

Learning in Virtual Communities through Collaboration¹

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1. Introduction

Collaborative and group-oriented types of learning become very well accepted by the learners. These interactive and collaborative forms are used at different levels of formal and informal learning and vocational training.

Computer Supported Collaborative Learning (CSCL) is a common term which describes different forms of learning that provide integrated tools and environment for different forms of group learning.

The application of advanced technologies like Semantic Web and wireless technologies enriches the main functionalities of social tools which support the communication and exchange resources and experience among members of virtual communities. These communities seem to be a very appropriate and effective form of collaborative learning.

The basic aim of the paper is to make an overview of the current concepts and tools for providing and supporting effective collaboration and communication among participants in Virtual Communities (VC).

2. Virtual communities

The virtual communities is a very effective structure for group learning and exchange of ideas, knowledge, skills, experience, and competencies. Needs of VC

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for high levels of communication and collaboration should be satisfied efficiently by the use of technology achievements and the development of new advanced forms of education (Fig. 1).

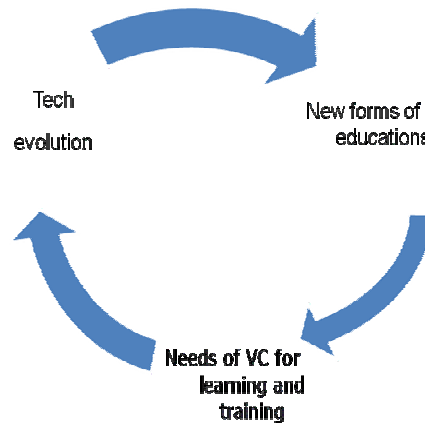


Fig. 1. Evolution cycle of Technology, e-Learning and society needs

A virtual community or online community is a group of people that primarily or initially communicate or interact via the Internet, rather than face to face. Online communities have also become a supplemental form of communication between people who know each other in real life. A Computer-Mediated Community (CMC) uses social software to regulate the activities of participants. An online community such as one responsible for collaboratively producing open source software is sometimes called a development community [1].

The basic characteristics of virtual communities proposed by Wesley [2] can be defined as an outlined, easy-to-follow knowledge sharing process and an appropriate technology medium that facilitates knowledge exchange, retrieval and collaboration.

The definition of Virtual education, used in [3] is: Virtual education refers to instruction in a learning environment where teacher and student are separated by time or space, or both, and the teacher provides course content through course management applications, multimedia resources, the Internet, videoconferencing, etc. Students receive the content and communicate with the teacher via the same technologies.

The definition of Virtual Learning Environment (VLE), such as Learning Management System (LMS), Course Management System (CMS), Learning Content Management System (LCMS) proposed in Wikipedia [1] is: A virtual learning environment (VLE) is a software system designed to support teaching and learning in an educational setting. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice), communication, uploading of content, return of students work, peer assessment, administration of student groups, collecting and organizing student grades, questionnaires, tracking tools, etc. New features in these systems include wikis, blogs, RSS and 3D virtual learning spaces.

Two terms related to Virtual Communities (VC), are Virtual University (VU) and Virtual Classrooms (VCs). They represent a virtual organization of education at different levels of complexity and hierarchy.

All tasks and services related to education can be organized in educational portal. Its basic purpose is to provide a user-friendly interface for learners and to support access to all integrated services that establish basic learning activities – delivery of learning materials, assessments, and other support activities like payment or collaboration features as it is shown in Fig. 2.

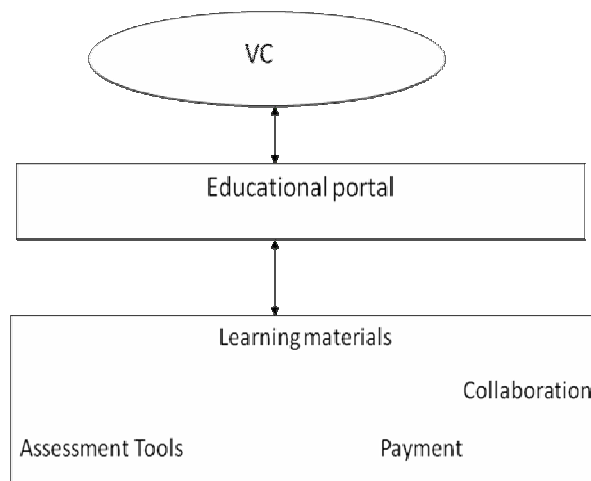


Fig. 2. VC interaction with educational services through educational portals

These services can be delivered by educational or knowledge portals as it is stated in [4] depending on the target group of users – learners or a company staff (Fig. 3).

