10 Models of Teaching + Learning

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Introduction

Here we have collected 10 models,
each of which answer the questions:
What is teaching?
What is learning?

Each model is partial—incomplete.
But each provides a point of view, a frame.

The models are arranged from simple to complex.

They begin with two open-loop processes.
Model 1, the famous he Nuremberg Funnel,
frames teaching as content delivery.
In Model 2, Shannon provides a richer view of
communication,
adding encoding/decoding and noise to the process.

Models 3 + 4 close the loop,
introducing feedback to the process—
first external assessment and then self-regulation.

Models 5 + 6 + 7 + 8 add other levels of feedback,
introducing second-order systems—
first more levels of external assessment,
then systems for helping organizations learn
and systems for generating knowledge within a discipline,
and finally framing students as second-order systems.

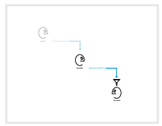
Model 9 + 10 are about conversation—
defined as interaction between two second-order
systems—
first a conversation between teacher and student
and then more broadly a conversation between
a community of learning and a community of practice.

We acknowledge that the collection is incomplete,
and we invite others to share their models.

We offer the collection based on the belief
that teaching + learning are fundamental
to creating the sort of society
in which we would all like to live—
but that current processes of education are far from ideal.

We also believe that improving education
(defining and reaching a desired state)
requires understanding the current state.

We believe models may aid discussion
about where we are and where we should go.

1 

Nuremberg Funnel
Teaching as content delivery

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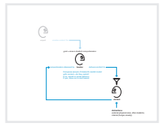
Shannon's Model of Communication
Introducing the problem of noise in transmission

3 

Assessment: External Regulation
Checking that students received "the message"

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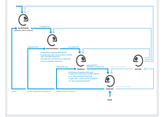
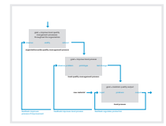
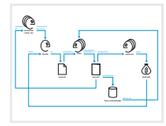
Self-regulation
Learning by acting in the world

5 

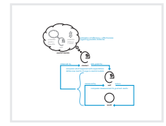
Second-order Assessment
Regulating the regulators

6 

"Boot-strapping:" How Organizations Learn
Improving the way we improve

7 

Feedback Supports Knowledge Creation
Aligning goals + incentives

8 

Students as Second-order Systems
Reflecting on goals + means while acting

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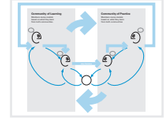
Teaching + Learning as Conversation
Two second-order systems interacting

10 

Communities of Learning + Practice
Embedding education in a larger system

Nuremberg Funnel

Teaching as content delivery

This model claims that learning is simply a matter of passively “absorbing” what the teacher presents, and that every student is capable of “taking in” content no matter what the form or subject.

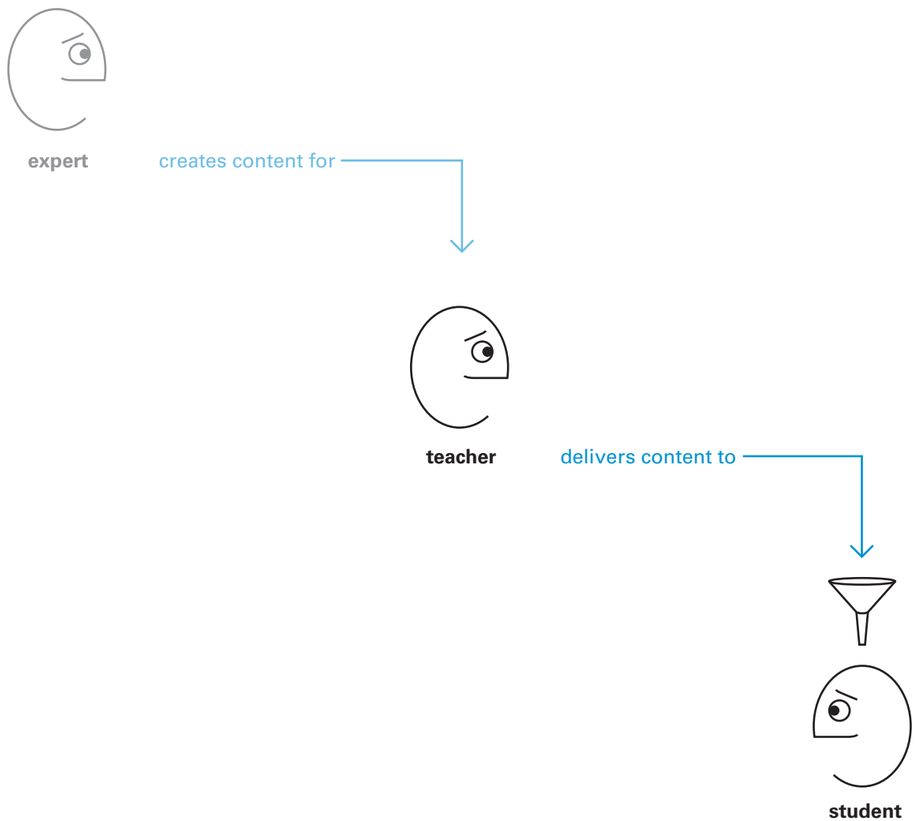
This model separates content from teacher and implies teachers are interchangeable (likewise students).

It also suggests content can be created by an author (expert) independent of teachers and students.

Of course, sometimes teachers are experts.

