

Laboratory of Computer Science Education

Costruttivismo e costruzionismo

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Qualche termine

Note (From Wikipedia)

- Epistemology = the philosophical study of the nature, origin, and limits of human knowledge
- Epistemologia = Lo studio critico della natura e dei limiti della conoscenza scientifica
- Gnoseologia = branca della filosofia che studia la natura della conoscenza.

Teoria della conoscenza (Realismo?)

- Conoscenza come rappresentazione mentale dell'oggetto che si afferma di conoscere
- *Rappresentazione vera*, cioè uguale all'oggetto rappresentato
- Conoscenza come rispecchiamento della realtà, del mondo come sarebbe anche se nessuno lo conoscesse
- Linguaggio come mezzo di trasporto capace di **trasferire conoscenze** da una persona ad un'altra

Pedagogia "istruttivista"

- Su questi presupposti si basa l'insegnamento tradizionale:
trasferimento di verità / conoscenza
- Soprattutto in termini di rappresentazioni attraverso il linguaggio
- Dal maestro all'allievo

Costruttivismo

- Il costruttivismo radicale **rompe con questa tradizione di pensiero**
- Il termine “costruttivismo” fu coniato da **Piaget** negli anni trenta del secolo scorso
- Il costruttivismo ha le sue basi nello **scetticismo**

Scetticismo

Senofane, VI secolo a.C.

- La conoscenza del mondo deriva dall'esperienza (percezione, azione, pensiero) e in quanto tale è soggettiva.
- Per stabilire quali conoscenze sono vere avremmo bisogno di un altro accesso al mondo, che non passi attraverso l'esperienza
- Anche nell'ipotesi che qualcuno riesca a descrivere esattamente come è il mondo, non c'è modo di affermare che è la “vera” descrizione.

Piaget

- Non si riceve la conoscenza passivamente attraverso i sensi o la comunicazione
- Lo sviluppo parte dall'individuo stesso, che *costruisce attivamente la conoscenza*
- Fattori esterni, come l'ambiente e le interazioni sociali, possono favorire lo sviluppo, ma non ne sono la causa
- I processi cognitivi servono al soggetto per organizzare il mondo esperienziale e non per scoprire una realtà ontologica oggettiva
- Consistono in
 - **Assimilazione**: incorporazione in uno schema già acquisito
 - **Accomodamento**: modifica della struttura cognitiva o dello schema comportamentale

Didattica costruttivista

- L'apprendimento individuale non avviene attraverso fasi standard prefissate
- E' necessario offrire a tutti le condizioni in cui ciascuno possa stabilire un proprio percorso individuale
- Ciò che l'insegnante può offrire sono stimoli ed indirizzamento, un contesto in cui poter apprendere
- Le parole e le azioni del docente vanno viste come oggetti tra quelli a disposizione per apprendere, insieme a testi e materiali
- La lezione tradizionale lascia il posto all'esperienza diretta

Constructionism - Kafai (Page 36)

Constructionism – the N word as opposed to the V word – shares constructivism’s view of learning as “building knowledge structures” through progressive internalization of actions...

It then adds the idea that this happens especially **feliculously** in a context where the learner is consciously engaged in constructing a **public** entity, whether it’s a **sand castle** on the beach or a **theory of the universe**

Constructionism - Kafai (Page 35)

Papert's constructionism views learning as building relationships between old and new knowledge, in interactions with others, while creating artifacts of social relevance.

