



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

PENSIERO COMPUTAZIONALE: dalle «scuole di samba della computazione» ai CoderDojo

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«Computational thinking» ?

- Seymour Papert
([Mindstorms](#), 1980, pag. 182)
- Jeannette Wing
([Comm. of the ACM](#), 2006)



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Non ho dubbi che nei prossimi anni vedremo la formazione di alcuni ambienti computazionali che dovrebbero essere chiamati "**scuole di samba della computazione**".

Ci sono già stati i tentativi in questa direzione [...] ma hanno fallito [...] perché troppo primitivi. I loro computer semplicemente non avevano la potenza necessaria per le tipologie di attività più coinvolgenti e condivisibili.

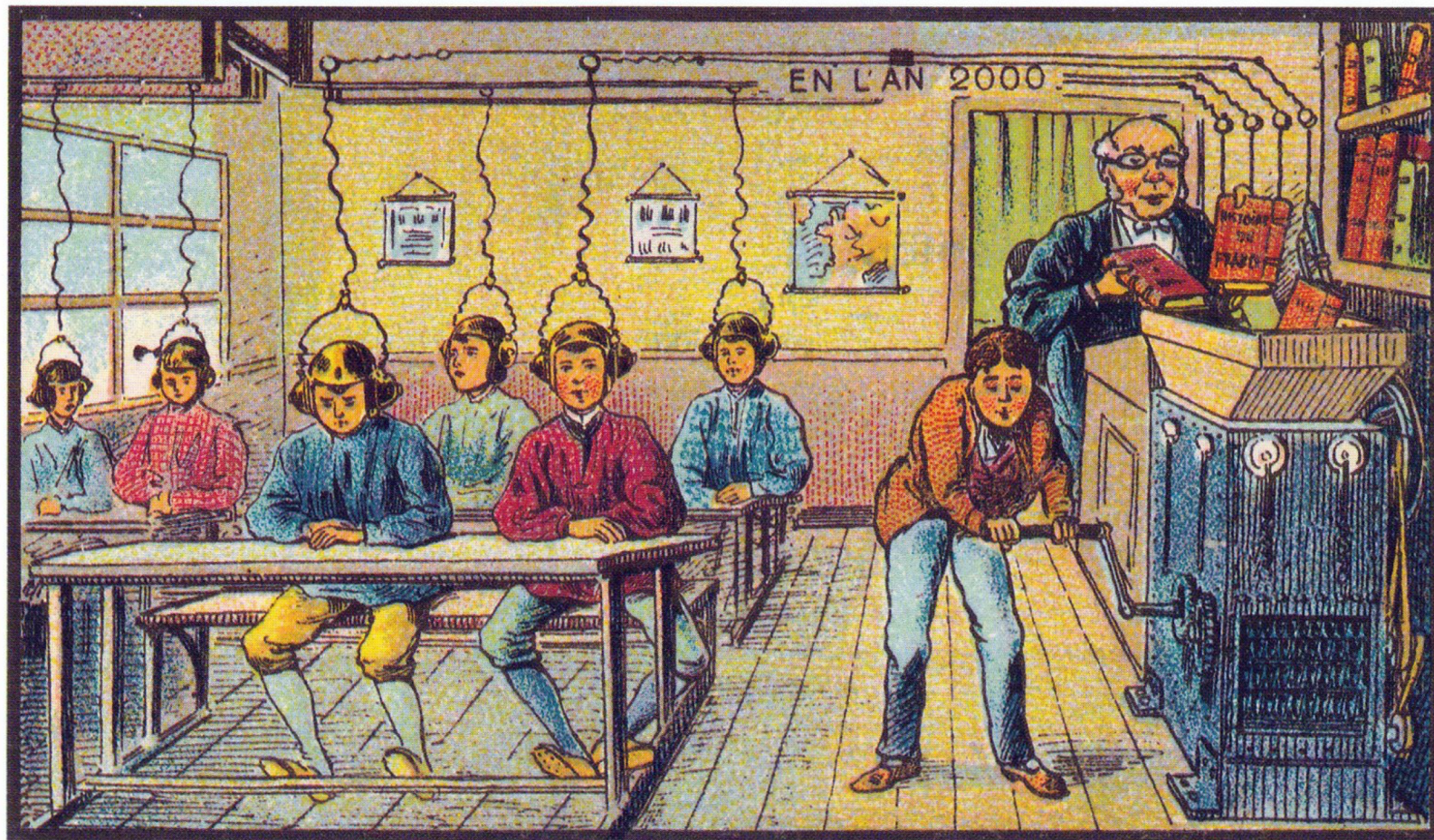
La loro visione su come integrare il **pensiero computazionale** nella vita di tutti i giorni non era sufficientemente sviluppata. Ma ci saranno altri tentativi, e altri ancora. E, infine, da qualche parte, tutti i pezzi verranno messi insieme e [tali scuole] prenderanno piede.

