Proposal of a Collaborative Learning Standardization

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Abstract
This paper reports on considerations and steps towards standardization of the collaborative learning environment. This standardization will extend and widen the field of applications possible within the collaborative learning paradigm, and will make possible the usage of the fruits of years of research and individual implementations of the concept of collaborative learning, from our own laboratory and from others.

1. Collaborative Learning Support
Distributed collaborative learning support is a research domain that tries to find out ways to support the collaboration of multiple learners on the network (CSCL - Computer Supported Collaborative Learning), in problem solving or other cooperative curriculum activities, according to the used LT (Learning Technology). Compared to CSCW (Computer Supported Cooperative Work), CSCL has as a goal not so much the working efficiency, but the learning achievement efficiency, and the promotion of deep understanding of the subject field by the learner, combined with the recognition or meta-recognition of the achievement of this ability by other persons. The regular CSCL groupware implementation provides usually two types of activity space: a private and a collaborative working space, where the learners can exchange information in a synchronous or asynchronous manner.

2. Primitive Activities and Resources
Primitive activities in collaborative learning are: Dialogue (with Interaction), Data/idea sharing, Observing/suggesting, Turn-taking, Coordinating/Control, Planning/Executing, Initiative/Supervising. The resources required in collaborative learning are: Dialogue Channel, Shared Workspace (shared object space), Technologically mediated remote communication (audio & visual), Personal Workplace.

3. Collaborative Environment Structure
For collaborative learning, we can differentiate between learner-to-learner dialogue (communication) and other activities (problem solving, etc.). When a learner faces a problem that s/he cannot solve, s/he can, in collaborative learning, exchange meaningful information via interactions with his/her learning companion(s). This can lead to understanding other persons' perception ways and also help in finding eventual inconsistencies in ones own judgments. Present research analyze such interactions, their catalyzors and effects. Moreover, as the learning efficiency has been shown to increase in such situations, many systems try to positively encourage them via computer implementations.

4. Essential Structural Elements
Learners can belong to one or more groups and can be involved in projects or parts of projects together, therefore sharing a particular space, and work privately for the rest. The shared working place (collaborative workplace) contains the dialogue support objects for dialogue and information exchange support, the collaborative working objects for activity support, and the collaborative memory, for reference and information accumulation. On the other hand, the private working place contains the working depository of the private working objects, and the private memory for consultation and accumulation of private activities related information. Moreover, the information referencing layer contains information oriented towards individual and collaborative learning goals, learning materials, various educational data, libraries, educational applications, all-purpose tools, market applications, etc.

There are 6 essential structural elements of the collaborative learning environment standardization:
1. collaborative learning environment expression
2. collaborative workspace expression
3. collaborative learning resource(s) expression
4. collaborative workspace expression
5. learner group model in collaborative learning
6. collaborative memory structure expression
Due to the lack of space, these items are not detailed here.

5. Info Retrieval in Collaborative Learning
The collaborative learning support system has to able, at the learner's request, to send and receive information on the essential elements of both collaborative and private workspace. E.g., a loading function is necessary, which fetches collaborative/private work objects, requested by the group or by individual learners, from various resource(s) (load_into relation). This relation is defined within the essential structural elements of the collaborative learning environment. Another relation ensures the sending and receiving of problem solving communication data within the collaborative working place, between the dialogue support objects and the collaborative working objects (link_to relation). Another relation ensures the
inserting/ saving of objects, results and information from
the private workplace of the private workspace as
collaborative work objects of the collaborative workplace
(insert_in relation). The relations between the
collaborative work objects and the collaborative memory
are "store_to", for storing work objects into the
collaborative memory, and "refer_to" when referring
objects already stored. We are gradually building the
essential functions, which can be extended to serve any
collaborative learning environment.

6. Interface
Standardization of the interface means defining the 5
interfaces below.
1. between learning resource(s) and collaborative work object(s)
2. between dialogue support object(s) and collaborative work
object(s)
3. between the private workspace and collaborative work
object(s) of the collaborative workplace
4. between collaborative work object(s) of the collaborative
workplace and the collaborative memory
5. between the collaborative memory and group model
Due to the lack of space, these items are not detailed here.

7. Data Exchange
One of the essential structural elements of the
collaborative learning environment is the virtual agent.
The information exchange between the other essential
structural elements is done via agent(s). The attribute(s) of
the appropriate essential elements are stored in the
collaborative memory as well as the learning log
developed during the collaborative learning curriculum.
Furthermore, depending on the request from group
member(s) and collaborative work object(s), agents refer
the information in the collaborative memory and integrate
the exchanged information into a defined form. The
concrete function of agents is to cope with the behavioral
differences of the essential structural elements. Moreover,
the information exchange protocol content varies,
according to the transmission source and reception
destination, and according to the behavior or functions of
the bi-directional structure of the essential elements.
However, the basis functions and structure of the agents in
the collaborative learning environment are defined simply
as the exchange, deletion and addition of essential
structural elements.

8. Collaborative learning Agent
The standardization target delimited by the hypothesis is
represented by the 5 items below.
1. collaborative learning environment agent(s) structure
2. collaborative learning environment agent type(s)
3. essential elements of 1.
4. attribute(s) of 3.
5. relation(s) of 3.

8. Conclusion

The standardization of the collaborative learning
environment is a collective effort and an ongoing process.
We have outlined here some of the basic considerations
and steps we intend to take in the future towards this
standardization.
Further required functions for the collaborative learning
environment are as follows.
• Coordination (constrained and mediated by external
environment)
• Retification (material evidence in the external environment)
• Illustration (external representation)
• Storage (in later use, for the purpose of reflection)
Examples of general tools for supporting collaboration are
as follows.
• Concept Mapping tool
• Editors for argumentation network
• Work flow (planning tool)
• WYSIWIS (What you see is what I see)

At the university of Electro-Communications, Japan, we
have integrated a few parallel projects that have related
goals concentrated around distance-learning and life-long
learning, also known under the name RAPSODY [4] and
RAPSODY-EX [5]. The proposed standards are being
gradually implemented and brought to life within these
projects. Real-life feedback will be used to correct,
improve and fine-tune the proposed standard.

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