e-Learning						Knowledge management									
Learning process management, Learner support					Application level	Project development management, BI, CRM, Team (organizational) support									
e-Learning portal					Interface	Knowledge portal									
Search services ontologies		Collaboration and Communication services			Learning/Knowledge management services	Search services ontologies		Collaboration And Communication services							
Learning concepts map					Taxonomy	Knowledge map									
Learning objects (resources) repository					Information process management	Knowledge repository									
E-mail, file servers, Intra-, Extra, Inter-net services, mobile technologies					Infrastructure	E-mail, file servers, Intra-, Extra, Internet services, mobile technologies									
WP	DB	LO	e-mail	WWW	Learners, teachers, support staff	Learning and knowledge resources				WP	DBMS	EDM	E-mail	WWW	Team members

Fig. 3. KMS and e-Learning systems – common features (adopted from Mertins [4])

2.1. Community of practice

Lave and Wenger (1991) [15] used the term relation to situated learning as part of an attempt to “rethink learning” at the Institute for Research on Learning.

Community of Practice has become associated with knowledge management as people have begun to see them as ways of developing social capital, nurturing new knowledge, stimulating innovation, or sharing existing tacit knowledge within an organization. It is now an accepted part of Organizational Development (OD) [1].

2.2. Learning community

A learning community is a group of people who share common values and beliefs, are actively engaged in learning together from each other. Such communities have become the template for a cohort-based, interdisciplinary approach to higher education. This is based on an advanced kind of educational or 'pedagogical' design [5].

Community psychologists such as McMillan and Cavis [16] state that there are four key factors that defined a sense of community: “(1) membership, (2) influence, (3) fulfillment of individuals needs and (4) shared events and emotional connections (influence)”.

3. Abstract model of a learning system as LO repository

We extended the abstract model of a learning system proposed in [6] as LOR with two additional sections explaining how standard tools for communication and collaboration integrated in e-learning systems could be improved.

Another change should be applied in the field of static courses development. They could be replaced by ontologies in the specific domain. In this way high flexibility of delivered learning content will be achieved. Learning paths will be more adaptive to the specific learning needs of the students. Each learner will be able to receive and use the most appropriate for his/her education learning content.

Combination of extended learners' profiles, advanced tools for communication and collaboration, packages of RLOs described by meta-data and use of ontologies for representation of domain knowledge will provide highly interactive and adaptive to the learners' needs of education e-learning environment.

These improvements can be developed by the use of different social tools (Web 2.0) and Semantic web (Web 3.0) and integration of mobile technologies in education.

4. Social tools and media

Social software allows users to interact and share information and knowledge

This computer-mediated communication has become very popular with social sites like MySpace and Facebook, media sites like Flickr and YouTube, and commercial sites like Amazon.com and eBay [1].

