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Fostering Open Sensemaking Communities by Combining Knowledge Maps and Videoconferencing

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In this paper, our aim is to investigate the role of Compendium maps for both learners and educators to share and debate interpretations in FlashMeeting™ (FM) videoconferences in the context of OpenLearn, an online environment for open learning. This work is based on a qualitative study of knowledge maps and web videoconferencing interactions, and quantitative data presented in diagnostic reports about both tools. Our theoretical approach is based on the sensemaking concept and an existing framework for three learning scenarios. Our findings describe four applications of knowledge maps in videoconferencing: (i) Mind Maps for a FM virtual lecture (transmission scenario); (ii) Learning Path Map which integrates a FM conference (studio scenario); (iii) Concept Maps during a peer-to-peer event (negotiation scenario) and (iv) Web Maps for a FM replay (assessment scenario).

Keywords: Knowledge Mapping, Open Learning, Open Sensemaking Communities, Videoconferencing.

1 Introduction

The development of new technologies and the open content movement have been opening up new opportunities for widening participation. The Internet, "*as a new publishing medium*", provides its users with a considerable increase in access and circulation of knowledge and offers a new world of learning to those outside the academic realm ([1], p.33).

OpenLearn is an Open Educational resources (OER) project developed by the UK Open University (OU), and launched in October 2006, supported by the William and Flora Hewlett Foundation. As of March 2008, OpenLearn has published 3371 hours in the LearningSpace and 5194 in the LabSpace of OERs designed specifically for distance learning (the OU's core business), and covers a range of subjects from arts and history to science and nature. There are more than 300 units at all study levels from access to higher education, graduation and post-graduation.

Our current work is to investigate how knowledge maps can be combined with a web videoconferencing tool to foster *open sensemaking communities* [2] around the OERs, that is, the interpretative work that must take place around any resource for learning to take place.

OpenLearn is published on the open source Moodle platform (<http://moodle.org>), augmented with sensemaking support from knowledge media technologies. *Compendium* is a software tool for visual thinking, used to connect ideas, concepts, arguments, websites and documents. It is designed as a sensemaking tool to link, interpret and annotate resources within the Open University site, as well as out to any other resource on the web, with a default visual language of icons and connections designed to provoke reflection on the differences between questions, ideas, and challenging/supporting evidence and arguments. *FM* is a Web

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videoconferencing tool designed to enhance community awareness, by mapping the social interactions, as well as the social impact of learning objects in communities [3].

Through FM and Compendium, participants can structure, acquire and reconstruct the knowledge shared during the discussions and argumentations in online meetings. They can use these tools to [4]:

- plan meetings and map the discussion;
- manage collective knowledge by mapping the most important questions, ideas, and arguments as they arise;

Learning scenarios	Learning goals	Requirements	Pedagogical strategies for collaborative learning.
Transmission	Acquire knowledge from the expert	Learners have to understand what experts mean through clear demonstrations, expositions, narratives, arguments and examples	Collaborative activities may support learners in trying to understand ideas by sense making and argumentation process.
Studio	Develop metacognitive skills about learning how to learn.	Learners have the ability to understand given information, focusing on applying and extending their understanding to different tasks.	Collaborative activities may support learners in arriving at shared understanding by integrating different viewpoints, personal beliefs and information from different sources in a process of argumentative learning.
Negotiation	Create new knowledge by sharing and building on meaning, making practices and ideas the focus of inquiry.	Learners must have the ability to understand the important debates and problems and to use the right language to examine and influence ongoing discussion.	Collaborative activities may support learners in creating new knowledge on the basis of what is shared, argued and agreed.

Table 1: Pedagogical Scenarios Described by Andriessen et al ([6], p.15-22).

- summarise important topics graphically;
- reinterpret significant content discussed, reconstruct maps and share new representations for next meetings;
- visualise the process and plan interventions to improve learning.

2 Making Sense on the Web

In an open learning context, learners do not have ready access to an expert tutor or cohort of peers, and may be drawing on diverse other OERs, blogs, wikis, newsfeeds etc., some of which may be superior, complementary, contradictory, or of dubious authority. So while there is strong *intra*-unit structure embedded in the pedagogical narrative of a given OER, which the learner must critique and internalise, the weaker *inter*-unit structure must be constructed by the learner, or in conjunction with others, as they seek to integrate understanding across OERs and the universe of other information sources. What support for managing this information ocean can we provide in the learning environment in which our OERs are embedded, in order to move learners towards knowledge construction and negotiation? Users need intuitive, powerful tools to manage, share, analyse and track information, ideas, arguments and the connections between them.