[...]

Saranno manifestazioni di un movimento sociale di persone interessate nella computazione personale, interessate nei loro bambini, e interessate nell'educazione.



L'anno 2000 immaginato nel 1900



At School





Principles:
1. Mixed age classrooms, with classrooms for children aged 2½ or 3 to 6 years old;
2. Student choice of activity from within a prescribed range of options;
3. Uninterrupted blocks of work time;
4. A Constructivist or "discovery" model, where students learn concepts from working with materials, rather than by direct instruction.

Teacher types: lion-tamer, entertainer and new romantic - the problem of self-judgement in assessment.

An educational movement, guided by passion and principle, to help students develop consciousness of freedom, recognize authoritarian tendencies, and connect knowledge to power and the ability to take constructive action.

Learn naturally if given the freedom to follow own interests and a rich assortment of resources.

School is damaging to education: "The pupil is thereby 'schooled' to confuse teaching with learning, grade advancement with education, a diploma with competence, and fluency with the ability to say something new."

Optimal learning demands that students receive instruction tailored to their learning styles.

Knowledge is continuously gained through both personal and environmental experiences. The learner must:
1. be able to reflect on the experience;
2. use analytical skills to conceptualize the experience; and
3. make decisions and solve problems to use the ideas gained from the experience.

Modifying the goal of learning activity in the light of experience or possibly even reject the goal. 'Single-loop' learning is the repeated attempt at the same problem, with no variation of method and without ever questioning the goal.

A characteristic of an adaptive organization that is able to sense changes in signals from its environment and adapt accordingly.

An organization is created and defined by communication; communication "is" the organization and the organization exists because communication takes place.

A cybernetic and dialectic framework that offers a scientific theory to explain how interactions lead to 'knowing'.

Learning is a social process whereby knowledge is co-constructed and is situated in a specific context and embedded within a particular social and physical environment.

Groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.

Education based on science that modified and improved the individual.

The process that occurs between a teacher and student that infuses direct experience with the learning environment and content.

Knowledge as mental representation:
1a. Knowledge is not passively received either through the senses or by way of communication;
1b. Knowledge is actively built up by the cognising subject;
2a. The function of cognition is adaptive, in the biological sense of the term, tending towards fit or viability;
2b. Cognition serves the subject's organization of the experiential world, not the discovery of an objective ontological reality.

The learner is not a passive recipient of knowledge but that knowledge is 'constructed' by the learner.

groups construct knowledge for one another, collaboratively creating a small culture of shared artifacts with shared meanings

knowledge is distributed across a network of connections to people and information - learning consists of the ability to construct and traverse those networks

A human being develops cognitively from birth throughout his or her life through four primary stages of development: sensorimotor (0-2), preoperational (2-7), concrete operational (7-11), and formal operational (11-). Assimilation is incorporation of new experiences into existing mental schema, accommodation changes mental schema.

The area of capabilities that learners can exhibit with support from a teacher or peer.

