Formal and Informal learning - working together

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Experimentarium 26.03.2007

’School is a time-consuming and generally ineffective way to learn’

"If you want to build a boat, do not instruct the men to saw wood, stitch the sails, prepare the tools and organize the work, but make them long for setting sail and travel to distant lands."

(Antoine de Saint-Exupery)

Formal ↔ Informal

Formal learning is

- official
- curriculum-fixed
- scheduled
- pedagogically designed

  (organized learning paths, didactically build up learning sequences)
- controlled
- often instrumentally motivated
- evaluated, graded (certified)

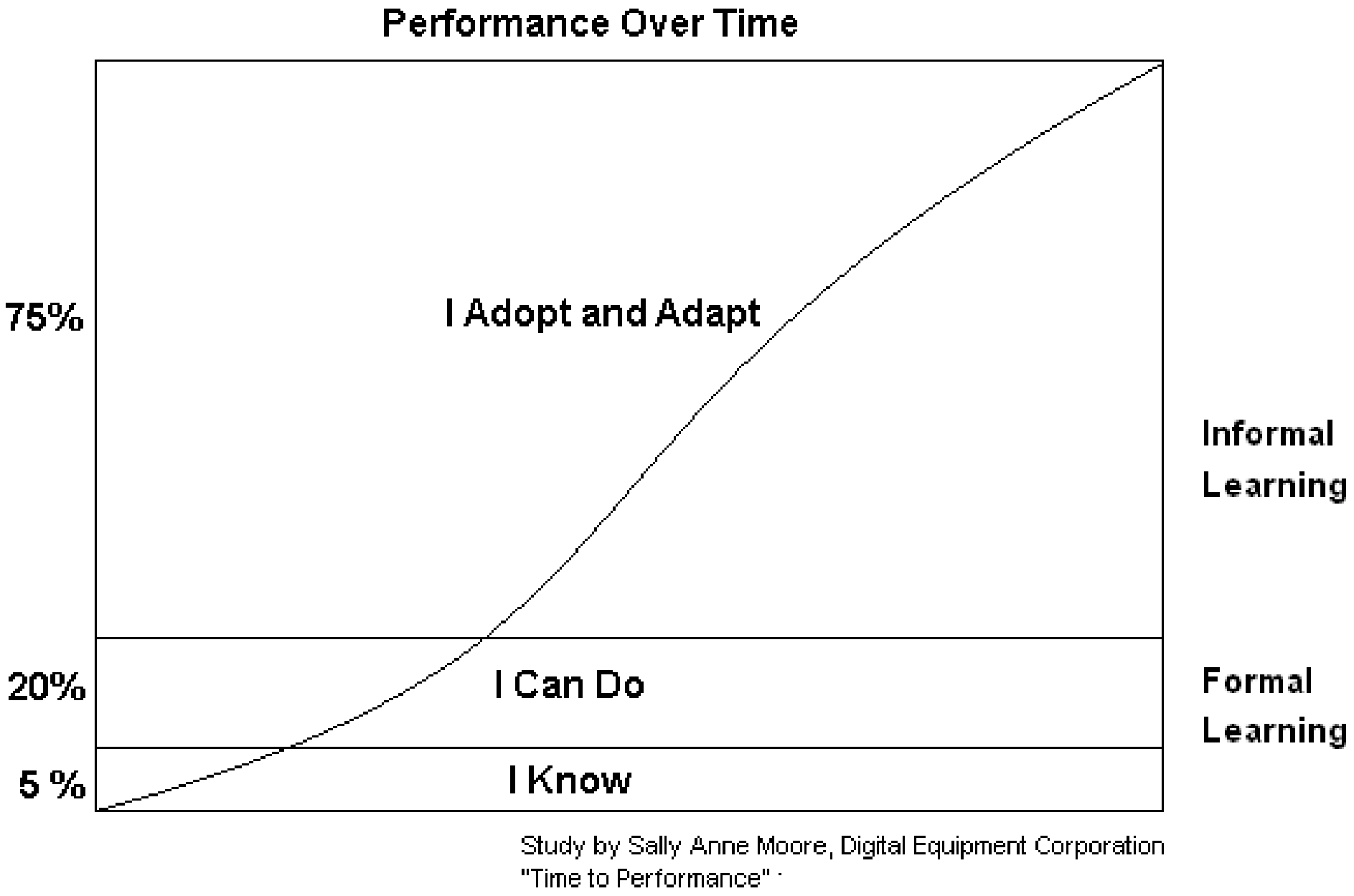
Informal learning

- is unofficial
- serves a concrete purpose
- happens when you need it
- is unstructured

  (asking a friend, reading a news paper)
- is uncontrolled, part of everyday life
- is intentionally driven
- is often tacit

Where on this continuum do you (want to) find the science centres and museums?

Where on this continuum do you (want to) find the school?


Performance Over Time
75%
I Adopt and Adapt
Informal
Learning
20%
I Can Do
Formal
Learning
5 %
I Know
Study by Sally Anne Moore, Digital Equipment Corporation
"Time to Performance"

When have you learned science?

- when you know (?) the concepts
- when you master the theory
- when you can solve the equations
- when you can work out the solution of a problem
- when you can speak the science jargon
- when you are able to do practical work in the lab
- when you can cope with everyday situations involving science
- …

Strong links between your conceptions of science and

the way you teach science

the way you behave in situations involving science.