Our specific concern within OpenLearn is to investigate support for what we call Open Sensemaking Communities [2], a concept we are using to investigate *designing for sensemaking*: embedding OERs in an environment that supports end-users (both learners and educators) in engaging more deeply with the material and with each other in self-organising communities of interest. The focus on *[sense][making]* reflects Karl Weick's formative work on

giving shape and form to *interpretations*, and the individuals/communities articulating them. "*Sensemaking is about such things as placement of items into frameworks, comprehending, redressing surprise, constructing meaning, interacting in pursuit of mutual understanding, and patterning.*" ([5], p.6).

Weick points out that sensemaking comprises what people do in socially complex situations, when confronted by incomplete evidence and competing interpretations. The degree of uncertainty around learning will of course vary depending on the learner's ability, the learning objective, the complexity of the material, and to a degree, the discipline (e.g. there are harder "truths" in the sciences than in the humanities). However, the point is that when there is uncertainty, what else is there to do but through discourse, construct a narrative to fill in the gaps? "*The point we want to make here is that sensemaking is about plausibility, coherence and reasonableness. Sensemaking is about accounts that are socially acceptable and credible.*" ([5], p.61).

A primary challenge is to assist self-organising learners and educators in assessing, extending and contesting. OERs. This also requires access not only to the *text,* but to the *context* (e.g. annotations, argumentation, and the people behind them). This rationale shapes the selection of the social and conceptual networking software tools that we are evolving, which are designed to make visible and manipulable the connections between ideas, and between the people behind them. What will sensemaking infrastructures enable us to do for intellectual landscapes over OERs?

Andriessen et al (2003) describe three learning scenarios to analyse educational contexts under which specific learning goals can be achieved based on pedagogical strategies
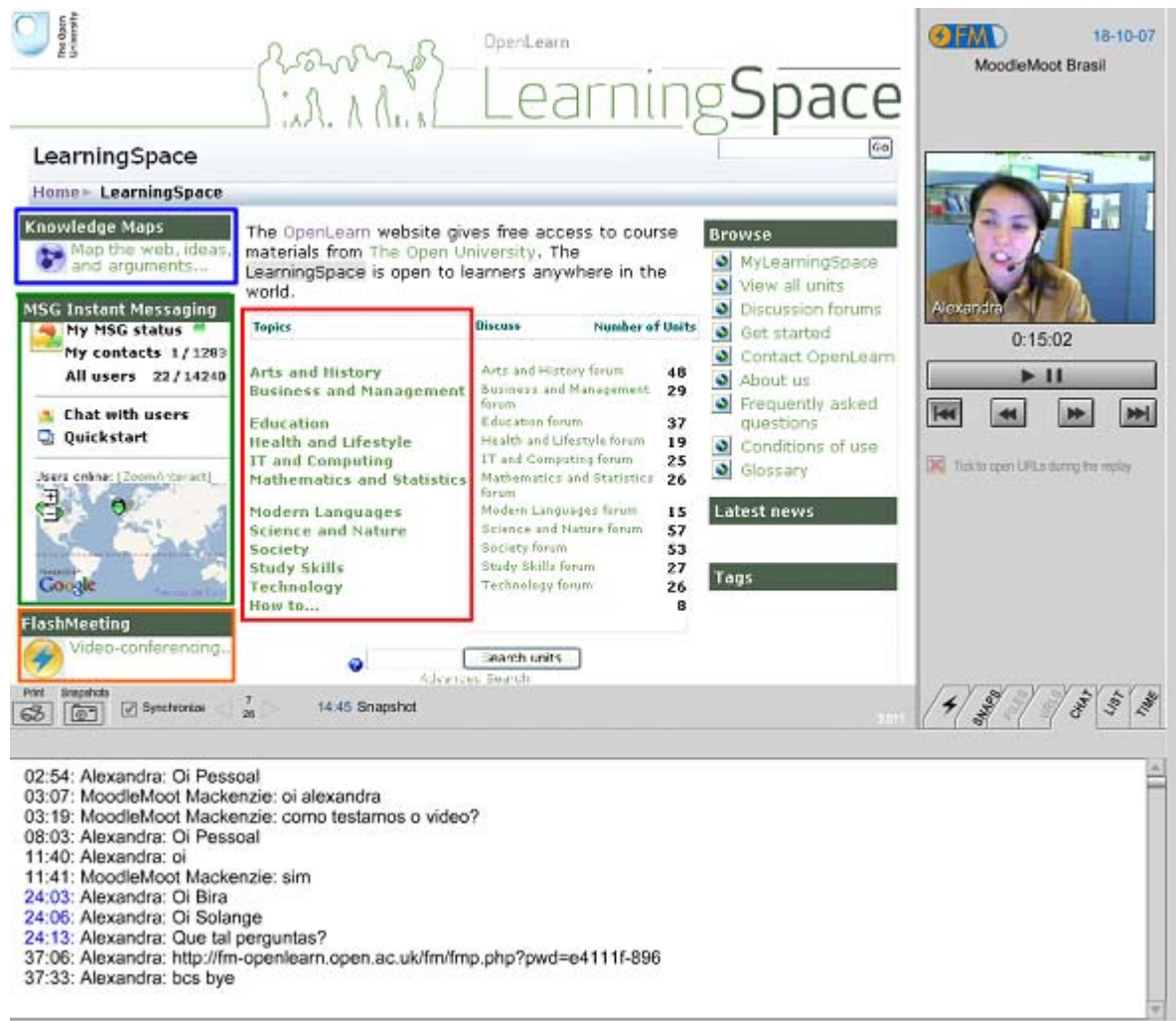
Figure 1: The FM-OpenLearn Folksonomy of Public Meetings.

