Introduction to studies

Learning skills, brain & cognition

2009

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Contents

- Intelligence and learning
- Brain and cognition
- Learning styles and cognitive skills
- Self-regulation
- Motivation

Course contents (core content level)

The course supports professional identity formation and gives a foundation to develop strong workplace and interpersonal skills.

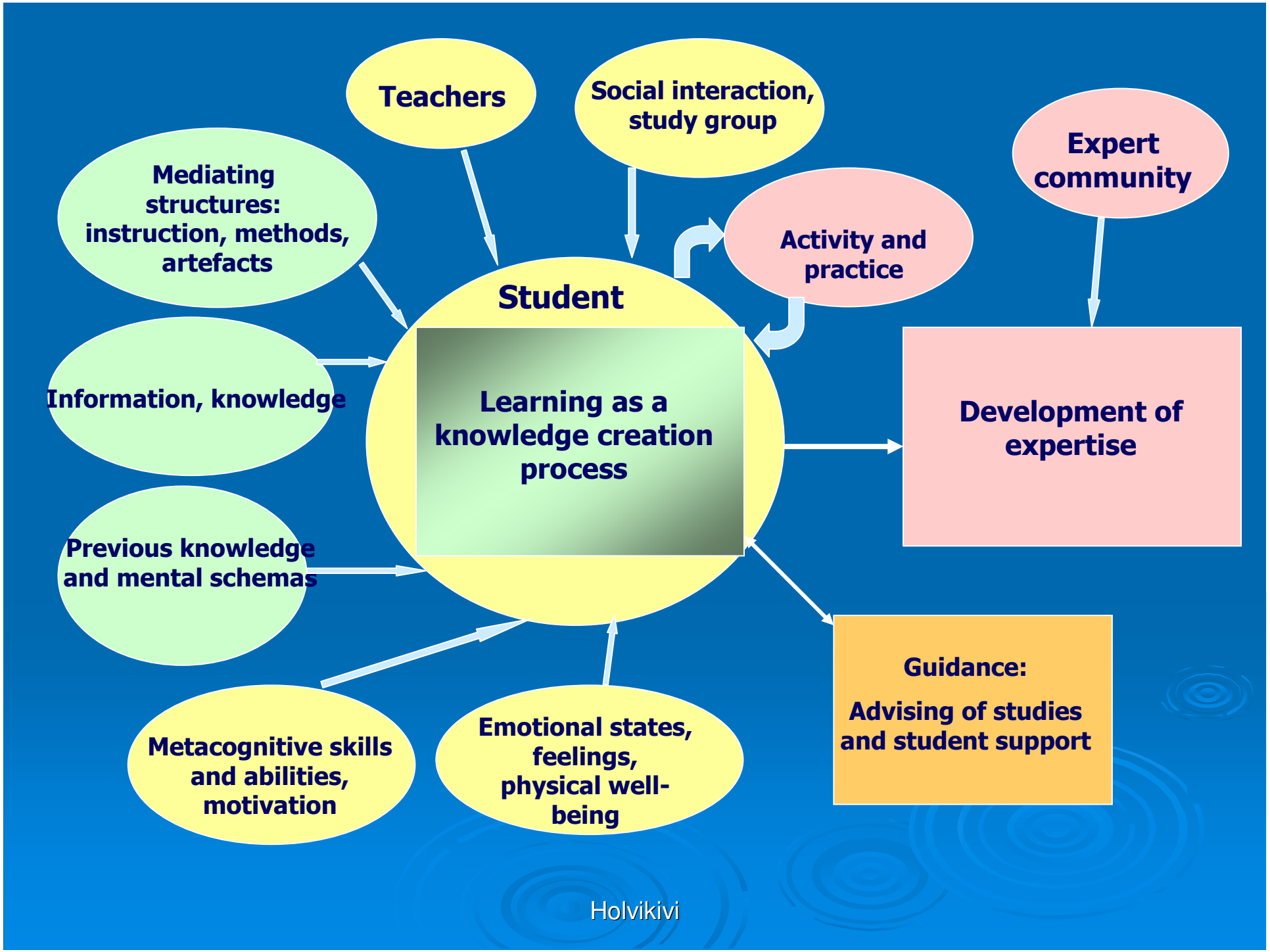
Core content:

- familiarization with university studies and the study community;
- university practices and the study environment: physical environment (buildings and classrooms, information systems, services, and study aids) and social environment (support networks, safety and well-being, student community, and collaboration)
- academic competence (study skills and ability to plan studies)
- professional growth and internationalization skills (multiculturalism and student exchange)

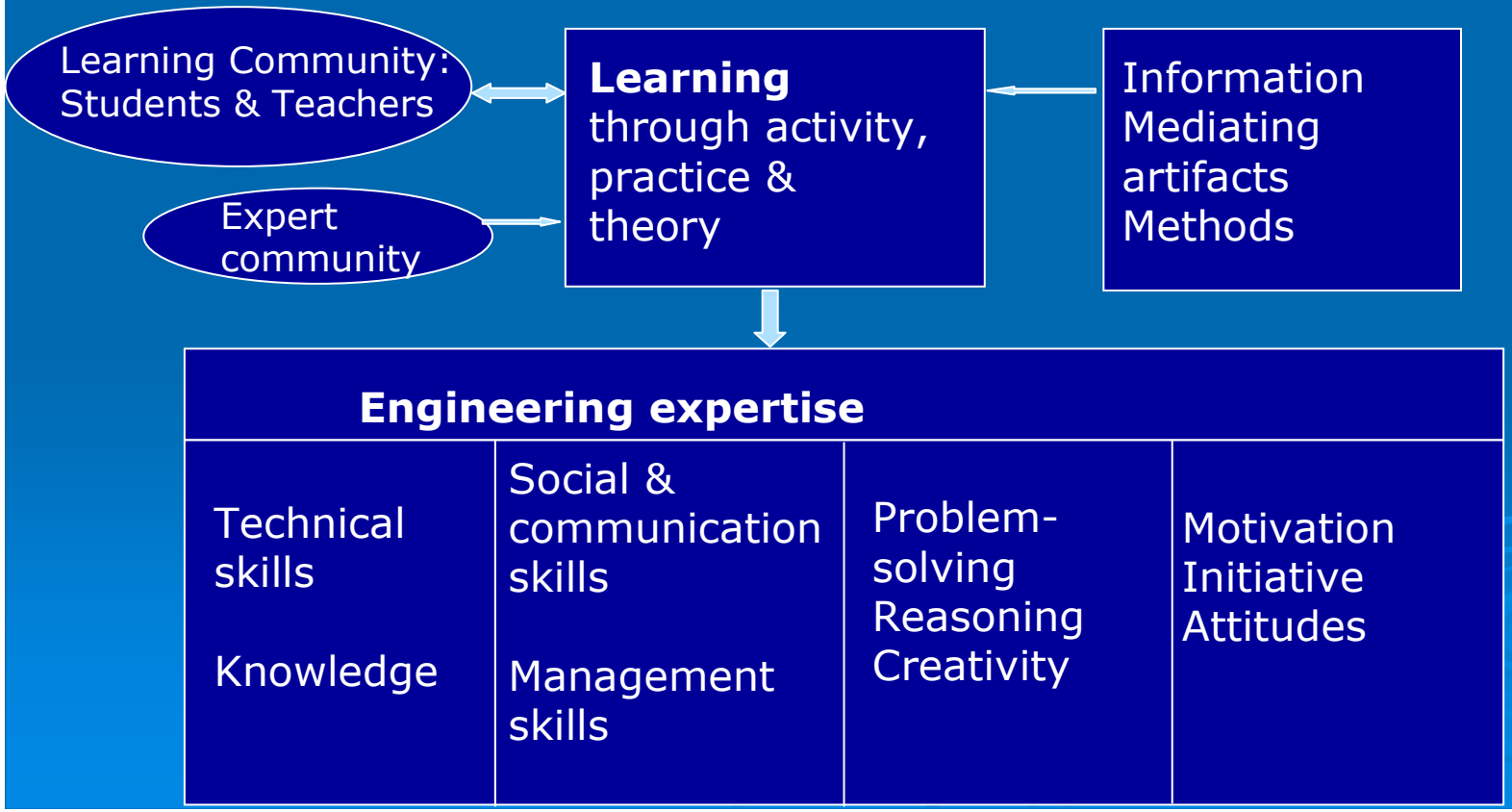
Core content level learning outcomes (knowledge, understanding and skills)