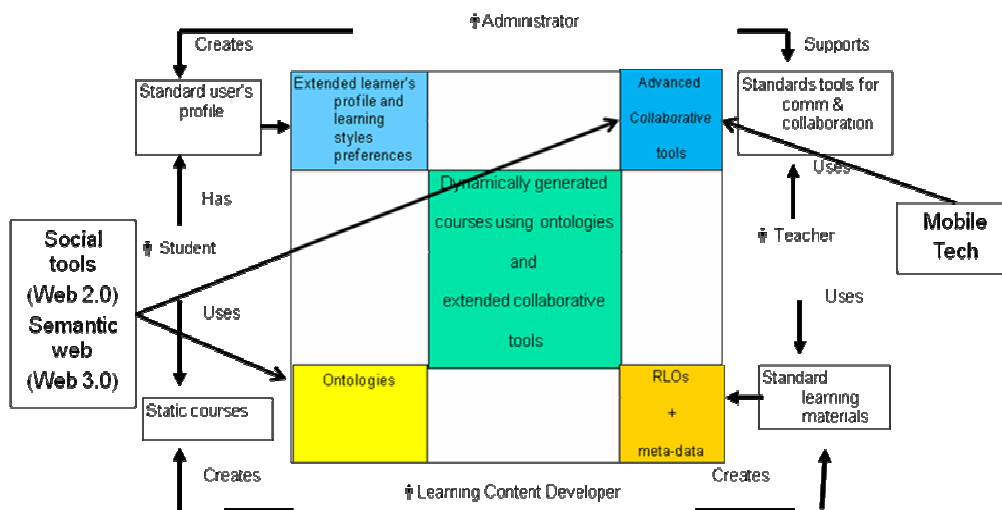


Fig. 4. Extended abstract model of LS as LOR [6]

The terms Web 2.0 and Enterprise 2.0 are also used to describe this style of software [8]:

- Conversational technologies are seen as tools to support work units and the individual knowledge worker
- Many advocates of using these tools believe (and actively argue or assume) that they create actual communities, and have adopted the term “online communities” to describe the resulting social structures.

Social media tools may include some of the listed capabilities for communication and collaboration integrated in different learning environments:

- Instant Messaging
- Text chat
- Internet forums
- Blogs
- Wikis
- Collaborative real-time editor
- Prediction markets
- Instant Messaging
- Text chat
- Internet forums
- Collaborative real-time editor
- Prediction markets
- RSS and atom feeds
- Wikis
- Aggregators
- Videowiki
- Social bookmarking tools
- Voting and polls system
- Social networks
- Mashup tools.

4.1. Web 2.0 – multiple definitions

Web 2.0 is a term describing the changing trends in the use of World Wide Web technology and web design that aim to enhance creativity, information sharing, and collaboration among users. These concepts have led to the development and evolution of web-based communities and hosted services, such as social-networking sites, video sharing sites, wikis, blogs, and folksonomies. [9]

“Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as platform, and an attempt to understand the rules for success on that new platform.” [10].

Web 2.0 websites typically include some of the following features/techniques:

- Cascading Style Sheets to aid in the separation of presentation and content
- Folksonomies (collaborative tagging, social classification, social indexing, and social tagging)
- Microformats extending pages with additional semantics
- REST and/or XML- and/or JSON-based APIs
- Rich Internet application techniques, often Ajax and/or Flex/Flash-based
- Semantically valid XHTML and HTML markup
- Syndication, aggregation and notification of data in RSS or Atom feeds
- mashups, merging content from different sources, client- and server-side
- Weblog-publishing tools
- wiki or forum software, etc., to support user-generated content
- Internet privacy, the extended power of users to manage their own privacy in cloaking or deleting their own user content or profiles.

4.2. Social media

Social media aims to support the process of sharing and exchange of information like graphics, videos and audio resources among different users in Web.

Different types of social media types are listed here [11]:

- Communication
 - o Blogs: Wordpress, TypePad, Blogger (service)
 - o Microblogs / Presence apps: Twitter and Pownce
 - o Social networking: Facebook, LinkedIn, MySpace and Avatars United
 - o Social network aggregation: FriendFeed, SocialThing, Youmeo
 - o Events: Upcoming.org, Eventful;
- Collaboration
 - o Wikis: Wikipedia, PBWiki
 - o Social bookmarking: del.icio.us and StumbleUpon
 - o Social News Sites: Digg, Mixx and Reddit
 - o Opinion sites: epinions, Amazon reviews, Yelp;
- Multimedia
 - o Photo sharing: Flickr and Zoomr
 - o Video sharing: YouTube and Vimeo
 - o Livecasting: Ustream and Justin.tv
 - o Audio and Music Sharing: imeem;
- Entertainment
 - o Virtual worlds: Second Life
 - o Online gaming: World of Warcraft
 - o Game sharing: Miniclip.com.

4.3. E-Learning 2.0

E-Learning 2.0, by contrast (patterned after Web 2.0) is built around collaboration. e-Learning 2.0 assumes that knowledge (as meaning and understanding) is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. Advocates of social learning claim that one of the best ways to learn something is to teach it to others [18].