for collaborative learning. Based on the framework summarised in Table 1, we later analyse the uses of OpenLearn tools to foster open sensemaking communities in section 5.

3 Videoconferencing

3.1 The FlashMeeting Project (FM)

In an open learning environment, in addition to other ways of communication, such as email, forums and instant messaging, videoconferencing transforms synchronous communication with the use of multimedia.

The FlashMeeting videoconferencing project (FM) has been integrated with OpenLearn in a Moodle "block" and requires no installation. OpenLearn account holders can "book" a meeting, adding the meeting details, such as date, time and duration, number of attendees, title and keywords etc. and forward the meeting link to the meeting attendees via email or posted in a forum. Up to 25 participants can connect in a meeting.

The system forces only one person to broadcast at any one time, while co-attendees can raise a symbolic hand or

interrupt. The background channels of communication in FM include a text chat facility, voting, indicating emoticons and a shared whiteboard. The whiteboard can be used for collaborative work, such as discussing or annotating uploaded slides, brainstorming by adding text or drawing.

All meetings are recorded, and replays can be syndicated in a publicly accessible Web page, including a folksonomy[1] created according to the keywords added by the users in the meeting booking page. The replays can be easily browsed, edited and annotated (Figure 1). The replay page also includes automatically generated links to the chat transcript, and to linear and polar representations of the communication channels used in the event.

3.2 Videoconferencing Use

Over four years of research, the FM application has been

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[1] Folksonomy is the practice and method of collaboratively creating and managing tags to annotate and categorize content. <http://en.wikipedia.org/wiki/Folksonomy>.

offered to a range of industries, including schools, universities, companies and research institutes. At the moment, it is used by over 40 European projects and numerous sensemaking communities worldwide.

Over 800 naturalistic meetings not including the word "test" in the title have been recorded in the FM-OpenLearn server. Over 80 recorded events are syndicated at the FM-OpenLearn folksonomy, mostly including moderated project meetings, webcasts, virtual seminars, interviews and peer-to-peer meetings.

Our strategy involved in OpenLearn is to support sensemaking communities to understand the power of "opening up" their learning with videoconferencing, focusing on:

■ Effective support for peer learning in a synchronous Web 2.0 world.

■ Integration with OpenLearn units via the "related meetings" link.

■ Social networking, facilitated in FM through the page "My Events".

■ Re-use and syndication of meetings as shared content via the FM folksonomy.

■ Live attendance maps and replay reuse maps showing the importance of a public replay.

■ Meeting replay with knowledge maps, to show knowledge transferred in the meeting.

4 Knowledge Mapping

4.1 Compendium
The Compendium software tool developed by the Knowledge Media Institute at OU-UK provides a visual user interface for users (e.g. learners, educators or software developers) to cluster, connect and tag icons representing issues, ideas, concepts, arguments, websites or any media document. Through Compendium, learners can represent their thoughts and reflections while they study or work on a unit.

They can share their knowledge maps with others in order to learn together. Knowledge maps can be very useful as a summary of a topic, collection of important resources and as a learning path through the maze of the Web.

Knowledge Mapping [7] is a concept which comprises techniques and tools for visualising conceptual models as explicit structures graphically. Knowledge mapping techniques include:

■ Conceptual models of any subject such as concept maps [8].

■ Personal plans such as mind maps [9].

■ Models of dialogue and argumentation such as dialogue maps [10] and argument maps [11].

