21st century (knowledge society) abilities and the role of ICT

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TOOL 5100
Outline

• What do we mean by 21st century abilities
• Examples and repeat from last lecture
• Scardamalia & Bereiter’s position
• Wegerif’s position
• Fischer et al’s position
3 papers


Identifying knowledge society abilities

- According to experts and popular literature our basic skills need to be supplemented with the skills required for 21st century knowledge work
  - Basic skills: Mathematics, Physics, History, English, etc.
- Experts disagree on what these knowledge society abilities should be, how they are related to basic skills, how to teach them, and how to support them by ICT
Examples of suggested abilities

• Popular literature and newspapers
  – Communication, collaboration, ability to work in groups, imagination, creativity, information-seeking, information sharing, problem solving, argumentation, digital literacy

• Bereiter & Scardamalia (1997, 2002)
  – Working with knowledge objects to clarify meaning (improvable ideas)
  – Making schools into knowledge building organizations

• Wegerif (2002)
  – Information-seeking and sorting, reasoning, problem identification, creative thinking, critical evaluation

• Fischer et al (1995)
  – Evolution of design artifacts, and communication between collaborative designers

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From last lecture ..

- Stahl, Koschmann and Suthers mention basic processes and practices associated with CSCL
  - Information sharing (but beyond this)
  - Interaction
  - Negotiation
  - Joint meaning making (meaning can here mean many things)
  - Evolving common artifacts (like writing a paper together)
Knowledge practices laboratory

- In the European Knowledge practices laboratory (KP-Lab) project two of our aims are
  - Identifying emerging practices for the 21st century
  - Developing tools for supporting these practices and for transforming current practices into new ones
- We identified in KIKK case collaborative design as a knowledge practice new employees entering a product development company have to learn:
  - Joint artifact development
  - Multidisciplinary team work
21st century abilities --> CSCL

- CSCL is supposed to be the educational technology match for knowledge society abilities
- CSCL has communication support as one of its core features, and the rest is built around that
- Knowledge society skills is more than communication, because relates to the basic (cognitive) skills in an effort to reach
  - Deep learning (Scardamalia & Bereiter)
  - Higher order thinking (Wegerif)
  - Shared context (Fischer et al.)
The three papers

- The three papers address different aspects of knowledge society abilities
- Supplement and complement each other
- Some key differences are with respect to:
  - What is locus of learning?
    - In the interaction; in shared artifacts; in students’ heads, etc.
  - What role does CSCL technology play?
    - Idea generator/transformer, scaffolding an evolving artifact, prompting student reflection, etc.
Question regarding learning implications

• Stahl, Koschmann & Suthers put it in this way in the previous lecture:
  – “CSCL locates learning in meaning negotiation carried out in the social world rather than in the individuals’ heads”.

• Do you think they agree to this (completely or partially):
  – Scardamalia and Bereiter?
  – Wegerif?
  – Fischer?
Scardamalia & Bereiter’s position

• Paper divided into two parts:
  – Knowledge building theory and pedagogy
  • Themes:
    – Knowledge advancement as community achievement
    – Knowledge advancement as idea improvement
    – Knowledge of in contrast to knowledge about
    – Collaborative discourse rather than argumentation
    – Constructive use of authoritative information
    – Emergent understanding
  – Knowledge building tools (Knowledge Forum)
Positioning

• The authors distance themselves from related approaches to education and tool use and claim their position (knowledge building) is neither
  – Traditional education
    • Focus on right and wring answers; memorization; extensive testing (*knowledge about*)
    • Knowledge transmission as metaphor for teaching/learning
  – Constructivist approach
    • Self directed (active) learning (*knowledge of*)
• Instead they advocate what might be called a “third approach” (which builds on the latter)
Knowledge building

- Emphasis on
  - Collaborative problem solving as idea improvement driven by authentic problems (knowledge of)
  - Knowledge creation and innovation
  - Schools taking part in “civilization-wide efforts” to advance knowledge frontiers
- It is legitimated by working on problems that can be connected to problems worked on by professionals
- Goal is to advance the ‘state of knowledge’ in classroom communities
Locus of learning