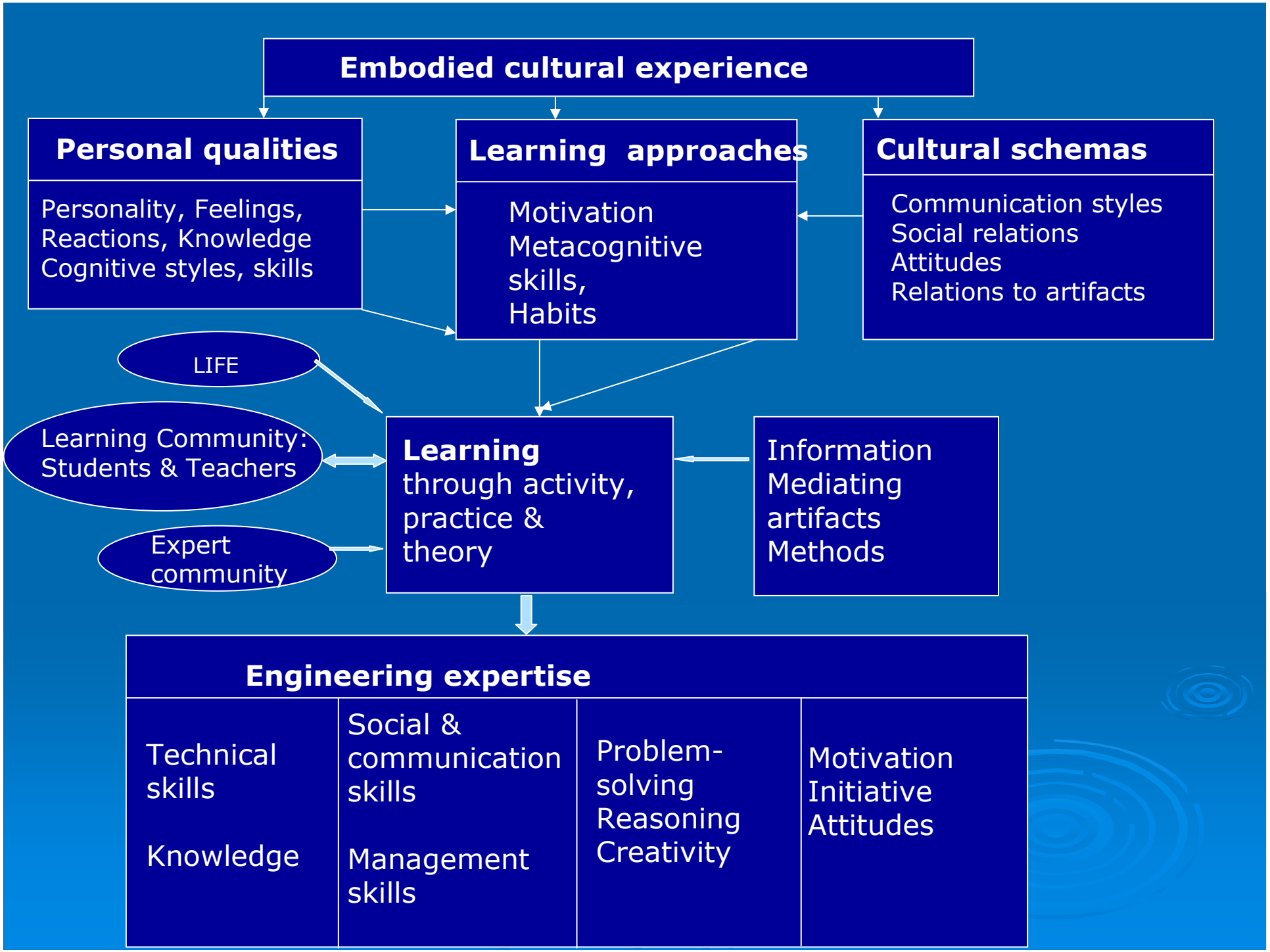
- Integration into the study community. Understanding of the requirements and possibilities of higher education, and an ability to plan studies and follow study practices. Ability to use student guidance services. Ability to use library and on-line information in conducting research, and self-reliance in studying in a network environment.

- Understanding of the curriculum, and capability to make informed choices on studying and career planning. Ability to develop metacognitive skills and academic competence. Understanding of professional identity, field of study, and potentials for career development, as well as knowledge of internationalization choices.