The learning of new forms of activity as they are created, rather than the mastery of putative stable, well-defined, existing knowledge and skill.

Scaffolding is the support given during the learning process which is tailored to the needs of the student with the intention of helping the student achieve his/her learning goals.

Learners obtain knowledge by forming and testing hypotheses.

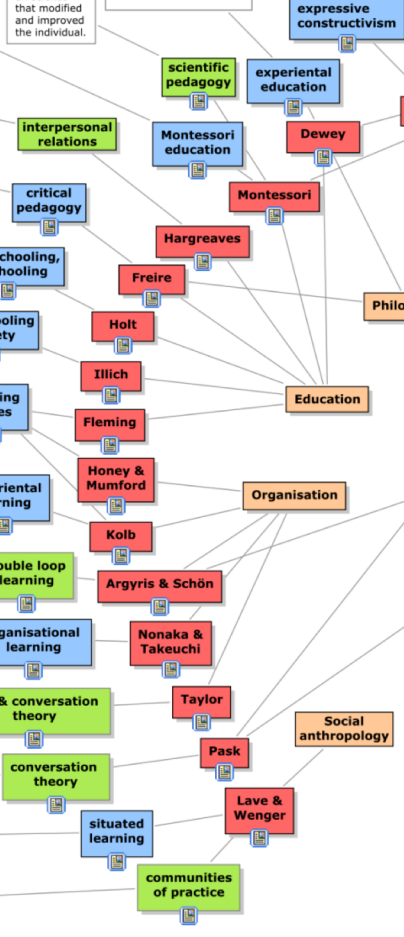
New knowledge to acquire is related with previous knowledges.

We have several different ways of learning and processing information, but these methods are relatively independent of one another: leading to multiple "intelligences" as opposed to a general intelligence factor among correlated abilities

In Mastery learning, "the students are helped to master each learning unit before proceeding to a more advanced learning task".

Taxonomy of learning objectives that educators set for students in three "domains": Cognitive, Affective, and Psychomotor. Learning at the higher levels is dependent on achieving lower levels. Designed to motivate educators to focus on all three domains, creating a more holistic form of education.

Learning as a process of forming associations between stimuli in the environment and the corresponding responses of the individual. Reinforcement strengthens responses and increases the likelihood of another occurrence when the stimulus is present again.



Learning Theory

Key concepts

Learning paradigms or 'world views'

Learning theorists

Scientific disciplines

Learning Theory v6 is a hypertextual concept map of established learning theories 30th April 2013.

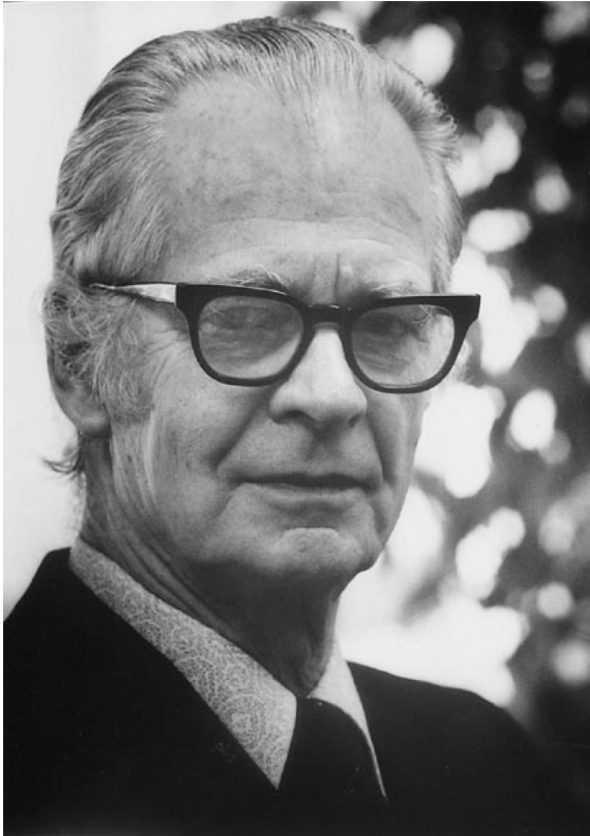
This is necessarily a reduction of a complete picture of learning theories, but nevertheless it attempts to map and link key scientific disciplines, theorists, concepts and paradigms.