Delivery of a message does not ensure learning:

- The message may not be received.
- Receiving may not be the same as understanding.
- Understanding may not be the same as learning.
- Students may not learn (or may not study) unless they foresee a penalty (or reward) for doing so.
- In order to understand a second message, students must often understand a first message. (This suggests that learning “builds on a foundation.”)

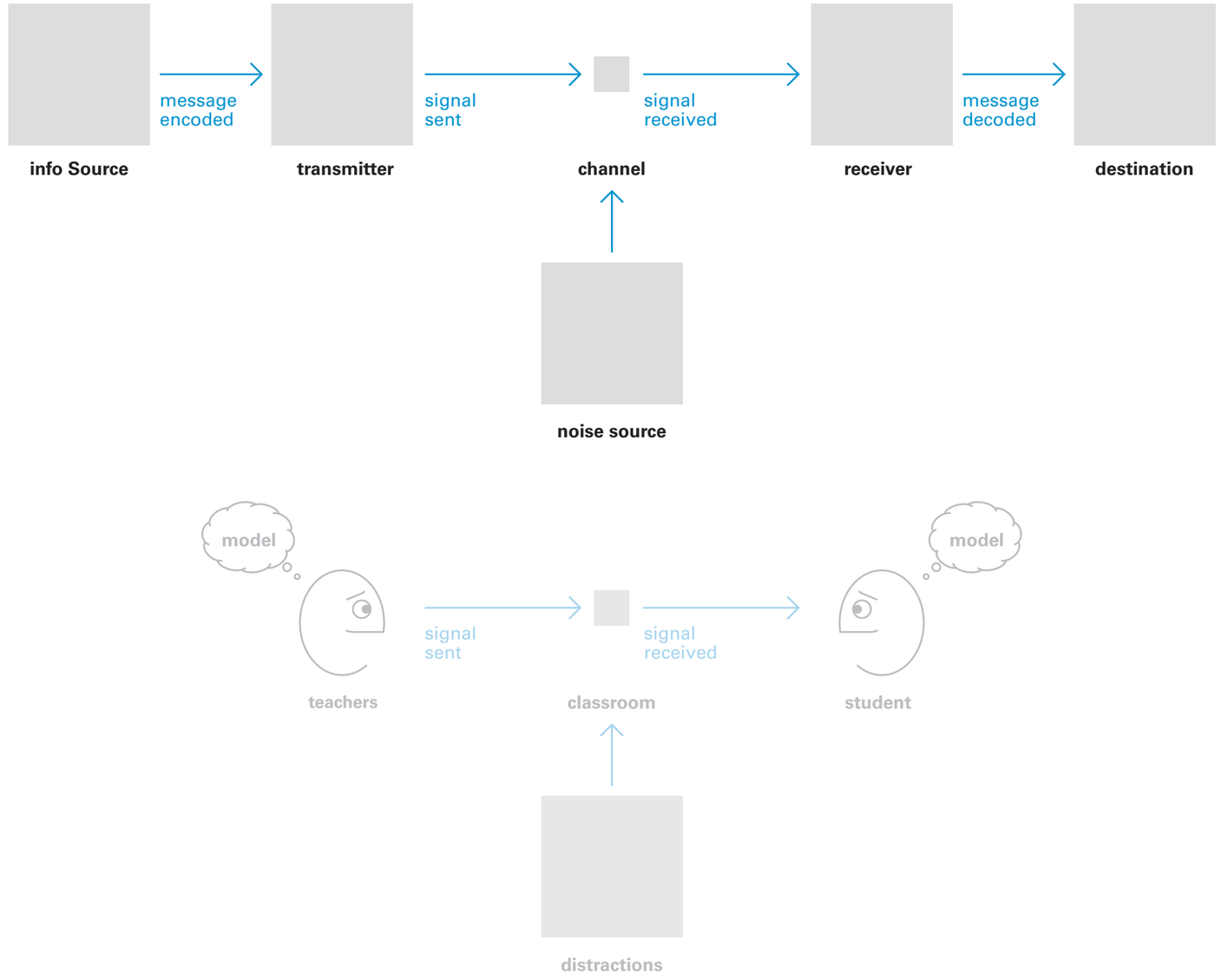


Shannon's Model of Communication

Introducing the problem of noise in transmission

This model assumes sender + receiver
share a common vocabulary
(which makes encoding + decoding possible);
but a goal of education is to expand students'
vocabularies, a process this model does not describe.

Shannon explained how adding redundancy
in a message can compensate for noise in a channel.
This is analogous to saying that repetition is sufficient
to compensate for failure of a student
to correctly decode a message.



Assessment: External Regulation

Checking that students received “the message”

This model is like any feedback system.
For example, a captain gives the order
to dock the ship at port (sets a higher level goal).
The pilot sets a course toward port by moving the wheel
and then watching to see if the ship veers off
because of wind or tide.
If so, the pilot compares the current heading
with the desired heading
and adjusts the wheel accordingly.
At a lower level, changing the heading
translates into setting a new goal
for the “wheel angle” (or rudder angle).