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Discussione

- Quali sono i “gears of your childhood”?
- Riuscite ad identificare metodologie e suggerimenti presi da questi testi che possano essere immediatamente applicati?
- Riuscite ad identificare metodologie e suggerimenti di più ampio respiro?
- Ci raccontate qualche esempio significativo di insegnanti che, anche inconsciamente, seguivano questa scuola di pensiero?
- Qual è la vostra opinione sul pensiero di Papert?
- Riflessioni sullo stile di Papert
- Meta-riflessioni sulle mie lezioni

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Constructionism - Kafai (Page 35)

- Constructionism is not constructivism, as Piaget never intended his theory of knowledge development to be a theory of learning and teaching
- nor is constructionist learning simply discovery learning and thus opposed to any forms of instruction.
- in constructionism, people and not computers are seen as the driving force for educational change

Constructionism - Kafai (Page 36)

but teaching without curriculum does not mean spontaneous, free-form classrooms or simply 'leaving the child alone'. It means **supporting** children as they build their own intellectual structures with materials drawn from the surrounding culture. In this model, educational intervention means changing the culture, **planning new constructive elements** in it and eliminating **noxious ones**

Constructionism - Kafai (Page 37)

A child, using his own body, pretending to be the turtle, could execute every single one of these steps. Papert attributed great importance to this feature, which he called **syntonic** learning, because it allowed children to identify with the computational object in multiple ways

Constructionism - Kafai (Page 38)

A third and equally important feature of Logo programming is the idea of children learning about their own thinking and learning, called reflection or metacognition. Papert claimed that in learning programming, children learn to articulate procedures, recognize repetition, and “debug” their own thinking when programs don’t run as expected

Learning Logo thus combined multiple purposes: learning to program, learning mathematics, and learning to learn.

Constructionism - Kafai (Page 40)

Microworlds are the prototypical constructionist learning environment for the following reasons.

- scientific and mathematical microworlds offer access to ideas and phenomena that students may not easily encounter
- they provide environments that challenge naive understandings by providing the learner with feedback on their interactions and manipulations.
- these interactions with the microworld allow the learner to develop personal knowledge that can provide the foundation for more formalized interactions.
- microworlds create a type of learning environment in which talking about mathematics (or science) is part of the classroom peer culture.

Constructionism - Kafai (Page 42)

The curricular model of ISDP responded to several of the criticisms of previous Logo research (Palumbo, 1990).

First, it situated the daily programming activities in the class- room rather than in a distant computer laboratory visited only once a week.

Second, it integrated the learning of programming with other subject matter such as the learning of fractions, rather than keeping programming isolated from the rest of curriculum.

Finally, students were asked to create a meaningful artifact [...] rather than to produce small pieces of program code with no authentic purpose.

Costruttivismo/Constructionism - Ackermann

The implications of such a view for education are trifold: 1. teaching is always indirect. Kids don't just take in what's being said. Instead, they interpret what they hear in the light of their own knowledge and experience. They transform the input. 2 the transmission model, or conduit metaphor, of human communication won't do. To Piaget, knowledge is not information to be delivered at one end, and encoded, memorized, retrieved, and applied at the other end. Instead, knowledge is experience that is acquired through interaction with the world, people and things. 3. A theory of learning that ignores resistances to learning misses the point. Piaget shows that indeed kids have good reasons not to abandon their views in the light of external perturbations. Conceptual change has almost a life of its own.

Costruttivismo/Constructionism - Ackermann

Whether grounded in action as in Piaget's theory, or mediated through language as in Vygotsky's, most constructivist models of human intelligence remain essentially science-centered and logic-oriented –and so does Papert yet to a lesser extent.

In "Epistemological pluralism and the revaluation of the concrete" Papert and Turkle offer a far less canonical view on the mutual roles of formal and concrete knowledge which, to them, both prevail even in adults and scientists

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12 constructivist teaching behaviors (Brooks & Brooks)

- Encourage and accept student autonomy and initiative
- Use raw data and primary sources, along with manipulative, interactive, and physical materials
- When framing tasks, use cognitive terminology such as “classify,” “analyze,” “predict,” and “create”
- Allow student responses to drive lessons, shift instructional strategies, and alter content
- Inquire about students’ understandings of the concepts before sharing [your] own understandings of those concepts
- Encourage students to engage in dialogue, both with the teacher and with one another