Teachers
Social interaction, study group
Expert community
Mediating structures: instruction, methods, artefacts
Activity and practice
Student
Information, knowledge
Learning as a knowledge creation process
Development of expertise
Previous knowledge and mental schemas
Guidance:
Advising of studies and student support
Metacognitive skills and abilities, motivation
Emotional states, feelings, physical well-being

Engineering expertise			
Technical skills Knowledge	Social & communication skills Management skills	Problem-solving Reasoning Creativity	Motivation Initiative Attitudes


Learning Community: Students & Teachers
Expert community
Learning through activity, practice & theory
Information Mediating artifacts Methods
Engineering expertise
Technical skills
Knowledge
Social & communication skills
Management skills
Problem-solving Reasoning Creativity
Motivation Initiative Attitudes


Embodied cultural experience
Personal qualities
Personality, Feelings, Reactions, Knowledge
Cognitive styles, skills
Learning approaches
Motivation
Metacognitive skills,
Habits
Cultural schemas
Communication styles
Social relations
Attitudes
Relations to artifacts
LIFE
Learning Community: Students & Teachers
Expert community
Learning
through activity, practice & theory
Information
Mediating artifacts
Methods
Engineering expertise
Technical skills
Knowledge
Social & communication skills
Management skills
Problem-solving
Reasoning
Creativity
Motivation
Initiative
Attitudes

Intelligence and expert performance

IQ, general intelligence

- Linguistic competence
- Reasoning
- Spatial ability
- Analytic and number skills
- General knowledge
- Visual & auditory processing
- Long-term storage and retrieval
- Working memory and processing speed

Views of intelligence

- Academic success requires analytical intelligence, GI
- Modern society versus instinctive behavior
  - evolution prepared us for natural surroundings,
  - schooling prepares us for information society
- IQ does not seem to predict expertise nor does it predict the acquisition of complex problem-solving competence

Successful intelligence

(Sternberg)

- analytical intelligence,
- practical intelligence
- creative intelligence
- executive processes to plan and control activity are instrumental for successful performance.

Multiple intelligences

- linguistic,
- bodily-kinesthetic,
- spatial,
- musical,
- logical-mathematical,
- intrapersonal,
- interpersonal,
- naturalist intelligences
- emotional intelligence

Other views on intelligence

- Intelligent action
  - as deciding what to do next;
  - if the environment is well-designed and well-known to the person, intelligent action is greatly facilitated.
  - people are not particularly good at tasks that require abstract reasoning or intensive recall but they excel at using resources in a systematic but creative fashion to work their way to solutions.

Other views on intelligence

- The Cree in Canada (hunters):
  - showing respect, self-control, and listening attentively as essential parts of intelligent behavior, in addition to good sense of direction, wisdom and a quick wit.
  - Insensitivity, living like a white, and craziness were seen as negative competences.
- Chinese views of intelligence:
  - focus on hard work and effort,
  - intelligence is not a quality of a person but behavior.
- The Japanese view of intelligence encompasses
  - social competence such as one's ability to sympathize with others.
- African conceptions of intelligence focus on
  - wisdom,
  - trustworthiness and
  - social attentiveness.

The acquisition of expert performance as problem solving

- Even the most talented individuals in a domain must spend over ten years actively engaging in particular practice activities (deliberate practice) that lead to gradual improvements in skill and adaptation that increase performance.
- The acquisition of expert performance can be described as a sequence of mastered challenges with increasing levels of difficulty
- The mental representations of experts appear to be qualitatively different from those of less skilled individuals. It is not simple difference in accumulated knowledge about past experience.
- Expert – novice differences appear to reflect differential ability to react to representative tasks and situations that have never been previously encountered.