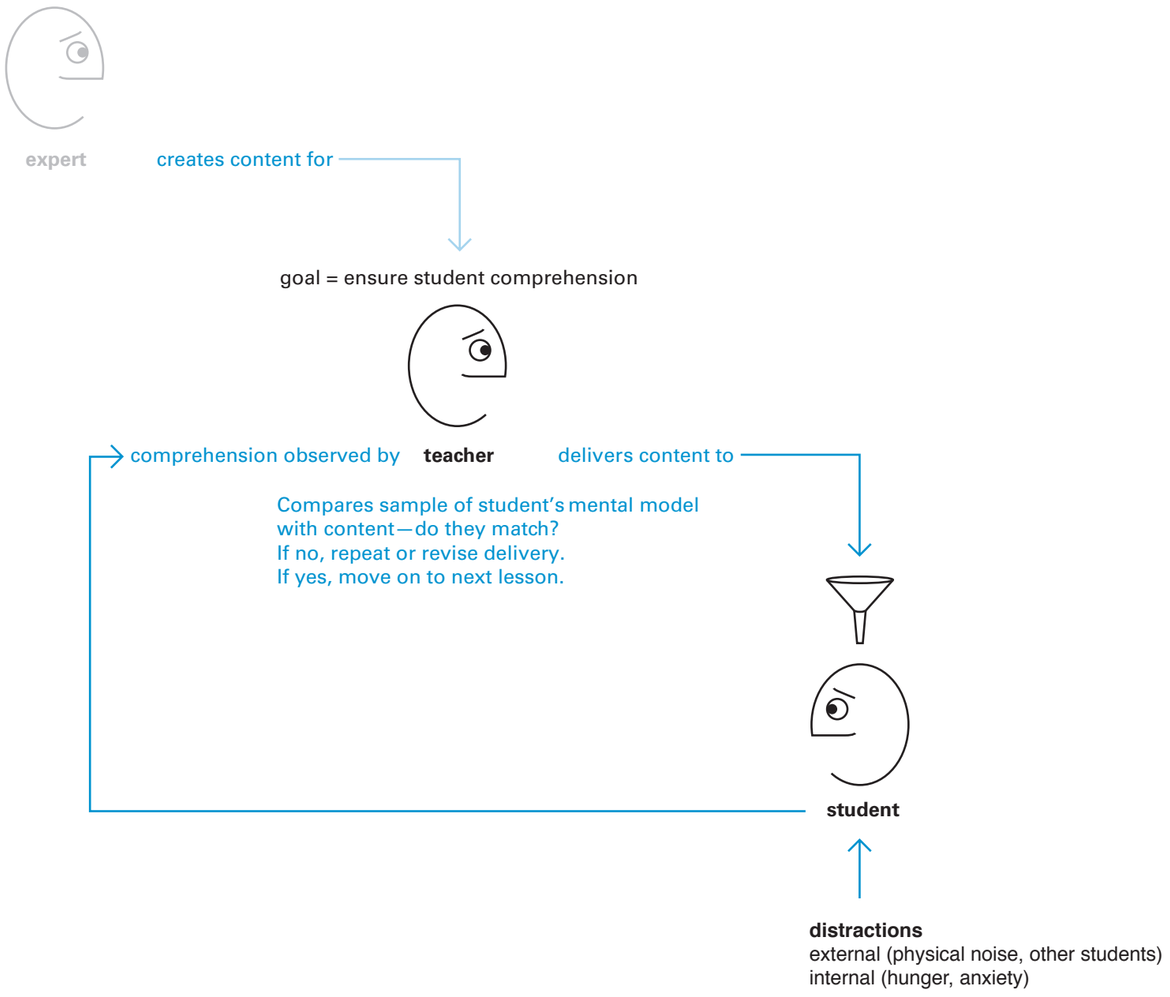
This model assumes teachers have a responsibility to
ensure that their students learn.

Teachers organize a series of “lessons”
(lectures, exercises, etc.) which lead to mastery
of a higher-level “unit”.

When students demonstrate competence in one lesson,
the teacher then moves on to the next.

SRA is an example of this model applied first to teach
reading and later to other subjects.

One issue with this model is that
both teachers and students are accountable
to agents outside the model.



Self-regulation

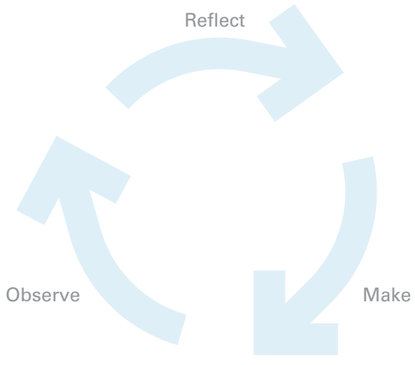
Learning by acting in the world

Students learn by acting in the world,
measuring the effects of their actions,
comparing those effects to their goals,
and modifying their actions to bring the effects
more in line with their goals.

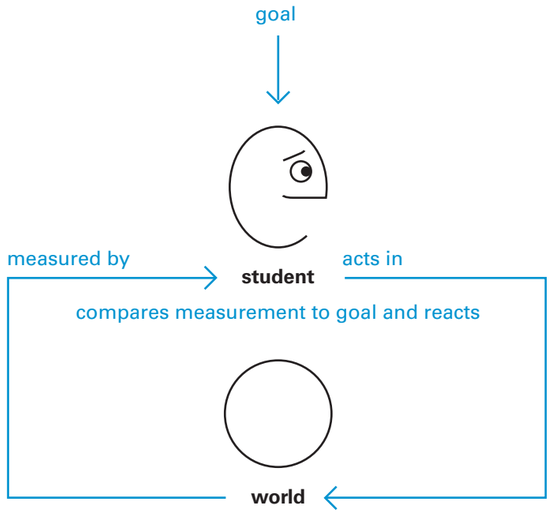
"Acting in the world" could be operating a simulation,
or teaching back to the teacher, or teaching each other.