12 constructivist teaching behaviors (Brooks & Brooks)

- Encourage student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other
- Seek elaboration of students' initial responses
- Engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion
- Allow wait time after posing questions
- Provide time for students to construct relationships and create metaphors
- Nurture students' natural curiosity through frequent use of the learning cycle model

Traditional classroom vs constructivist classroom

- Strict adherence to a **fixed curriculum** is highly valued
- Learning is based on **repetition**
- **Teacher-centered**
- Teachers disseminate information to students; students are recipients of knowledge (**passive learning**)
- Teacher's role is **directive**, rooted in authority
- Students work primarily alone (competitive)
- Pursuit of student **questions and interests** is valued
- Learning is based on **interaction**
- **Student-centered**
- Teachers have a dialogue with students, helping students construct their own knowledge (**active learning**)
- Teacher's role is **interactive**, rooted in negotiation
- Students work primarily in groups (**cooperative**)

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Cognitive Apprenticeship Framework

<i>Content</i>	Types of knowledge required for expertise
	Domain knowledge subject matter specific concepts, facts, and procedures
	Heuristic strategies generally applicable techniques for accomplishing tasks
	Control strategies general approaches for directing one's solution process
	Learning strategies knowledge about how to learn new concepts, facts, and procedures
<i>Method</i>	Ways to promote the development of expertise
	Modeling teacher performs a task so students can observe
	Coaching teacher observes and facilitates while students perform a task
	Scaffolding teacher provides supports to help the student perform a task
	Articulation teacher encourages students to verbalize their knowledge and thinking
	Reflection teacher enables students to compare their performance with others
	Exploration teacher invites students to pose and solve their own problems

Cognitive Apprenticeship Framework

<i>Sequencing</i>	Keys to ordering learning activities	
	Increasing complexity	meaningful tasks gradually increasing in difficulty
	Increasing diversity	practice in a variety of situations to emphasize broad application
	Global to local skills	focus on conceptualizing the whole task before executing the parts
<i>Sociology</i>	Social characteristics of learning environments	
	Situated learning	students learn in the context of working on realistic tasks
	Community of practice	communication about different ways to accomplish meaningful tasks
	Intrinsic motivation	students set personal goals to seek skills and solutions
	Cooperation	students work together to accomplish their goals

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Papert's Citations - About teaching

- The role of the teacher is to create the conditions for invention rather than provide ready-made knowledge.
- You can't teach people everything they need to know. The best you can do is position them where they can find what they need to know when they need to know it
- The goal is to teach in such a way as to produce the most learning from the least teaching
- The scandal of education is that every time you teach something, you deprive a student of the pleasure and benefit of discovery.

Papert's Citations - About schools

- Generally in life, knowledge is acquired to be used. But school learning more often fits Freire's apt metaphor: knowledge is treated like money, to be put away in a bank for the future
- The reason most kids don't like school is not that the work is too hard, but that it is utterly boring.
- Do away with curriculum. Do away with segregation by age. And do away with the idea that there should be uniformity of all schools and of what people learn.
- In a classical joke a child stays behind after school to ask a personal question. "Teacher, what did I learn today? " The surprised teacher asks, "Why do you ask that?" and the child replies, "Daddy always asks me and I never know what to say"

Papert's Citations - About schools

Nothing bothers me more than when people criticize my criticism of school by telling me that schools are not just places to learn maths and spelling, they are places where children learn a vaguely defined thing called socialization. I know. I think schools generally do an effective and terribly damaging job of teaching children to be infantile, dependent, intellectually dishonest, passive and disrespectful to their own developmental capacities.

Papert's Citations - About learning

- I am convinced that the best learning takes place when the learner takes charge
- Rather than pushing children to think like adults, we might do better to remember that they are great learners and to try harder to be more like them
⇒ MIT Lifelong Kindergarten

Piaget's Citations

- The principal goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done