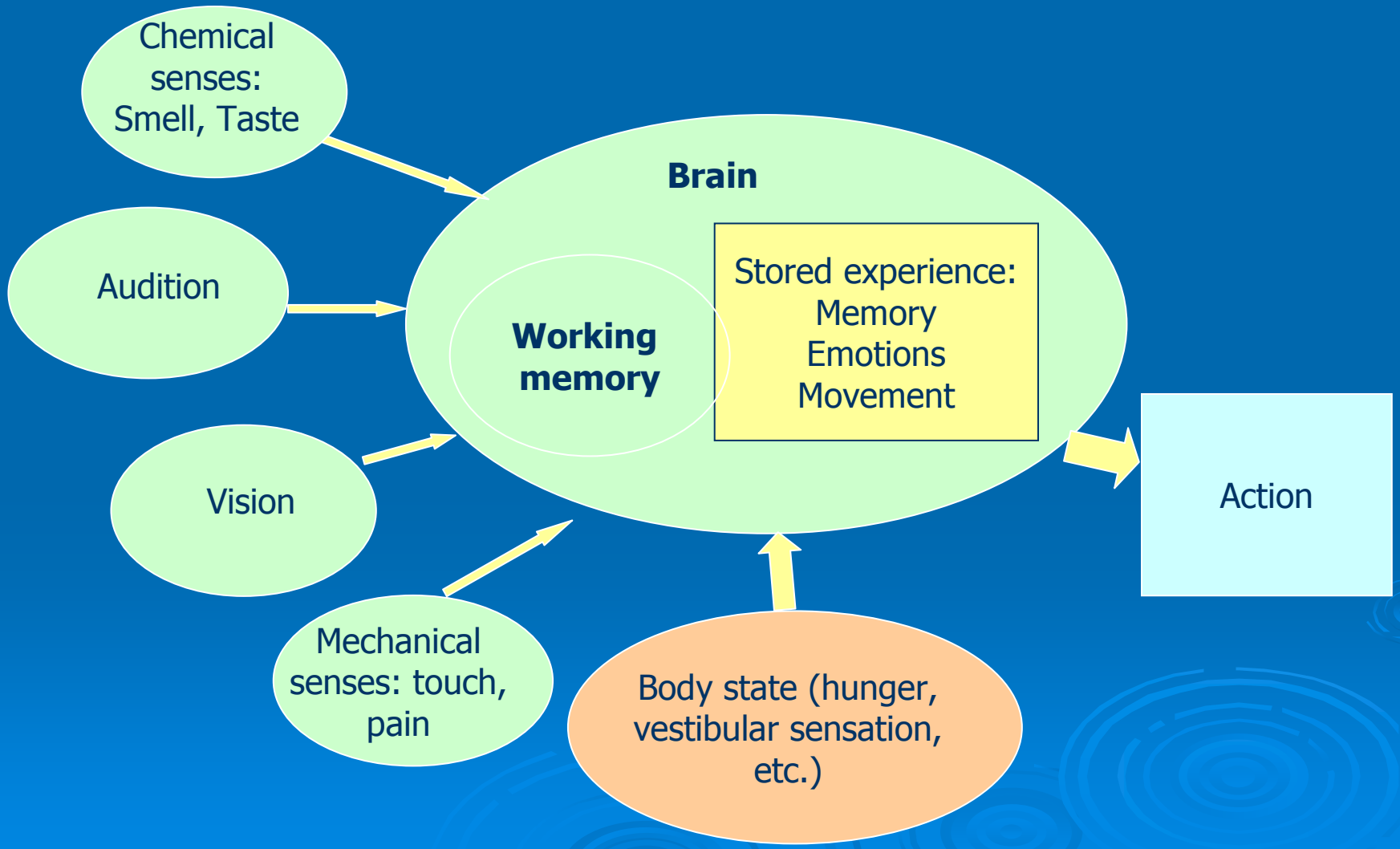
The acquisition of expert performance

- Comparison of several groups of professional musicians representing different levels of achievement:
- the most accomplished had spent more time in activities classified as deliberate practice:
  by the age of 20, the best musicians had spent over 10,000 hours practicing, which is 2,500 and 5,000 hours more than two less accomplished groups, respectively, and 8,000 hours more than amateur pianists of the same age.
- elite performers report a very high level of focus and concentration during deliberate practice. Practice sessions were limited to around one hour at a time; maximal level of deliberate practice was found to be 4-5 hours when sustained daily for months and years.

Learning, perception and memory


Emotions
Memory and knowledge
Mood
Learning situation
Concentration: alertness motivation
Perception

Modalities: perception



Human cognitive capacity 1

- Based on patterns and schemas
- Chess masters remember nearly all pieces in a game
- Affordances:
  visual object is perceived through intended action;
  perception depends on context
- Auditive and visual input separate

Auditory and visual input

- Yakking drivers are four times more likely to crash their cars. Using a hands-free headset instead of handheld phone made no difference at all.
- The brain can be intensely aware of what is coming through either the eyes or the ears but not both at the same time.
  (Certain brain regions were activated when subjects consciously chose to see; these were muted when they chose to hear.)