Part of deliverable D2.2.1 for the HoTEL EU project designed by Richard Millwood richard.millwood@brunel.ac.uk

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Skinner e il comportamentismo



Ad un comportamento (risposta), inizialmente poco frequente, viene associato uno stimolo (rinforzo positivo) e la frequenza di tale comportamento aumenta molto.

Istruzione “programmata”

“Macchine per insegnare”

Trasmissione della conoscenza

Sbagliando si impara... a sbagliare (?!)



Piaget e il costruttivismo



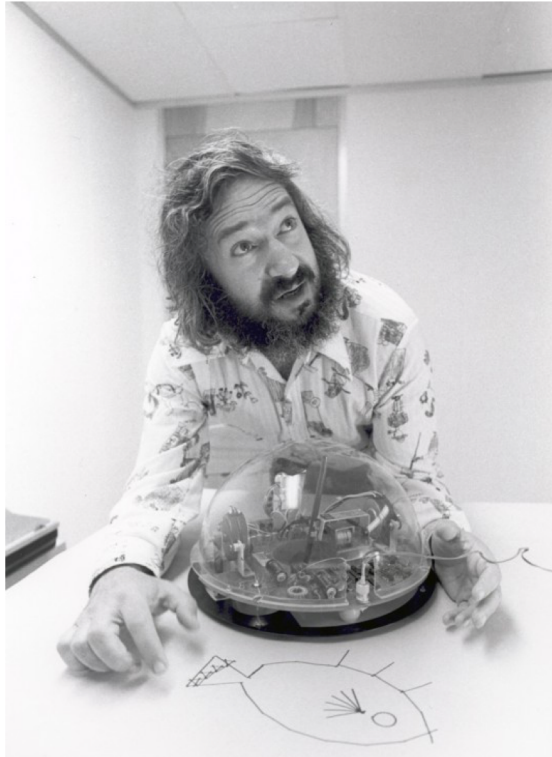
Epistemologia genetica:

..“l'uso di metodi attivi che diano ampio spazio alla ricerca spontanea del bambino o adolescente e richiedano **che ogni nuova verità debba essere appresa, riscoperta o almeno ricostruita dallo studente e non solo trasmessa a lui**”.

(To Understand is to Invent, 1979)



Papert e il costruzionismo



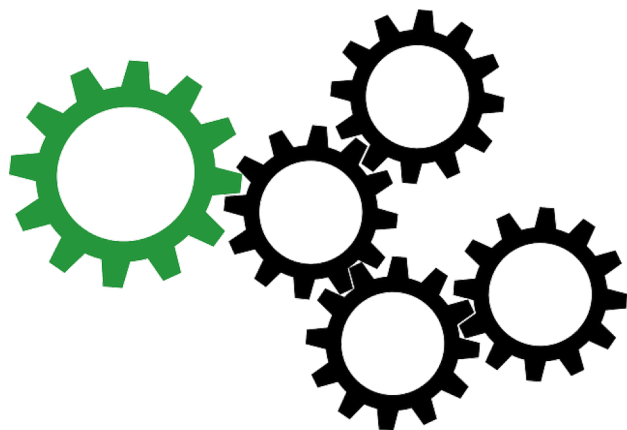
Il costruzionismo condivide l'idea costruttivista dell'apprendimento **come costruzione di strutture di conoscenza.**

Poi aggiunge l'idea che ciò accade particolarmente bene in contesti in cui **chi apprende è consapevolmente coinvolto nella costruzione di un'entità pubblica**, non importa che sia un castello di sabbia o una teoria dell'Universo.