4.4. Social network

A social network is a social structure made of nodes (which are generally individuals or organizations) that are tied by one or more specific types of interdependency, such as values, visions, ideas, financial exchange, friendship, kinship, dislike, conflict or trade [1].

Distributed social network can connect people across multiple websites and devices, using interactive widgets and applications.

The basic task of social network service is the development of VC where their members can share interests, ideas, experience, and resources.

Some examples of social networks are MySpace and Facebook.

The social network aggregation is the process of summarizing the information from different social network services in one location where users can access it without visiting different sources of information.

5. From Web 2.0 to social semantic Web

Using “How people learn” framework proposed by Bransford et al. [12], Semantic web allows for each type of learning to be described in [13]:

- Learner – centered
 - o Content that changes in response to individualized and group learner models;
- Knowledge – centered
 - o Agents for selecting, personalizing, and reusing content;
- Community – centered
 - o Agents for translating, reformatting, time shifting, monitoring, and summarizing community interactions;
- Assessment – centered
 - o Agents for assessing, critiquing, and providing “just in time feedback”.

5.1. Web 3.0

Web 3.0, a phrase coined by John Markoff of the New York Times in 2006, refers to a supposed third generation of Internet-based services that collectively comprise what might be called 'the intelligent Web' – such as those using semantic web, microformats, natural language search, data-mining, machine learning, recommendation agents, and artificial intelligence technologies – which emphasize machine-facilitated understanding of information in order to provide a more productive and intuitive user experience

Nova Spivack defines Web 3.0 as the third decade of the Web (2010–2020) during which he suggests several major complementary technology:

- transformation of the Web from a network of separately siloed applications and content repositories to a more seamless and interoperable whole.
- ubiquitous connectivity, broadband adoption, mobile Internet access and mobile devices;
- network computing Web services interoperability, distributed computing, grid computing and cloud computing;
- open technologies, open APIs and protocols, open data formats, open-source software platforms and open data
- open identity, open reputation, roaming portable identity and personal data;
- the intelligent web, Semantic Web technologies such as RDF, OWL, SWRL, SPARQL, GRDDL, semantic application platforms
- distributed databases, the “World Wide Database”
- intelligent applications, natural language processing, machine learning, machine reasoning, autonomous agents a more productive and intuitive user experience.

5.2. Social semantic Web

The main idea of Social Semantic Web is the development of explicit and semantically rich knowledge units.

The concept of Social Semantic Web proposed by Gruber [14] is that the Social Semantic Web can be seen as a Web of collective knowledge systems, which are able to provide useful information based on human contributions and which get better as more people participate.

The Social Semantic Web combines technologies, strategies and methodologies from the Semantic Web, Social Software and the Web 2.0 [1].

The socio-semantic web (s2w) represents the knowledge using semi-formal ontologies, taxonomies or folksonomies.

The basic concept of S2w is that the acquisition of knowledge is not entirely based on automated semantics with formal ontology processing and inferencing. Rich semantics of information is achieved by communication and collaboration among users of knowledge.

An example of Semantic wiki social Semantic web is semantic wiki. It is a wiki allow users to make their internal knowledge more explicit and more formal. This way knowledge is better searchable and easier to be found.

A Semantic Service Oriented Architecture (SSOA) is a computer architecture that supports a scalable IT solution using rich and machine-interpretable descriptions of data, services, and processes. This is achieved by interaction autonomous software agents.

SSOA is technically founded on three notions:

- Service-oriented architecture (SOA)
- Standards Based Design (SBD)
- Semantics-based computing.

As a result of our research we propose a basic set of social tools that can be successfully integrated in education:

- Instant Messaging – ICQ, Skype, integrated in the e-learning system
- Internet forums – internal or external for the e-learning system
- Blogs - Wordpress
- Wikis -PBWiki

- Videowiki –Videowiki, ByblePly
- Social network services – MySpace, Linked, Youtube
- Social bookmarking – Scuttle
- Aggregators – FriendFeed
- Voting and polls system – Doodle
- Semantic wiki – OntoWiki, DynamOnt
- Composition tool to aggregate, manipulate, and mashup content – Pipes.