• Focus on improving the state of knowledge in a given community
• This is not knowledge inside the head but knowledge in the open, represented by artifacts generated by the community
• More specific: represented by textual ideas, presented visually on computer screens and stored in a shared database
• Interface consist of textual notes associated with type and content that can be organized in views
Difficult terms

- These terms mean basically the same
  - Idea
  - Epistemic artifact
  - Conceptual artifact

- Or rather one is the more general of the other in following order:
  - Idea --> conceptual artifact --> epistemic artifact

- Think of “idea” as a Popperian World 3 object (distinguished from World 1 and World 2 objects)
- Think of “epistemic artifact” as a “knowledge object” embedded in a Knowledge Forum note
Knowledge Forum (notes and views)

Figure 4: Rise-above view and notes by grade 3 students studying natural disasters

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Wegerif’s position

- This is cursory reading
- Wegerif identifies higher order thinking and show how this is related to CSCL and other paradigms of pedagogy and educational technology
- Represent a dialogical perspective to CSCL (see Theme 8) and draws on sociocultural perspectives (e.g. Vygotsky), which is different from S&B
- Gives suggestions for computer support

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Orientations to learning and educational technology

- Four orientations
  - Behaviorist (--> CAI)
  - Cognitive (--> ITS)
  - Constructivist (--> Microworlds)
  - Participatory (--> dialogic approach to CSCL)

- This is slightly different from Wegerif’s classification, paralleling Koschmann’s paper on paradigms of educational technology we have next week (Theme 3)
Connection to Vygotsky’s ideas

- Human learning and thinking is mediated by tool-systems
- Thinking is both individual and social (first proposed by Dewey)
- Tools can be both abstract and concrete
- Constant movement between internalization and externalization (see Theme 4)
- Wegerif suggests to teach thinking skills by integration with the teaching of basic skills
Role of technology

• More than just a mediating artifact, it is a support and resource of dialogues through which thinking skills are taught
  – Utilizing the dynamic (digital) medium and supporting multiple representation of information
  – Act likes a “teacher” to prompt and stimulate reflection and discussion during educational activity (see Theme 7 and Fischer paper)
  – Networks of knowledge creation for collaborative problem solving and distance education (see S&B paper)
Fischer et al’s position

• Describes another 21st century ability
  – Collaborative artifact development (evolution of design artifacts)
  – Communication between collaborative designers
• Addresses a shortcoming of the knowledge building approach
  – Using the computer as a scaffolding device and not only a knowledge building device (ref. Vygotsky)
• Using the computer to provide prompts to trigger reflection and discussion as suggested by Wegerif
  – Active mediation
Evolution of design artifacts

- Complex artifacts need to be developed over time as part of an evolutionary process involving multiple stakeholders
- Proposes the SER model of evolutionary development (see Theme 4 for additional developmental models)
- Domain oriented design environment (DODE) as the basic tool
- Kitchen design as exemplary application domain
Locus of learning

• According the authors:
  – “Rather than modeling the cognitive processes of designers, DODEs augment the abilities of designers to understand, manage, and communicate complexity”
  – “design artifacts are never complete but instead are constantly evolving”
Long term collaboration

• How to communicate intent from designers to users and later developers

• They claim that representations created to communicate *intent* in the past (i.e. designers’ original meaning with their artifacts) can be reused as *context* for understanding possibilities and limitations or new design proposals

• These representations are integrated with design artifacts, thus creating a kind of “*hybrid knowledge objects*” (which is therefore different from notes in Knowledge Forum whose context is determined by their knowledge type and network of links)
Scaffolding with critics

- Complex activity needs scaffolding
- The computer can complement the teacher (domain expert) in some situations
  - After hours
  - At a distance
- KID/Janus uses a computational critic mechanism to alert designers to problematic situations, such as violation of design rules and other established domain distinctions, and to provide information relevant to the situation.
KID/Janus: Critiquing design to stimulate reflection, discussion and redesign