(Situating Constructionism, 1991)



Dagli ingranaggi ai computer (Mindstorms)

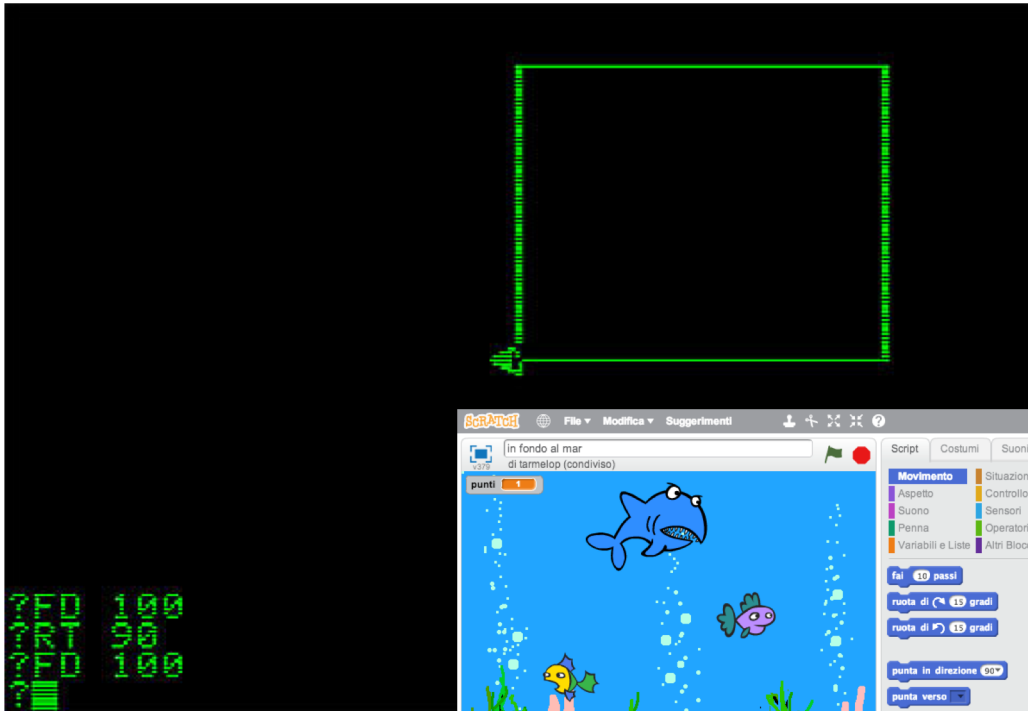


Scuole di samba?