6. Educational media subsumed by the Web

The basic task is to provide better, more functional and efficient group work and communication among participants in education. It should facilitate the development of group projects and activities like project planning and management and to support different forms of asynchronous and synchronous communication. Collaborative tools allow free exchange of knowledge and experience and in this way increase the competence of learners in a separate filed of education. Another advantage of collaborative learning is the skill and experience for team work that the student acquires in the education process. They become familiar with pros and cons of group work and gain practical skills for collaborative tools efficient use for different group problems solving. These skills will be very useful for each learner to be an esteemed member of the team.

6.1. Educational media enhancements

Anderson [13] proposes a web-based learning model where standard educational media are enhanced by web tools such as video and audio conferencing, radio, television, etc. (Fig. 5)

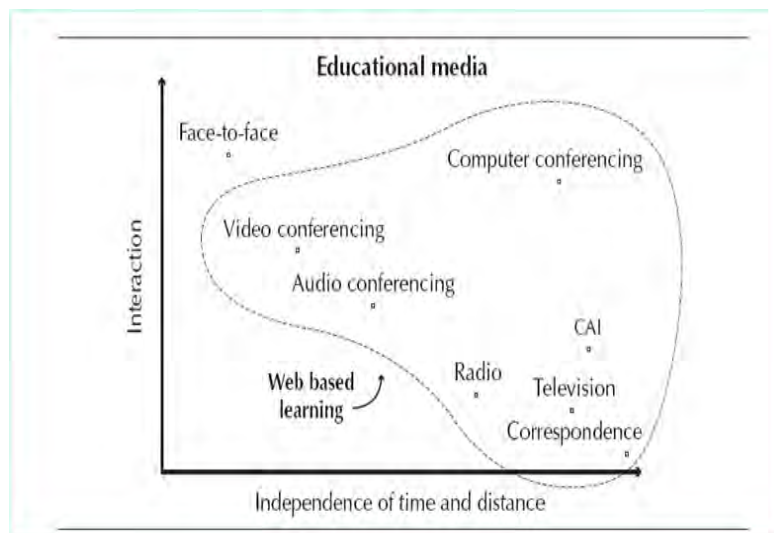


Fig. 5. Educational media subsumed by the Web (adapted from Anderson in [13])

We extend the concept with integration of Web 2.0 technologies (Blogs, Wikis, RSS and atom feeds, Aggregators, Videowiki, Social bookmarking tools,

Voting and polls system, Social networks, Mashup tools, etc.) in education. In this way a new generation of e-learning is developed – Learning 2.0., as it is shown in Fig. 6.

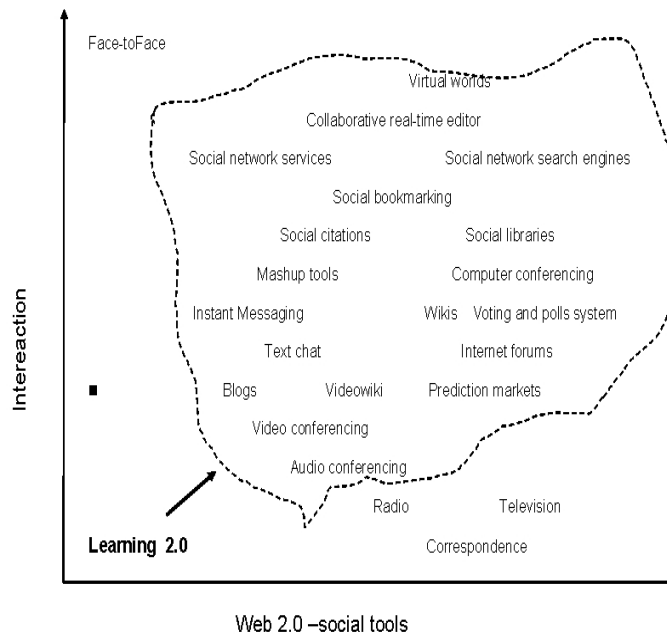


Fig. 6. Educational media subsumed by the Web 2.0 (adapted from Anderson in [13])

The most advanced and social oriented form of learning includes integration of Web 3.0 tools like Semantic social network services, Semantic wikis, Semantic forums, etc. in learning environment. In this form advantaged of social tools are improved by the capabilities of Semantic web (Fig. 7).

