# Constructionist Theory Overview
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     Constructionist theory expands the *constructivist* perspective on learning, which Papert (1993) defined largely in contrast with "instructionism." Compared to constructivist theory, constructionism emphasizes more on the art of learning and on the significance of learning through making (Ackermann, 2001). Learning is not only the construction of knowledge, but also the construction of the world in a more literal sense. By constructing artifacts, activities, processes, and other observable things which reflect and embody the meaning which is simultaneously being constructed, a positive feedback loop emerges: the construction of the thing contributes to the construction of knowledge, which contributes to the construction of the thing, and so on. Learning is inextricable from context and is the result of interactions between learners and features of their environments such as other learners, tools, resources, language, social structures, and so on. Thus, the use of external supports are essential in this learning process. Papert's constructionism, in this sense, is considered as more situated and pragmatic than constructivism (Ackermann, 2001). Constructionist theory provides a set of principles for the design of learning described below.
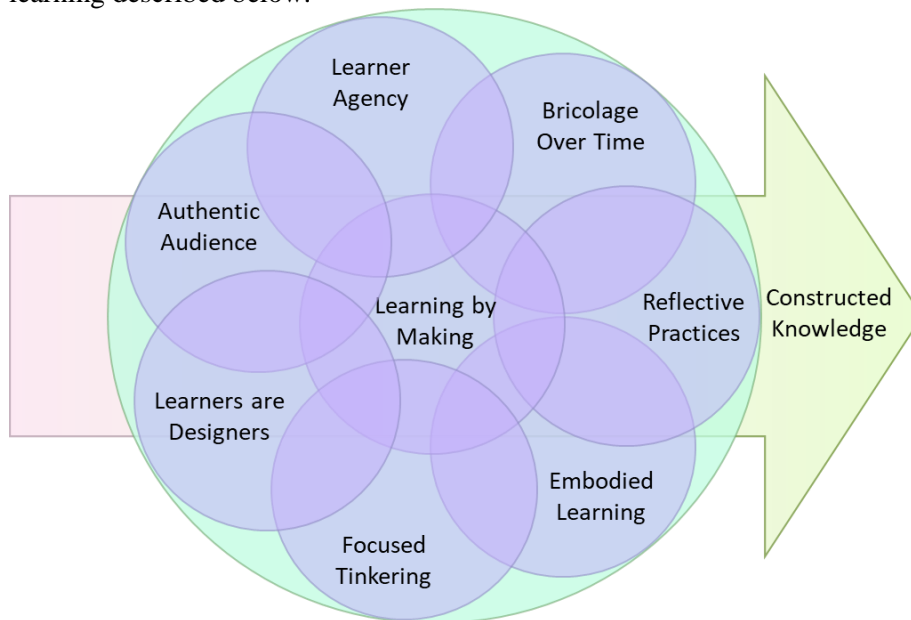
     Learning is most powerful when learners make things of their own design. The constructed artifacts mirror the construction of meaning occurring in the minds of the learners. The artifacts are tangible objects-to-think-with — tools of embodied cognition.

     Learners should be situated as designers. As designers on design teams, they engage in negotiation of goals, roles, procedures, tools, and meanings. They collaboratively design, prototype, iterate, and deploy their artifacts in the real world.

     The artifacts must be personally meaningful, which depends on some preconditions. The first of these is the agency of the learner. When learners have autonomy and authority over the goals, processes, roles, and nature of the artifacts, those artifacts take on personal significance. Artifacts are embodiments of the meanings the learners have constructed, and the act of constructing meaning involves constructing one's own mind. Therefore, learner agency in constructionist learning leads to ownership and authorship of self.

     Another precondition to meaningfulness of artifacts is the authenticity of the intended use of the artifact. If learners create artifacts which they know will only be seen by their fellow learners and

teachers, construction of artifacts is akin to drill-and-practice activities. Learners need to know that the artifacts they are creating will have real-world impact. They need authentic audiences.

Resnick and Rosenbaum (2013) define tinkering as "a playful, experimental, iterative style of engagement, in which makers are continually reassessing their goals, exploring new paths, and imagining new possibilities." Situating learners as designers fosters a more focused form of tinkering which facilitates development of skills in framing, reflection, and reflection-in-action. Focused tinkering provides a means of balancing the product-driven activity of artifact construction with the joy and freedom of exploration. This tinkering involves a great deal of productive failure, and combined with learner agency learners develop bricolage skills. A bricoleur is one who skillfully uses whatever materials, tools, processes, frameworks, and ideas they find at hand, often using these things in new ways and for new purposes.

Constructionist Theory - Learning Activity Design Principles
- Engage learners in making things (physical things, digital things, representations, processes, frames/theories, etc.).
- Give learners the agency to determine what they will design, and how they will go about constructing it - be careful not to dictate goals and processes beyond general parameters outlined by the course learning outcomes.
- Engage learners in constructing things that have a real-world impact or audience beyond the course, particularly things that solve real-world problems (immediately - not hypothetically or in the future after they graduate).
- Help learners develop skills in focused tinkering and the ability to keep trying many approaches while embracing failure.

References
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