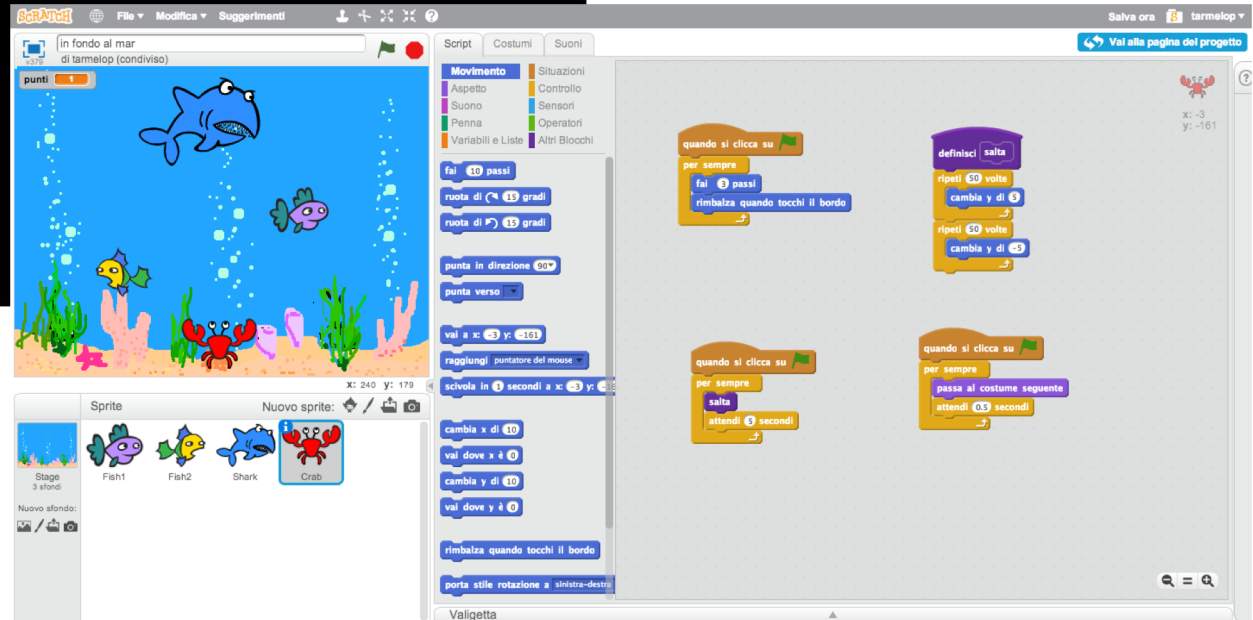
- Per la preparazione del Carnevale di Rio
- Non scuole, ma club
- Migliaia di persone, da bambini ad anziani, da novizi a professionisti
- Coesione sociale, senso di appartenenza, scopo comune
- Apprendimento spontaneo e naturale ma **deliberato**: risultato professionale, spettacolare, con richiami alla tradizione ma anche con una forte critica politica



Da Logo a Scratch



Logo-style text output in green on a black background.