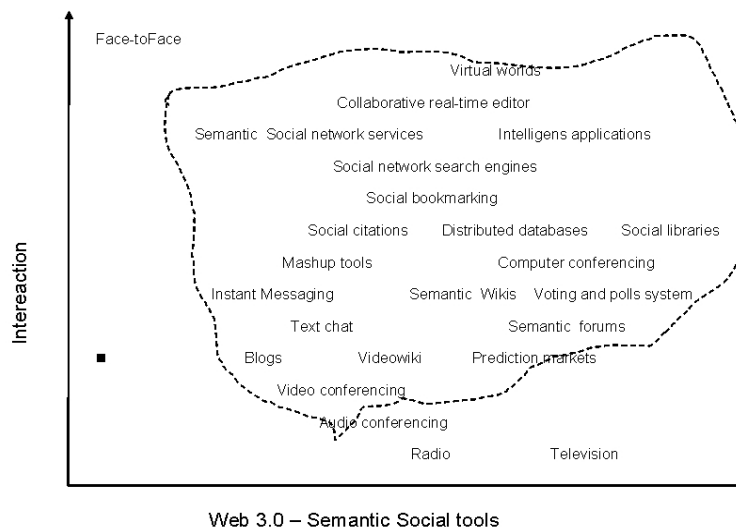


Fig. 7. Educational media subsumed by Web 3.0 (adapted from Anderson in [13])

Additional flexibility can be achieved by integration of wireless technologies and mobile devices in education. A very promising example of this integration are the mobile social networks.

6.2. Mobile social networks

The basic capabilities for mobile users are to create their own profiles, to participate in chat rooms, hold private conversations, share photos and videos, share blogs by using their mobile phone.

Mobile social networking represents a social networking using mobile devices and capabilities of wireless technologies. It is a commonly used type of communication in mobile virtual communities. Some of the most popular mobile social networks are AirG, Next2Friends, and NewsNomad.

The use of advanced technologies like SMS, WAP, Java, and i-mode seems to be a very useful tool for communication in VC of users including mobile communities.

7. Conclusion

The basic characteristics of virtual communities like groups of learners with special interests in a separate field of science are overviewed and their needs and requirements to educational services are described.

Important problems related to insufficient tools that provide capabilities for group work and communication, lack of necessary hardware devices for communication and some problems of the acceptance of new technologies in the educational process are discussed.

A simplified model of interaction between virtual communities' members and learning systems is proposed and the main issues of collaborative learning via mobile technologies are outlined.

We have analyzed the importance of efficient collaboration among participants in education and members of VC and the existing problems in this field.

The basic characteristics of virtual communities are defined as groups of learners with special interests in a separate field of science and business and their needs and requirements outlined for high quality education.

We have stated the challenges for future development of highly efficient collaboration features of an advanced system for education.

The recommendations for future research in the field of Computer Supported Collaborative Learning support for vocational education are given and some proposals are described for the better integration of the groupware and social software in the learning and development of user-friendly, attractive and easy to apply interface for encouraging the users to implement them in the educational process.

Our future research efforts will be also directed to the design and development of mobile collaborative learning as the most flexible form of interaction among participants in education. We will investigate the capabilities for better and more effective integration of Semantic web, Social tools, and Web 2.0 capabilities for development of high quality Learning 2.0 services for education and implementation of the capabilities of Web 3.0 and Social Semantic Web tools in the development of next generation of e-Learning.

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Обучение в виртуальных общностях путем коллаборации

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(Р е з ю м е)

В работе рассматриваются возможности семантического уэба для установления и развития социальных сетей. Представлен обзор разнообразных социальных инструментов и медий. Обсуждается значение разных типов виртуальных общностей при обучении. Представлена абстрактная модель обучающих систем (LSs) как банка обучающих объектов – Learning Objects Repository (LOR). Анализируется возможность расширения функциональностей социальных инструментов, используя семантические уэб технологии. Исследуется также и роль мобильных технологий при поддержки интенсивных и гибких коллаборативных средств и медий.