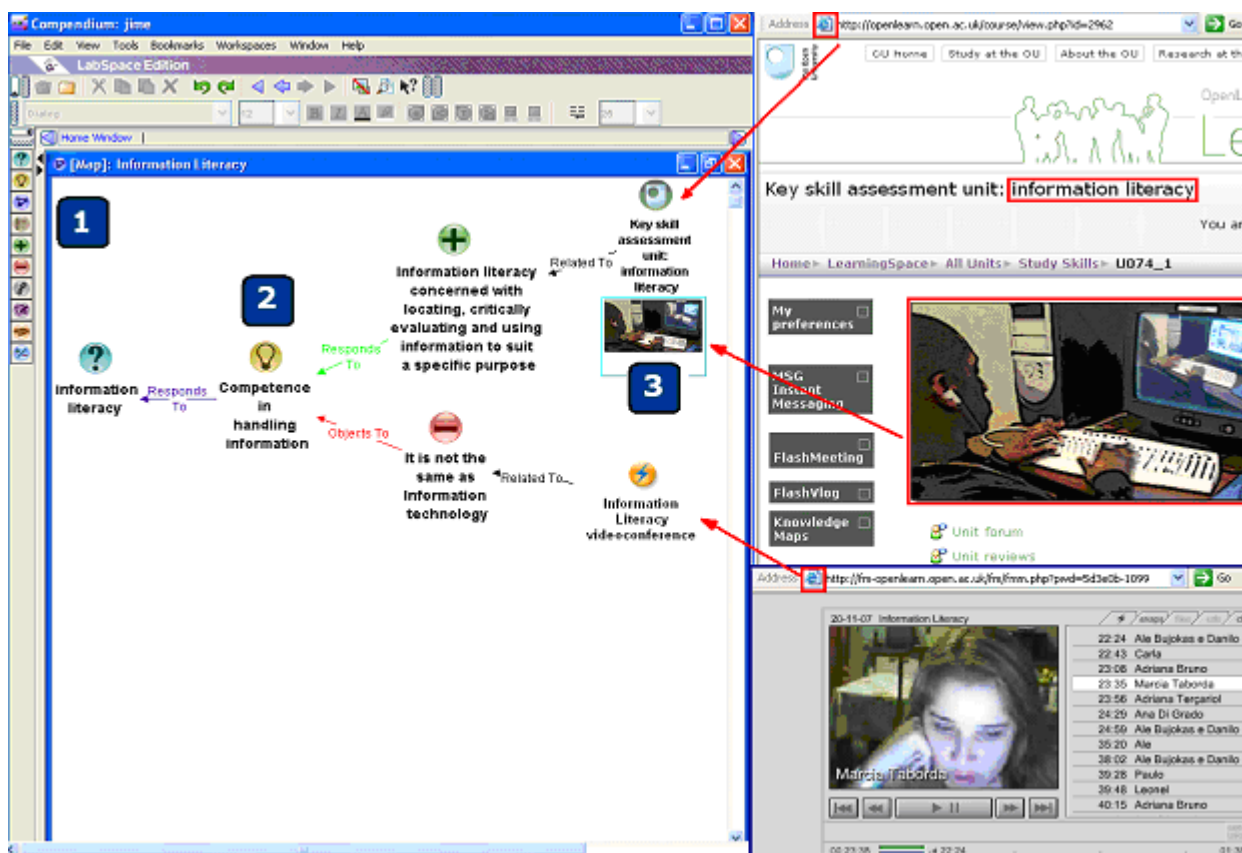Students can sketch these graphical schemes on paper

Figure 2: Compendium's User Interface for Linking Issues, Ideas, Arguments and Documents.
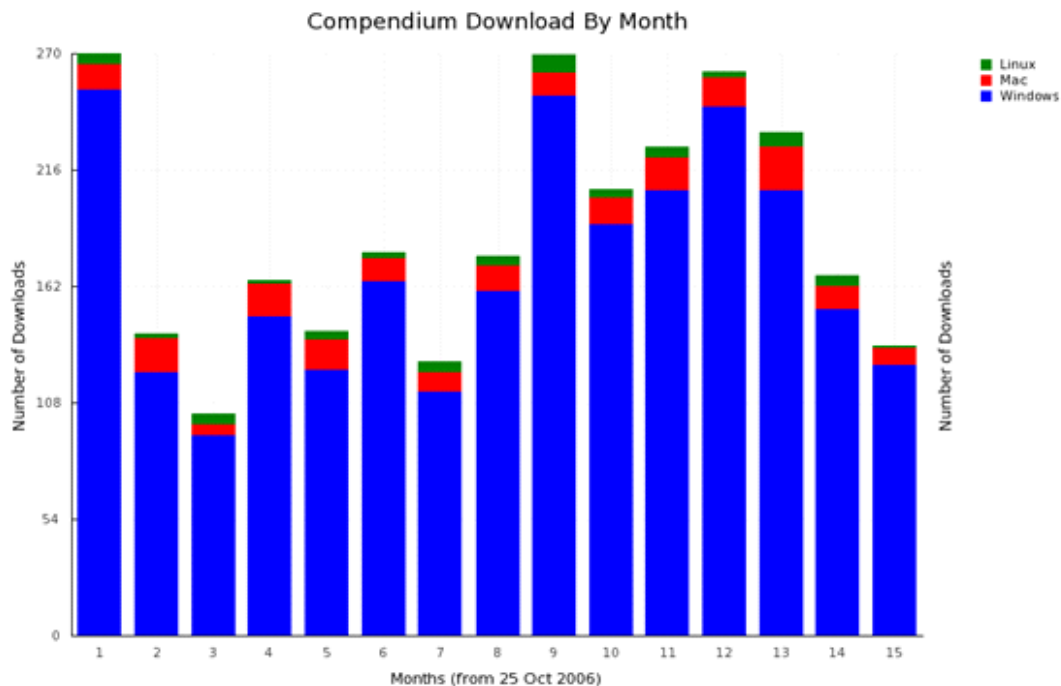
Figure 3: Compendium Downloads by Month in the LabSpace.

or use a mapping software tool to create knowledge maps. In this case, hypertext maps can be published on the web, users can navigate in hyperlinks, download, edit and upload it again [12].