This model frames students as seeking to maintain
a relationship with their environment.
It argues that learning cannot be "dis-embodied"
and is not merely a matter of mind
or an exchange of messages.

However, learning is not mere regulation;
a float valve does not learn.
First-order systems cannot change goals or strategies.



By framing learning as self-regulation,
we can see its relationship to design
and the creative process



Second-order Assessment

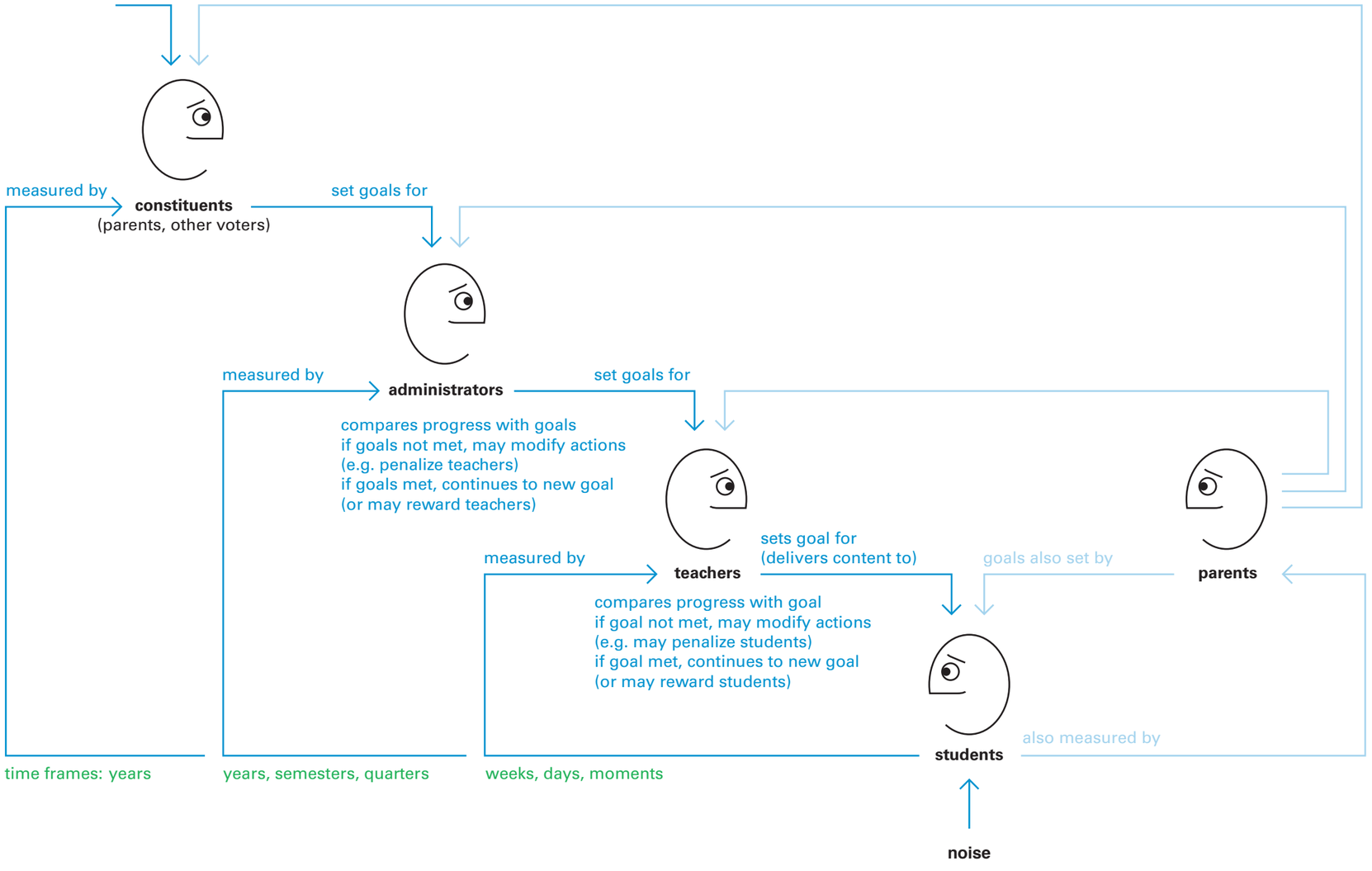
Regulating the regulators

Institutions are complex systems with many levels of feedback, operating across many time scales.

Constituents (e.g., parents) regulate administrators.
Administrators regulate teachers.
Teachers regulate students.

Students receive feedback on their performance from teachers and parents.

Likewise, teachers and administrators may receive feedback on their performance from parents—and even from students.

