reorganizes attention, valuation, and decision.

it is integrated into social interaction as a means to coordinate collective action [Wertsch \(2007\)](#).

PERSUASION AS MEDIATED MEANING-MAKING

If psychological tools are culturally provided means of regulating and organizing psychological functions, then persuasion is one of the most visible social arenas where such regulation occurs: persuasion recruits and stabilizes categories, warrants, emotional frames, norms, and identity positions that reconfigure what actors see as the object and what actions they see as reasonable.

From this perspective, persuasive tools can be operationalized as: - discursive instruments (genres, scripts, policy language, protocols, mission statements, narrative forms), - symbolic systems (metrics regimes, rankings, labels, standards, taxonomies), - visual-semiotic artifacts (diagrams, dashboards, maps, plots) that compress, highlight, and frame relations.

WHY VISUALIZATION BELONGS INSIDE “PERSUASIVE TOOL”

A common misconception is that visualization is “neutral display.” In practice, visualization choices can function rhetorically: selection, aggregation, annotation, scale, and sequencing can systematically frame interpretation and action. Empirical visualization research explicitly analyzes such framing effects in narrative visualization [Hullman and Diakopoulos \(2011\)](#). Therefore, your “Persuasive tool” category can legitimately include data visualization as a psychological tool: it is a semiotic technology that reorganizes what is salient, what is comparable, and what counts as evidence, thereby shaping collective orientation to the object.

WHY THIS SPLIT DOES NOT REINTRODUCE MIND-WORLD DUALISM

A Vygotskian reading does not reduce psychological tools to internal mental content. Psychological tools are publicly available semiotic means that function in interaction and only subsequently become reorganized as psychological processes. Therefore, “persuasive tool” should be treated as an activity-level mediator: it is part of how the community’s object is stabilized, contested, or expanded through communication.

EVERY TOOL HAS MATERIAL, SYMBOLIC, AND PRAGMATIC DIMENSIONS

Your second claim—every tool has material, symbolic, and pragmatic dimensions—can be supported by combining three complementary lines of theory: (a) socio-cultural accounts of artifacts, (b) mediated-action theory, and (c) the instrumental approach (artifact → instrument-in-use).

MATERIAL DIMENSION: PHYSICAL AND INFRASTRUCTURAL REALITY

Even “symbolic” mediators have material carriers (paper, screens, acoustic signals, servers, interfaces). Mediational means are never purely mental; they are embodied and instantiated in artifacts and technologies, which is why they can persist, circulate, be standardized, and be contested [Wertsch \(1998\)](#). Materiality matters because it shapes access, durability, reproducibility, and who can deploy the tool under which conditions.

SYMBOLIC DIMENSION: CULTURALLY ORGANIZED MEANING

Artifacts also embody meanings, classifications, values, and historically developed purposes. Wartofsky’s account of artifacts emphasizes that artifacts are objectifications of human praxis and representation, not mere physical items; they carry models of action and interpretation [Wartofsky \(1979\)](#). In socio-cultural psychology, artifacts are frequently treated as simultaneously material and ideal, precisely because their form and function are culturally organized [Cole \(1996\)](#).

This symbolic dimension is obvious for language and diagrams, but it also applies to technical tools: a syringe, a sensor, or a statistical workflow includes categories of “proper use,” legitimate measurement, and acceptable evidence—symbolic orders sedimented into practice.

PRAGMATIC DIMENSION: TOOL INTEGRATION INTO THE ACTIVITY SYSTEM

The pragmatic dimension concerns how the tool becomes operationally integrated into an activity system—through routines, competencies, role distributions, and recurrent problems. Here, Rabardel’s distinction is decisive: an artifact becomes an instrument only when coupled with utilization schemes (ways of using) developed by users in activity. This developmental coupling—often discussed as instrumental genesis—treats “tool-in-use” as a composite of artifact properties and socially learned usage schemes [Rabardel \(1995\)](#), [Rabardel and Bourmaud \(2003\)](#).

In activity-system terms, the pragmatic dimension is where tools articulate with: - the community (shared competencies and identities), - division of labor (who can use the tool; who interprets its outputs), - rules (standards, compliance, professional norms), - and the object (what counts as progress, success, evidence).

A COMPACT SCHEMA

This tri-dimensional account supports your overarching claim: even if we analytically label one node as “technical tool” and another as “psychological/persuasive tool,” both participate in material, symbolic, and pragmatic dynamics—only with different functional primacies.