This example in Figure 2 illustrates how students can create a map in Compendium in order to study an open educational resource. They can use dialogue mapping technique to record their thinking about the content represent their internal conversation graphically. By dragging and dropping a question-icon ❓ from the palette onto the map, they can type a key issue, problem, or question. They can then create and connect new nodes such as 💡 for answers, concepts or data; ✏️ for arguments, choices or possibilities; ➕ for supporting arguments; ➖ for counterarguments. Pictures, sites and documents from the web can be added into this map also by dragging and dropping the media resource, for instance FM URLs.

4.2 Knowledge Mapping

During fifteen months, from 25th Oct. 2006 launch to 10st Jan. 2008, the Knowledge Mapping reporting system shows 3378 downloads of the Compendium tool, with coverage across the different internal OU communities, with strong representation from elsewhere in the world:

5 Linking Knowledge Maps and FM for Open Learning

In this section we analyse learning scenarios where knowledge mapping was integrated to FM webvideoconference to foster sense making. The examples analysed were produced by the OpenLearn Community CPLP <http://labspace. open.ac.uk/course/view.php?id=1456>.

5.1 Knowledge Maps for a Virtual Lecture: Transmission Scenario

Figure 4 shows a Compendium map in the Portuguese language created for an online lecture in FM given by a Brazilian postdoctoral researcher. The map was used to guide her lecture and engage participants to discuss its key points in FM. This mind map shows new ideas about "Media Literacy in Education" which is also related to the OpenLearn unit (*U074_1: information literacy*).

These key concepts were selected from her blog Educational Media which can be accessed by the icon **1**. While she talks any participant can bring icons **2** either to highlight what she is presenting or to connect a question that can be typed in the chat **3**. Learners can exchange comments in the chat area in order to make sense about the content presented.

This example can be analysed as a transmission scenario. The Compendium map can be used to clarify and summarise the content of a virtual lecture.

In this case, the map indicates that the FM event focuses on a question "*How can we develop skills to use diverse "grammar" from different areas such as linguistics, discourse analysis, visual design, body language and spatial and audio interfaces?*". In the chat, a participant asks whether there is any issue or comments. Another partici-
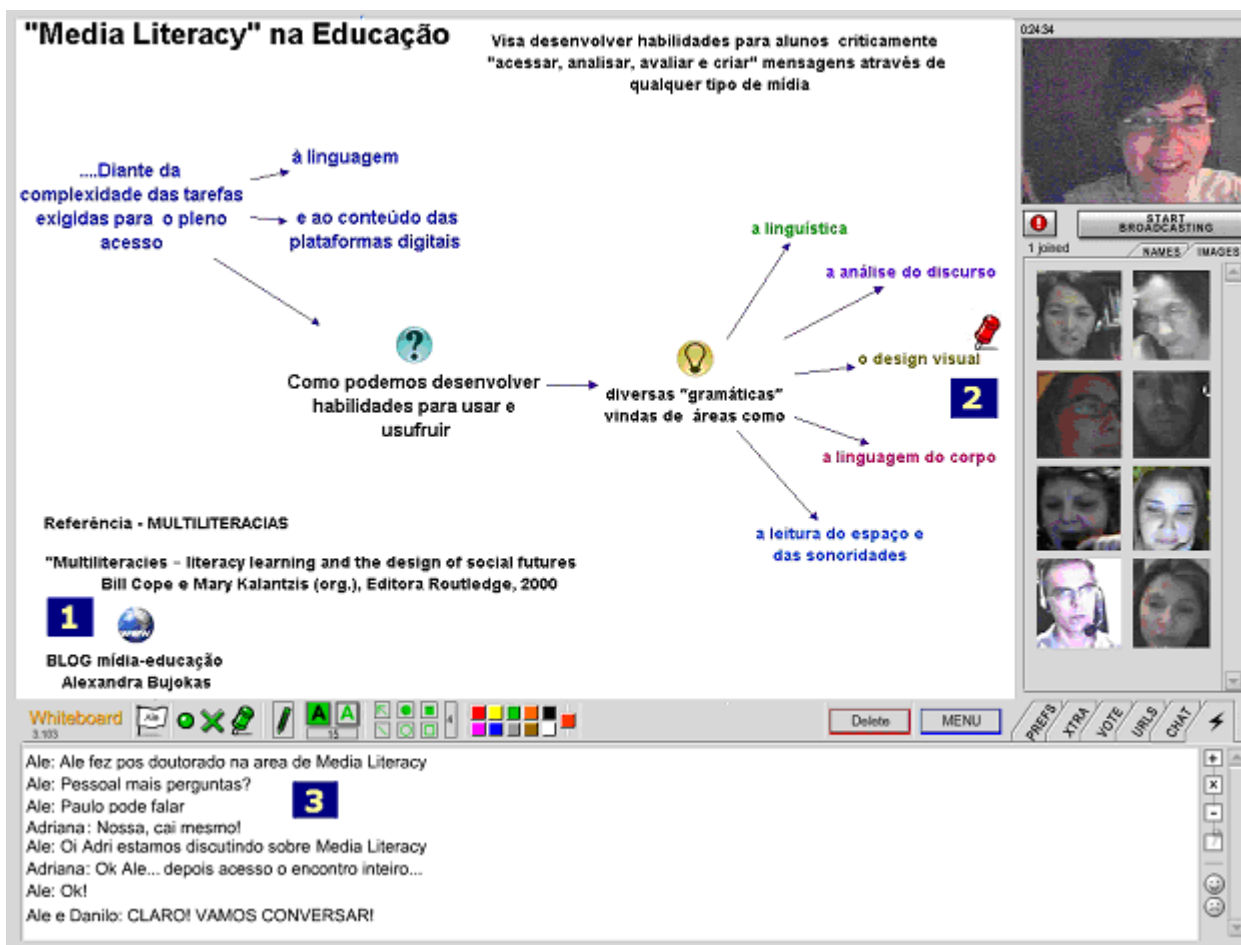
Figure 4: Studying the Arts and Humanities Through a Knowledge Map.