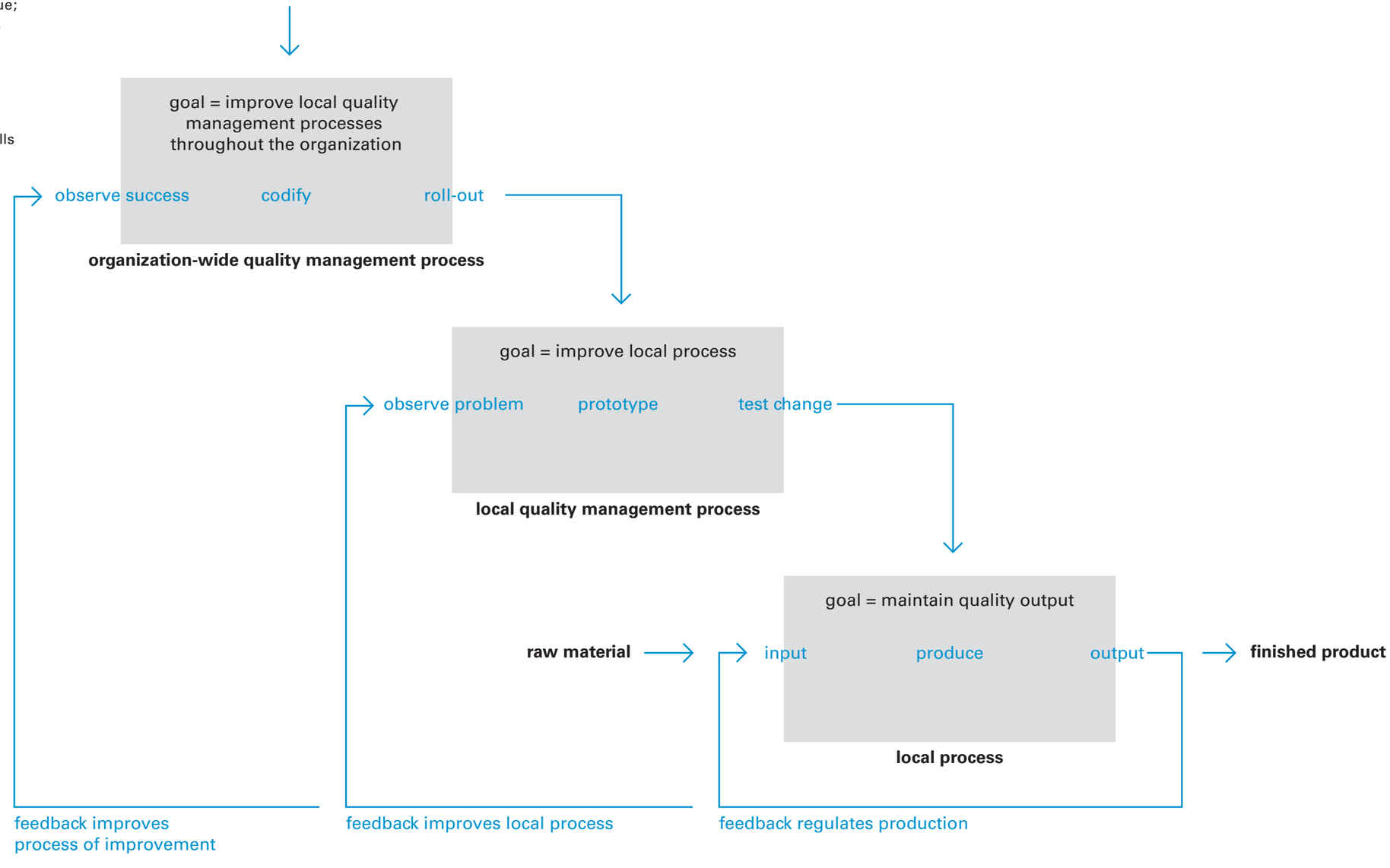


“Boot-strapping:” How Organizations Learn

Improving the way we improve

The quality cycle (plan, do, check) is a first-order feedback loop—a process used by quality teams to improve the way they implement a basic process. (Basic processes are likely to include self-regulation). An additional process monitors the work of all quality teams; identifies local solutions and processes that may have wider value; and distributes them to other parts of the organization.