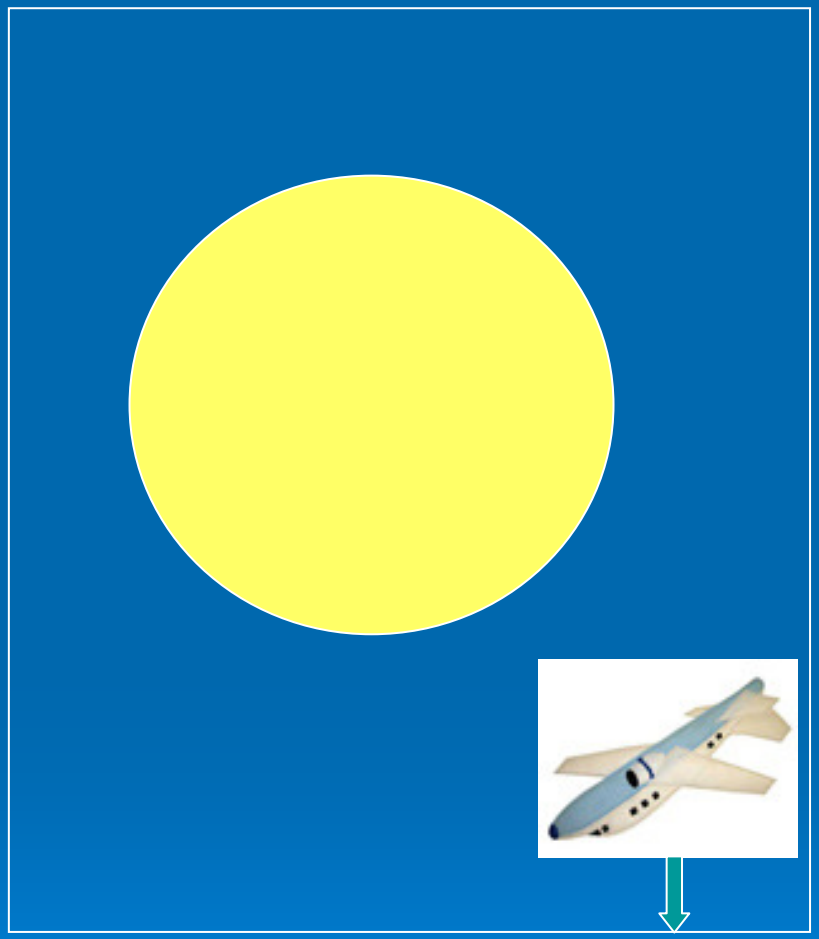
Auditory and visual input

- The use of sound during visual training can enhance later performance on a purely visual task, a finding that demonstrates just how much multisensory interaction occurs in brain areas that before now were thought to be dedicated solely to vision.
- Multisensory interactions can be exploited to yield more efficient learning of sensory information
- People can focus on more than three items at a time
  - if those items share a common color like players in a football team. They perceive separate individuals as a single set. Color seems to be the easiest sorting tool.