pant then describes problems with her internet connection, although after visualising the content of the presentation her answer indicates that she is fine and later she will replay what was missed. In this case, the map which offers a global picture of the lecture helps not only people who participate in this event but also attendees who arrived late. Andriessen et al ([6], p.16) point out that "*in transmission, argumentation is mainly considered as a reasoning process in which learners try to articulate strong and relevant arguments to arrive at an approved conclusion*". The lecturer can help learners visualise key ideas through a knowledge map.

The more familiar learners are with the content presented, the more engaged they become in such a discussion.

5.2 Learning Path Map Integrating FM Conference: Studio Scenario

Another kind of representation is a Learning Path Map, a sequence of learning resources significant to a learner or as a resource for educators to attend their specific needs. A learning path may be an interesting sequence of reference nodes hyperlinked to activities or content from OERs and other resources. It may represent an organised structure showing prerequisite knowledge, learning objectives and estimated study hours.

The Compendium map below illustrates how learners can extend their understanding about the content discussed in a FM conference. They can add more resources, describe connections, include more content and interesting media resources such as movie clips (e.g. in YouTube <http://www.youtube.com>), other presentations (e.g. SlideShare <http//www.slideshare.net>), definitions about concepts discussed (e.g. from Wikipedia <http://en.wikipedia.org> and blogs) and learning activities in OER (e.g. from OpenLearn, MIT Opencourseware, …).