IMPLICATIONS FOR MODELING: WHY “TOOL” AND “PERSUASIVE TOOL” IS A PRODUCTIVE DECOMPOSITION AVOIDING CATEGORY OVERLOAD IN “TOOLS/MEDIATING ARTIFACTS”

Engeström’s “tools/mediating artifacts” category is intentionally broad [Engeström \(1987\)](#). Your decomposition is warranted when persuasion is not incidental but structurally necessary to the activity—e.g., when the object requires building legitimacy, coordinating stakeholders, shaping professional judgment, or mobilizing collective intelligence around evidence.

DIAGNOSING CONTRADICTIONS AND CHANGE

Separating technical and persuasive tools can make contradictions more visible, for example:

Measurement–meaning contradiction: technical analytics produce outputs that persuasive tools frame selectively, creating tensions between “what the system shows” and “what the community accepts.”

Access–authority contradiction: a persuasive dashboard may be widely circulated while the technical toolchain that generates it is restricted, concentrating interpretive authority.

Skill formation contradiction: technical competence may be undervalued relative to rhetorical competence (or vice versa), reshaping professional formation and division of labor.

In such cases, the “persuasive tool” node becomes a legitimate site for analyzing how semiotic mediation reorganizes the object itself.

CONCLUSION

Interpreting the activity-system **Tool** element as a Vygotskian **technical tool** and your **Persuasive tool** element as a Vygotskian **psychological tool** is theoretically defensible and analytically fruitful when persuasion and orientation are constitutive of the object. Vygotsky’s instrumental approach supports the distinction between outward transformation and semiotic regulation [Vygotsky \(1978\)](#), [Wertsch \(2007\)](#). Activity theory supports examining these mediators systemically in relation to rules, community, and division of labor [Engeström \(1987\)](#). Finally, the claim that every tool has **material**, **symbolic**, and **pragmatic** dimensions is strongly supported when tools are treated not as isolated objects but as *artifacts-in-use* embedded in activity, as emphasized by artifact theory and the instrumental approach [Rabardel \(1995\)](#), [Rabardel and Bourmaud \(2003\)](#), [Wartofsky \(1979\)](#).

To operationalize this in your framework: treat “technical tools” as the mediators of production/transformation and “persuasive tools” as the mediators of meaning, legitimacy, and coordination—then analyze both across the material-symbolic-pragmatic dimensions to explain stability, conflict, and development in the activity system.

ACKNOWLEDGMENTS

None.

AUTHOR CONTRIBUTION:

Federico de la C. Conceptualization, Formal Analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – Original Draft Preparation

Heriberto RF: Conceptualization, Formal Analysis Validation, Visualization Writing, Original Draft Preparation, Writing– Review and Editing

Tzitz de la C: Conceptualization, Investigation, Supervision, validation, Visualization

Paul de la C: Methodology, Investigation, Supervision, validation, Visualization

REFERENCES

- Cole, M. (1996). *Cultural Psychology: A Once and Future Discipline*. Belknap Press of Harvard University Press.
- Engeström, Y. (1987). *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*. Orienta-Konsultit.
- Hullman, J., and Diakopoulos, N. (2011). Visualization Rhetoric: Framing Effects in Narrative Visualization. *IEEE Transactions on Visualization and Computer Graphics*, 17(12), 2231–2240. <https://doi.org/10.1109/TVCG.2011.255>
- Leont'ev, A. N. (1978). *Activity, Consciousness, and Personality*. Prentice-Hall.
- Rabardel, P. (1995). *Les Hommes et Les Technologies: Approche Cognitive Des Instruments Contemporains*. Armand Colin.
- Rabardel, P., and Bourmaud, G. (2003). From Computer to Instrument System: A Developmental Perspective. *Interacting with Computers*, 15(5), 665–691. [https://doi.org/10.1016/S0953-5438\(03\)00058-4](https://doi.org/10.1016/S0953-5438(03)00058-4)
- Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes* (M. Cole, V. John-Steiner, S. Scribner, and E. Souberman, Eds.). Harvard University Press.
- Wartofsky, M. W. (1979). *Models: Representation and the Scientific Understanding*. D. Reidel Publishing Company. https://doi.org/10.1007/978-94-009-9357-0_10
- Wertsch, J. V. (1998). *Mind as Action*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195117530.001.0001>
- Wertsch, J. V. (2007). Mediation. In H. Daniels, M. Cole, and J. V. Wertsch (Eds.), *The Cambridge Companion to Vygotsky* (178–192). Cambridge University Press. <https://doi.org/10.1017/CCOL0521831040.008>