Human cognitive capacity 2

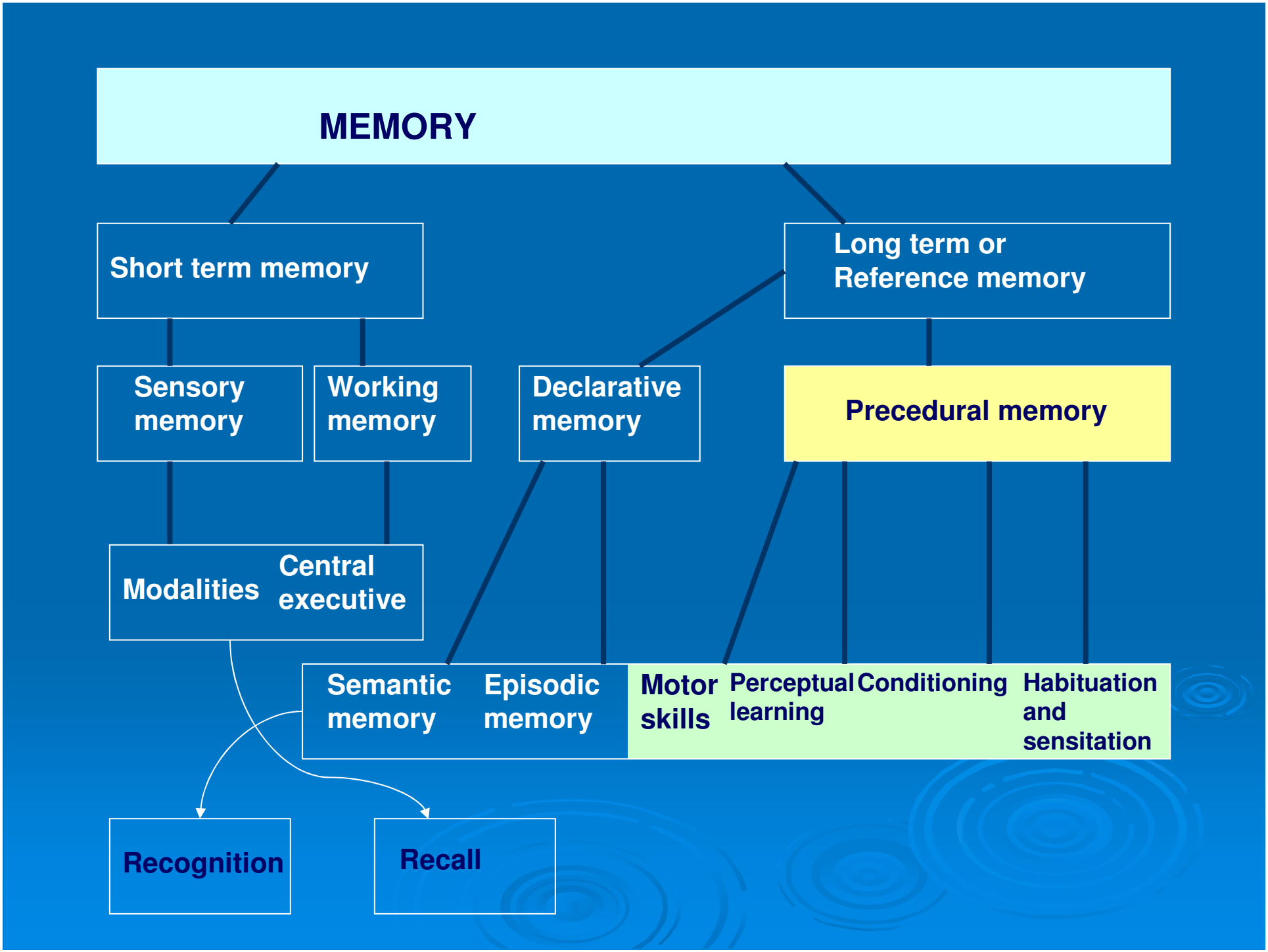
- Attention: selective perception
- Object and background: discrimination, exceptional features
- Attention is directed to one object
- Memory registers also unconscious perception
- Automatic actions (bicycle riding) do not need attention; but then action becomes fixed, difficult to modify (changes in interface)

Which way does the airplane fall?



Mental framework 1

Mental framework 2


MEMORY
Short term memory
Long term or Reference memory
Sensory memory
Working memory
Declarative memory
Precedural memory
Modalities
Central executive
Semantic memory
Episodic memory
Motor skills
Perceptual learning
Conditioning
Habituation and sensitation
Recognition
Recall

Improving memorizing

- Timing of activities is decisive when storing information to the memory.
- In an experiment, where fruit flies were trained to avoid a particular odor, it was found that massed training, giving the flies the same number of training experiences in rapid succession, did not produce an enduring memory;
- spaced training, with session intervals of 15 minutes, did produce.
- Distributed practice works better than massed practice.
- Spreading out your study is better than cramming.
- There is a specific time interval, about six to eight hours after training, when the neural activity is particularly strong, and lasting memories are formed.

Improving memorizing

- Memory consolidation takes place while we sleep, and it takes up to a few weeks of repeated rehearsal for the molecular reactions controlling gene and protein synthesis to record long-term memories.
- If the interval between rehearsal sessions is too long, the short-term memory will have weakened too much to benefit from repetition.
- Also, having a break and relaxing after intensive working often releases creativity and yields a solution to the problem under consideration.