This example can be analysed as a studio scenario, where, *"learners use collection of tools and tasks to adapt their learning to their needs and goals"* ([6], p.17). The Compendium map can be used as a visual authoring tool for the rapid (re)sequencing of learning resources, a form of high level "remixing" open educational resources. All these different resources in diverse media formats mapped in figure 5 can help learners to make sense of the main topic discussed [5]. The sensemaking process is emphasised when learners make retrospective sense of the situations in which they may find themselves. In this case, by mapping different resources which they are familiar with might help them
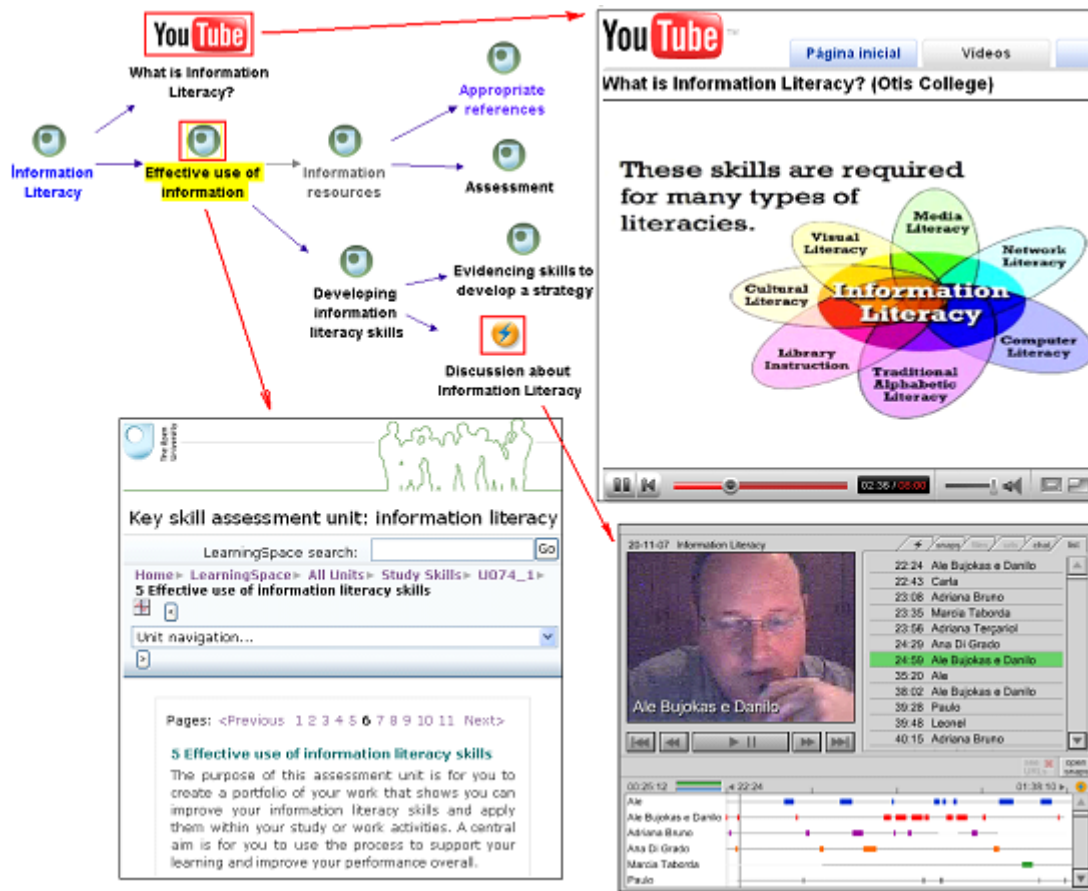
Figure 5: "Creating a Learning Path Map": Information Literacy.

establish connections between what they are learning and their previous knowledge or experiences.

5.3 Concept Maps during a Peer-to-Peer Event: Negotiation Scenario

Figure 6 shows a Concept Map done on the whiteboard created by all participants in a peer-to-peer discussion from Brazil and Portugal. In this map, each attendee brings a keyword which is meaningful for them in order to describe the notion of "*information literacy*" using the FlashBoard in FM and broadcasts the context by describing examples, experiences and knowledge. They also add their names after their keywords (e.g. Information literacy means "culture of participation" by Ale Bujokas, "development of competences" by Carla, "not only technical and scientific ones, but also socio-cognitive and collaborative skills related to the ability of inquiry" by Paulo, and "critical thinking" by Leonel).

This example can be analysed as a negotiation scenario. A collaborative concept map followed by oral narratives by each FM participant can represent the collective sensemaking process, in which the participants negotiate their own meaning to describe the concept (e.g. "information literacy") together. As Andriessen et al ([6], p.21) ex-

plain "*negotiation may be about problem solutions, meanings of concepts, which fosters individual learning on specific meaningful exchanges between individual participants.*".