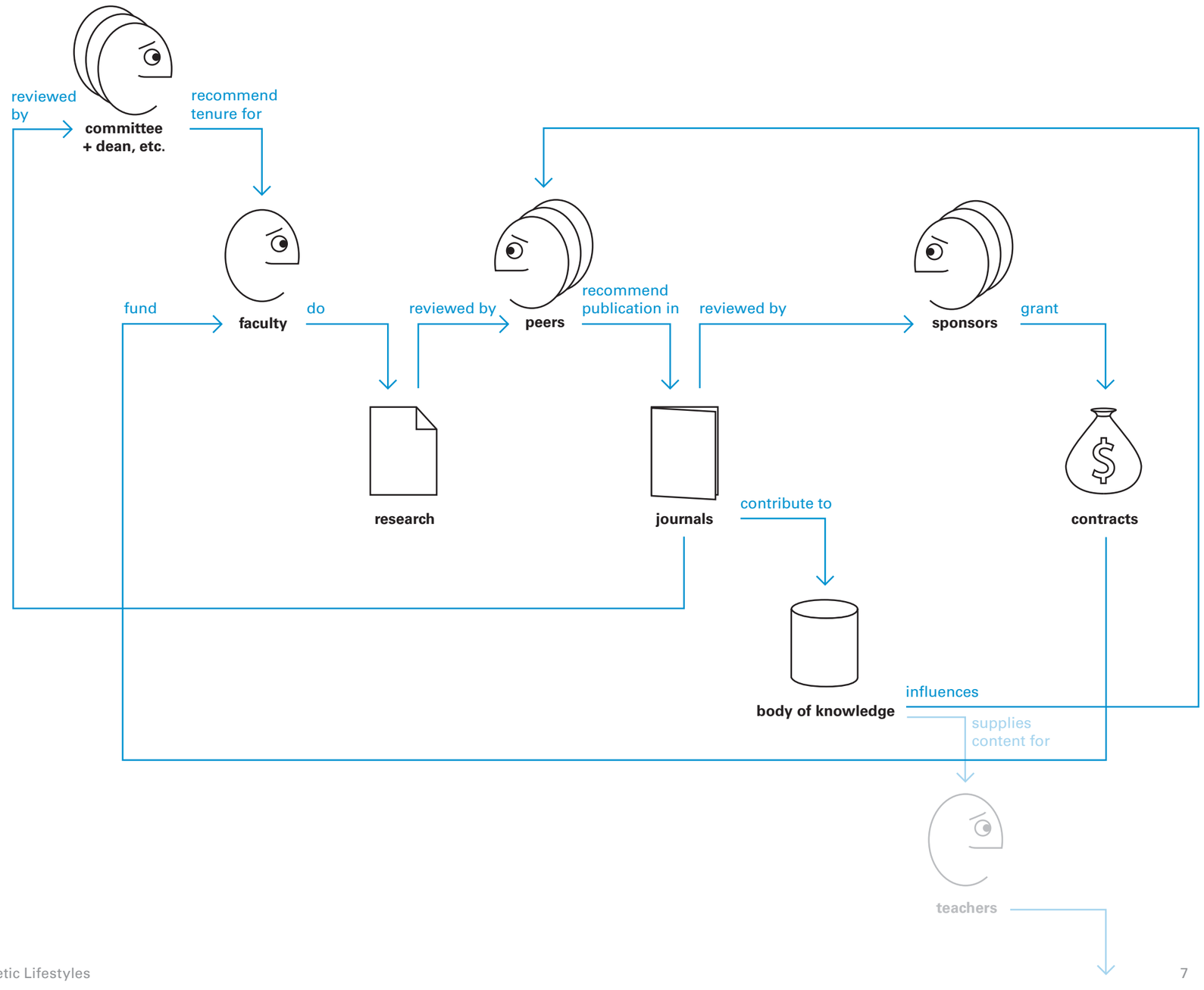
Walter Shewhart formalized the quality cycle, and his protege Edward Demming made it famous. Doug Engelbart refers to “the process of improving ‘the process of improving’” as “boot-strapping”; boot-strapping is a component of what Peter Senge calls a “learning organization.”



Feedback Supports Knowledge Creation

Aligning goals + incentives

Faculty seek long-term financial stability,
which makes tenure attractive.
Tenure requires publishing in peer-reviewed journals.
Journals seek new ideas based on new research.
Research requires funding, which is made more likely
by previous funding, research, and publishing.



Students as Second-order Systems

Reflecting on goals + means while acting

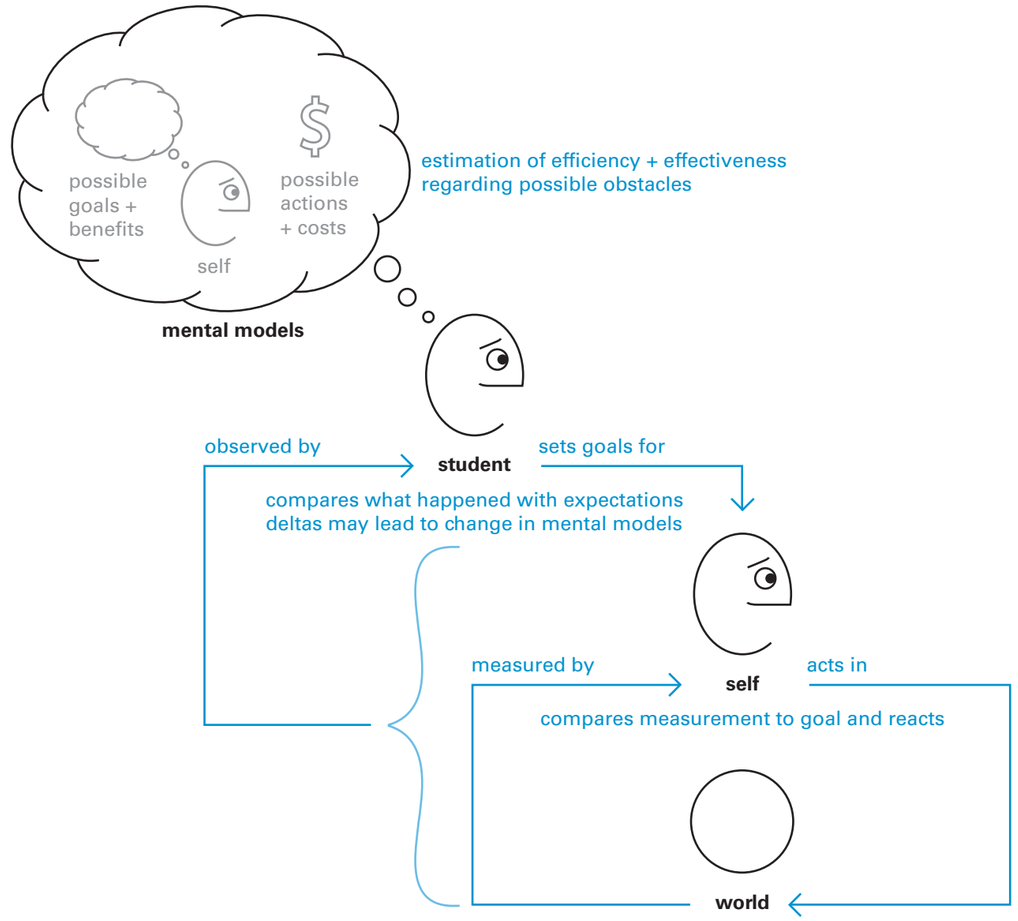
Students have a mental model of themselves,
a model of their goals,
and a model of possible actions (process for achieving goals)
which include effectiveness (how well an action achieves a goal)
and efficiency (how easily an action achieves a goal).