Various educational aims

The scientific society

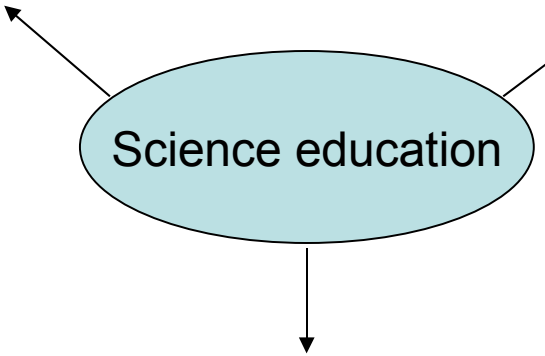
The civil society

(Acquisition of knowledge)

(Reflections on knowledge)

Qualifications→
Core curriculum

Bildung



Scientific literacy

Competencies

(Knowledge in action in relevant situations)

Working life & private life

Learning in school

- Learning as a combination of cognitive, social and affective processes
- Drawing on a wide range of learning theories (or should …)
- Pays attention to motivational problems (students are interested in science, but not in science education!)
- Learning is mostly organised within subjects (historically and socially developed)
- A didactical approach ensures a pedagogical interpretation of the subject knowledge (external and internal didactical transposition)

Various learning theories

Behaviorism Learning through behaviour

Cognitivism Learning abstract knowledge

Socioculturalism Learning as social behaviour within a culture

Situated cognition

Dialogical learning

Authenticity

Apprenticeship

Practicism Learning through participation

…..

Teaching for learning

Teaching which engages the learning in constructive, in addition to receptive, learning typically involves (Biggs, 1989):

- a positive motivational context, hopefully intrinsic but at least one involving a felt need-to-know and a aware emotional climate
- a high degree of learner activity, both task-related and reflective
- interaction with others, both at the peer level with other students, and hierarchically, within "scaffolding" provided by an expert tutor
- a well-structured knowledge base, that provides the longitude or depth for conceptual development and the breadth, for conceptual enrichment

New trends in science education

Contradictory tendencies: Standards (back to basics) and literacy (be ready for the global future) at the same time

The impact of PISA

Competence orientation

The concept of competence

- refers to the necessary prerequisites available to an individual or a group of individuals for successfully meeting complex demands
- should be used when the necessary prerequisites for successfully meeting a demand are comprised of cognitive *and* (in many cases) motivational, ethical, volitional, and/or social components
- implies that a sufficient degree of complexity is required to meet demands and tasks
- implies that much must be learned, but cannot be directly taught.

Competence is
- a preparedness for action
- based on knowledge
- displayed in a concrete situation

Competencies try to capture the common practice of the subject – across the different disciplines of the subject.

'The essence' - superior to the concrete content.

Why this shift towards competencies?

- Generel social trends: Increased complexity and contingency → difficult to formulate precise demands → increased emphasis on generel, social, and personal competencies
- Requirements from the business world – the insufficiency of the school
- Insight from learning theory: The lack of transfer of traditionel school knowledge (the situatedness of learning)
- Pragmatic reasons: You need a floating denominator to catch something new
- The adaptation of the educational system to the liberal society? Or a way to a progressive pedagogy?

What is science? – a pragmatic view

In the established practice science makes use of some characteristic ways of knowing:

Reductionism Causality	⇒ Modelling
Interplay theory – reality	⇒ Eksperiments
Description, presentation etc.	⇒ Representations
Theory of science (verification/falsification)	⇒ Knowledge about science

The fundamental science competences

The students should be able to

- build, use, and analyse models
- plan, perform, and describe experimental/practical work
- understand and transform between different representations of the same phenomenon
- put science into cross curricular, historical, philosophical, and personal perspectives (the Bildung dimension)
- (communicate, argue, ask questions, etc. like in all subjects)

The competence leap

What must the students **know** –

and what must they **do** to achieve this?

What must the students be able to **do** –

and what must they **know** to do this?

Educational setting

- High degree of student participation
- Groupwork, problemorientated
- Planning and teaching larger units (no single lessons)
- Open ended questions (uncertainty and diversity)
- Dialogue/argumentation
- Guided discovery
- Complex assessment assignments, groupbased project examination

The education is *explorative* and *community* organised

Differences between formal and informal learning

The strengths of school:

Time, room and tradition for reflection

A long tradition for didactical thinking

The weaknesses of school:

The institutional frame

The strengths of science centres:

Creation of situations where science is put into action – often interactive

Lend variation to school

The weaknesses of science centres :

Its isolated situations

Convergence between formal and informal learning

The challenge is to create a learning environment which mixes formal and informal learning. Build situations which make use of the experiences and tools from formal and informal learning in new contexts:

- The investigative attitude and fun from science centres
- The reflection and seriousness from school
- The process orientation (learning takes time) from school
- The complex, often every-day related situations from science centres
- The insight from learning theory and subject knowledge
- The innovative display and communication skills
- …

Establish development projects across schools and science centres (action research)

Research on the relations between formal and informal learning (A research centre)

Focus on the teachers

Few axioms are more fundamental than the one that acknowledges the link between what happens to teachers and what happens to students...the idea of making classrooms into learning communities for students will remain more rhetoric than real unless schools also become learning communities for teachers.

Sergiovanni 1996

Development of new knowledge

		TO	TO
		Tacit knowledge	*Explicit knowledge*
FROM	*Tacit knowledge*	Socialization (share experience)	Eksternalization (articulate)
FROM	*Explicit knowledge*	Internalization (action)	Combining (exchange, systematize)

Efter Nonaka og Takeuchi (1995)