Resnick e il Lifelong Kindergarten

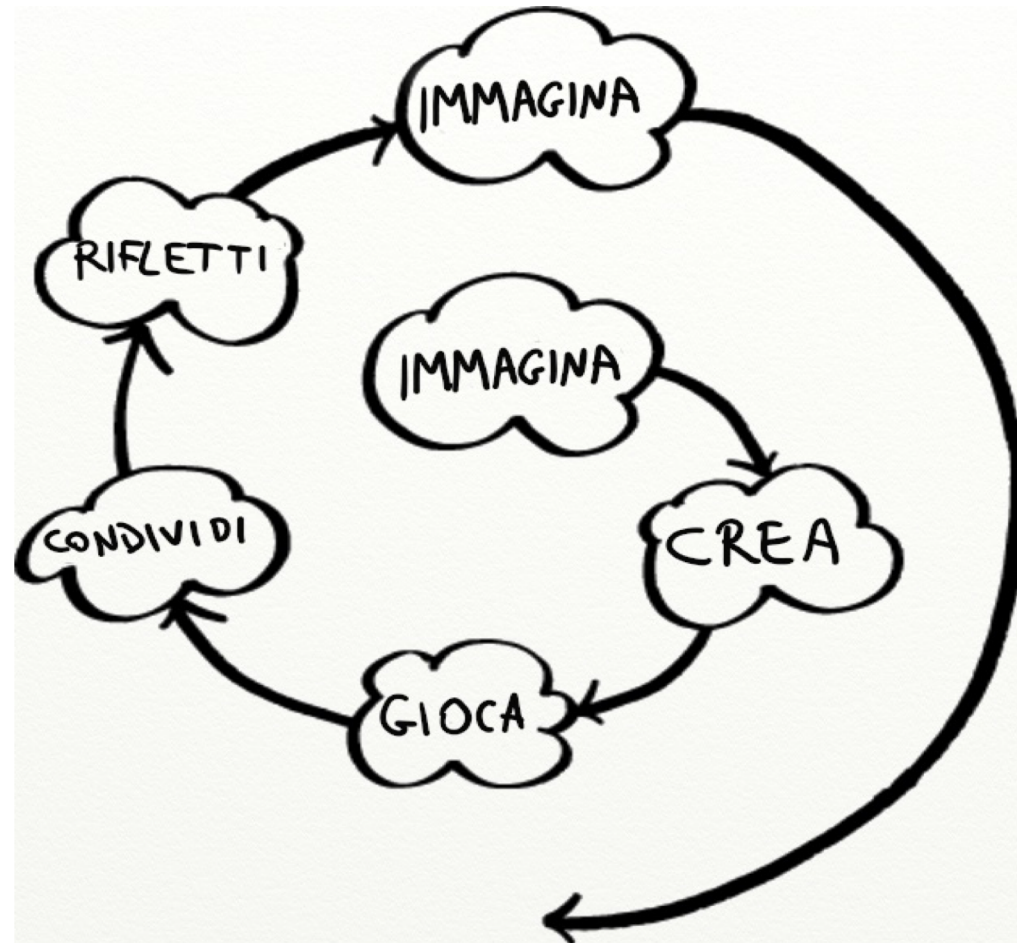


Invece di rendere gli asili come il resto delle scuole, dobbiamo rendere il resto delle scuole (in realtà, il resto della vita) più simili all'asilo.

(Lifelong Kindergarten, 2017)



Apprendimento creativo



Spirale dell'apprendimento creativo.
Traduzione di Michael Lodi, dall'originale di M. Resnick [CC BY-SA]



Apprendimento creativo

Projects



Peers



Passion



Play



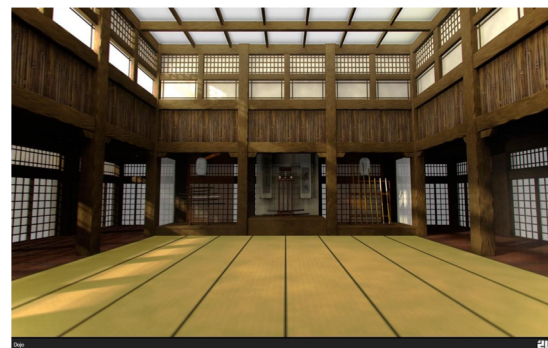
Coder...CHE??

Coder



+

Dojo



=

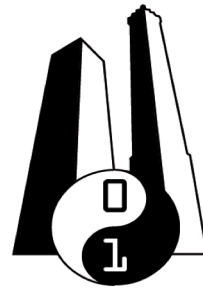
CoderDojo



Palestra di programmazione gratuita per bambini e ragazzi



CoderDojo



CoderDojo
Bologna



- Tutorial
- Merenda
- Esperimenti
- ... ma ogni dojo è indipendente
- Computer
- Merenda
- Genitore
- uno o due sabati al mese



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PENSIERO COMPUTAZIONALE = INFORMATICA?

- Pensare come un informatico per risolvere problemi (in ogni ambito della vita)
- CT è l'insieme dei processi mentali usati per formulare i problemi e le loro soluzioni in modo tale che la descrizione delle soluzioni sia effettivamente eseguibile da un agente che elabora informazioni



Abbiamo davvero bisogno del pensiero computazionale? [\(Lodi, Martini, Nardelli\)](#)

- La disciplina da insegnare è l'Informatica
- il «pensiero computazionale» è il sedimento concettuale che resta dopo tale insegnamento
- Porta concetti nuovi rispetto ad altre discipline
- Dal «risolvere problemi» al «far risolvere problemi»:
- «descrivere la soluzione» (**algoritmo**) in modo comprensibile (**linguaggio**) da un esecutore indipendente (**automa**)



Come imparare?

Diffidare dalle soluzioni preconfezionate:

imparate anche voi per scoperta, per tentativi, per prove ed errori
... perché è così che imparano gli informatici!

- <https://lodi.ml/risorse/> Raccolta di link in italiano, guide per iniziare, risorse gratuite, libri
- <https://lodi.ml/libri/>
- <https://lodi.ml/publications/> Pubblicazioni scientifiche e divulgative, alcune in italiano





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