Students observe themselves acting in the world
and may reflect on the value (= benefit - cost) of strategies
(lower-level goals + actions) in achieving higher-level goals.

In the process, they may change goals within a specific strategy
or even change strategies.

Reflecting on actions changes their mental models,
in particular changing assessment of effectiveness and efficiency.

This model can describe experimenting and designing.
It posits learning as assessment of our actions,
which causes us to revise our mental models.



Teaching + Learning as Conversation

Two second-order systems interacting

Much of higher learning involves conversation—
sharing + testing understanding in order to reach agreement.
We might argue that all reasoned learning
(anything above simple stimulus-response conditioning)
is based on conversation, even if that conversation
is with oneself.

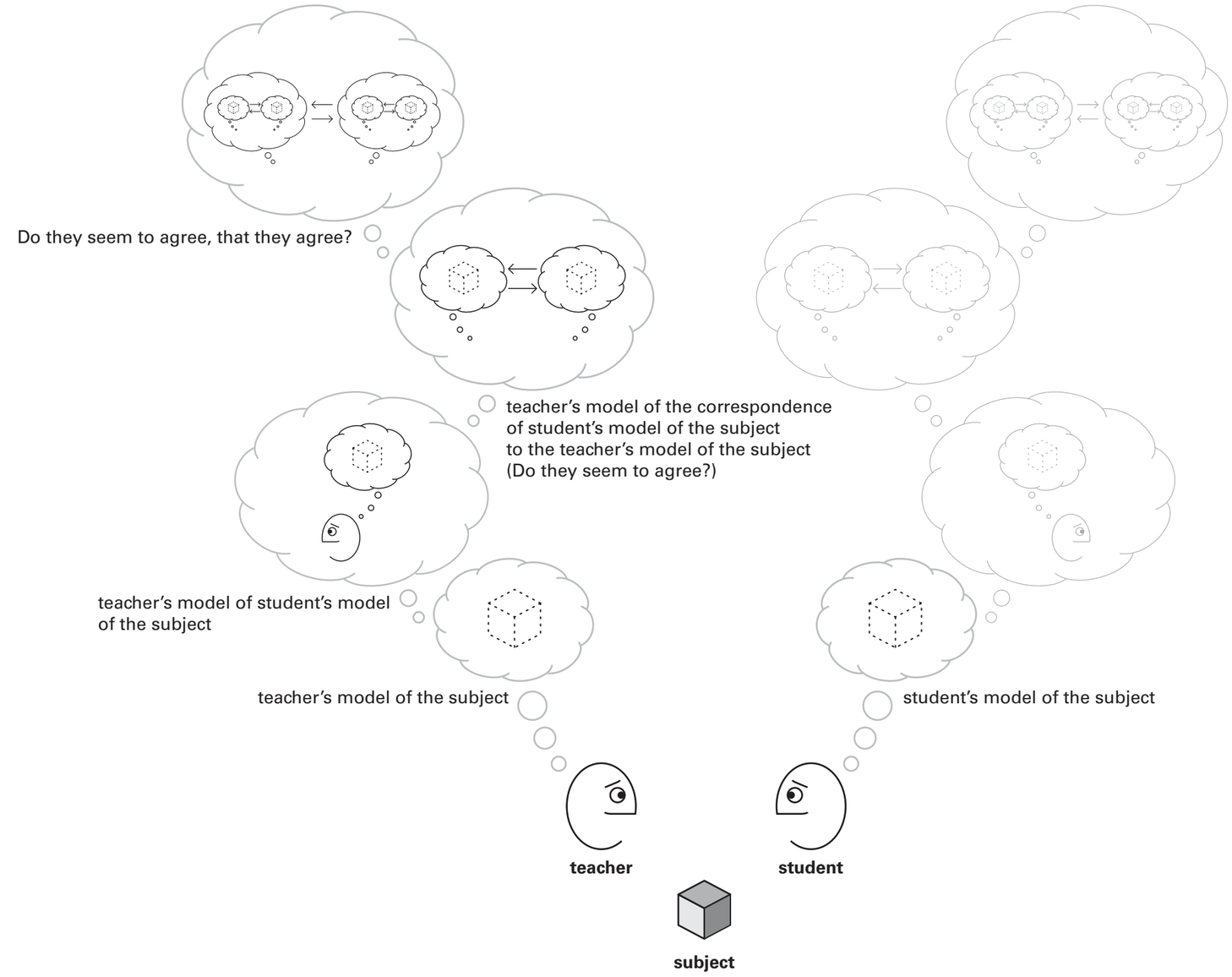
Conversation is required to understand and integrate
new information into prior models.
(To put it another way: Conversation is required to change
beliefs, and by definition learning is a change in belief.)
For example, watching a videotaped lecture requires a student
to focus on the topics being highlighted by a lecturer,
as well as to listen and understand how those topics interact—
which of all possible aspects of each topic do
and do not relate to the points being made—
to create a perspective or an idea that is new to the student.

The student literally re-makes the concept coming
from the lecturer by taking different perspectives
that would arise if it were an actual conversation
wherein the student and the lecturer re-constructed how
the pieces fit together. The student learns
the material by consciously running through how and why
the topics are inter-related to create a new, coherent,
complete concept.

As a result of the exercising of these perspectives,
the student's model matches the lecturer's model
to a sufficient degree to say that the student
"understands" the material.

We might even say that mastering a discipline means entering
into a series of conversations with members of the community
that comprise the discipline—even if one's access is restricted
by place and time so that the conversation is essentially only
within our imagination.

This model can describe the process by which an individual's
vocabulary grows—and the process by which a group
increases the scope of language available to it
(i.e., increases its "variety," in Ashby's terms).



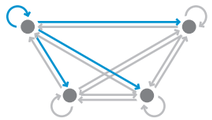
The process repeats as we discuss:
1) teacher's model
2) student's evolving model
3) degree of agreement

Subject may change:
1) current situation
2) desired situation (goals)
3) actions for achieving goals (means)

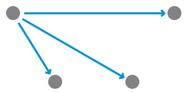
Communities of Learning + Practices

Embedding education in a larger system

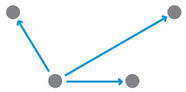
Students learn from both teachers and other students. Students + teachers form “a community of learning”. When students graduate, they may join a “community of practice”. In a healthy discipline, the two communities are engaged in conversation: The community of learning teaches the community of practice; likewise the community of practice teaches the community of learning.



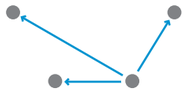
Each actor learns from observing herself and the others.



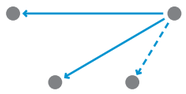
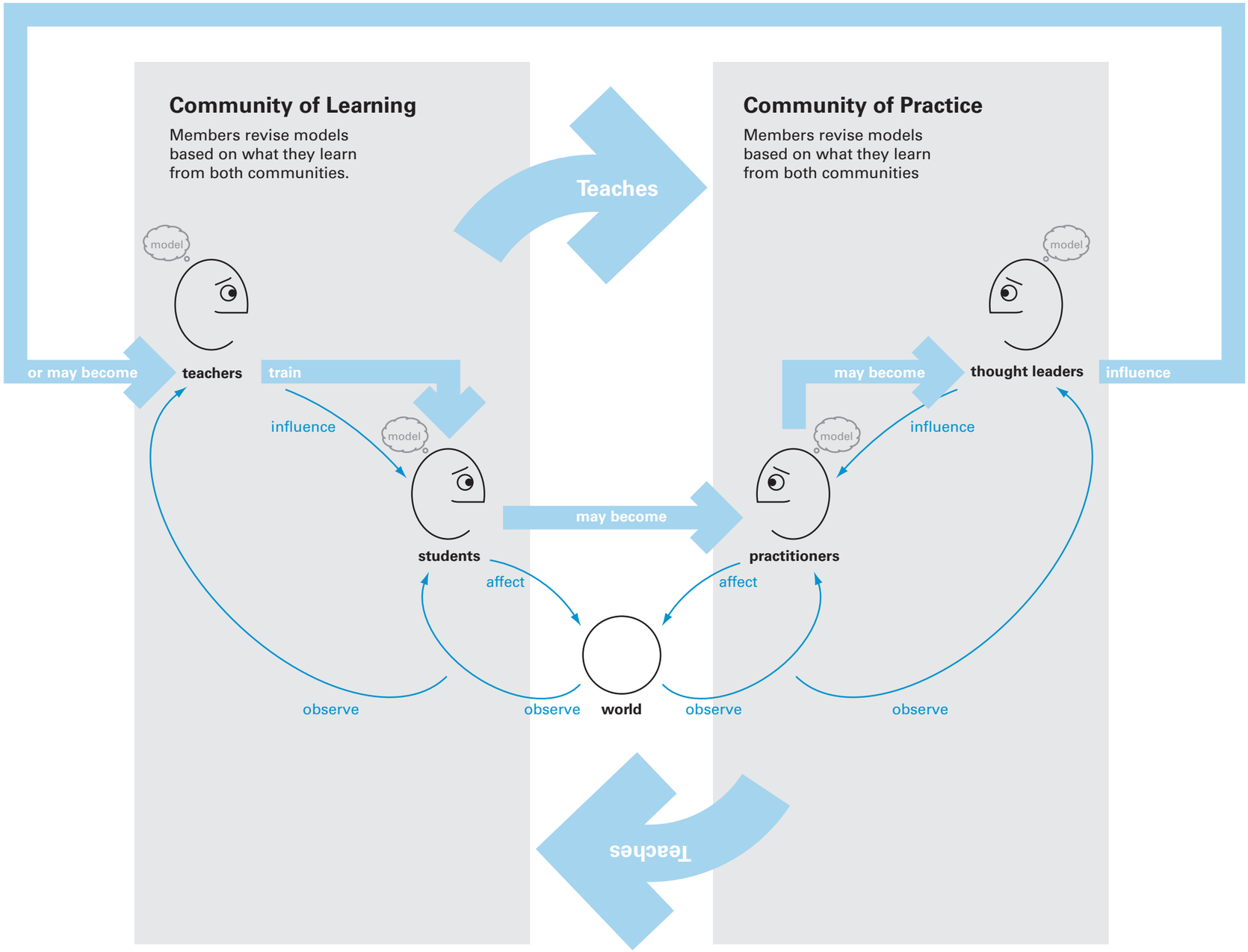
Teachers may become students, practitioners, or even thought leaders.



Students may become practitioners, thought leaders, or teachers.



Practitioners may become students, thought leaders, or teachers.



Thought leaders are typically already practitioners; they may become teachers or students