5.4 Web Maps for a FM Replay: Assessment Scenario

The FM Memos generate a set of metadata, available in XML format. This XML can be imported into Compendium and turned into knowledge maps as we can see in a virtual meeting about digital games applied to education in the example below. These Web maps can enhance the understanding of the event, as they include temporal and conceptual connections amongst all event elements, such as who attended the meeting and who spoke when (top images of Figure 7), the URLs visited and the whiteboard images or interactions (bottom images of Figure 7), text chat logs, annotations, votes and keywords. All these icons are nodes automatically linked in a knowledge map, which can be used to assist the replay users in structuring, acquiring and reconstructing the knowledge transferred during the discussions and argumentations in the meeting. The nodes are actually links back to the original replay as well; therefore a way of traversing the replay through different categories
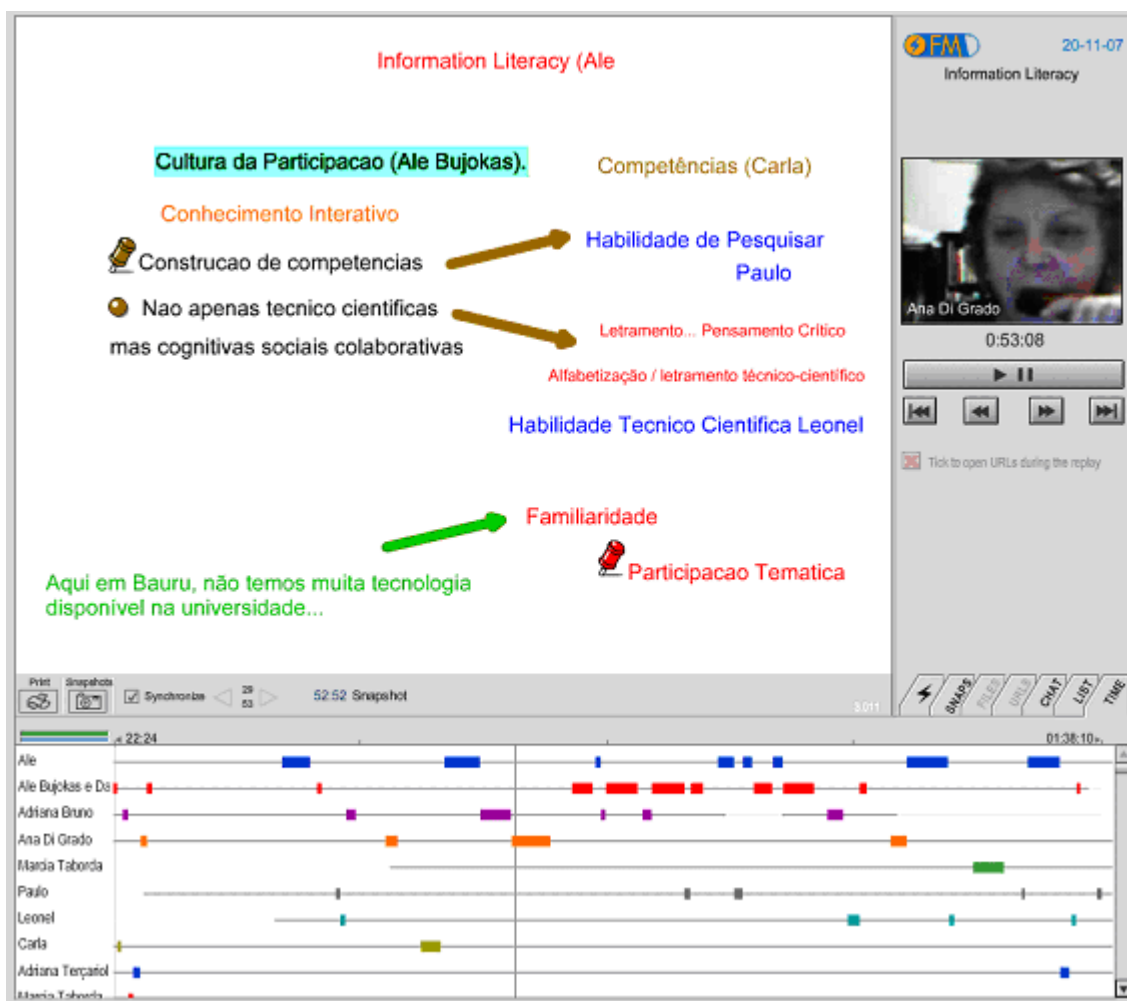
Figure 6: Negotiating the Meaning of Information Literacy Through a Concept Map.

of indexed timestamps. The bottom-right image of Figure 7 is a map edited by a participant and represents the key points of the whole discussion: key questions, ideas, arguments counterarguments and conclusions reached by collective sensemaking.

This example can be analysed as an assessment scenario, suggested by the authors. In the learning process, it is essential to engage learners in self-assessment or formative assessment, in which learners can reflect and develop a critical evaluation about the uses of OpenLearn Tools to enhance their learning and sensemaking process. Through these Web maps, they can analyse and assess different kinds of FM events which may differ in that they may present different map structures. For example, seminars and peer-to-peer meetings (negotiation scenario) can present richer maps in terms of URLs, broadcasts and chat logs, as they are more interactive events, involving the active participation of several attendees. In virtual lectures (transmission scenario), on the other hand, with a main presenter broadcasting and his/her virtual audience interacting with chat,

there is less interaction between participants. The structuring of the FM replay information in maps allows the users to browse the different parts of the event, based on the different event elements, such as individual broadcasts, annotations, URLs shared etc. These Web maps to navigate though the webconference may also help researchers to develop a qualitative analysis of the content in a FM conference.

Andriessen et al ([6], p.22) explain that *"Scenarios focusing on meaning making practice rather than on product, and on collaboration and group processes rather than individual knowledge were considered as better test-beds for the study of learning from argumentation".* Weick ([5], p.192) complements "*criteria for good sensemaking are not obvious (…). Reflection is perhaps the best stance for both researchers and practitioners to adopt if the topic of sensemaking is to advance*". In this sense, knowledge mapping can guide learners to clarify issues in a discussion, extend their knowledge, negotiate meanings collaboratively and also be applied to formative assessment.
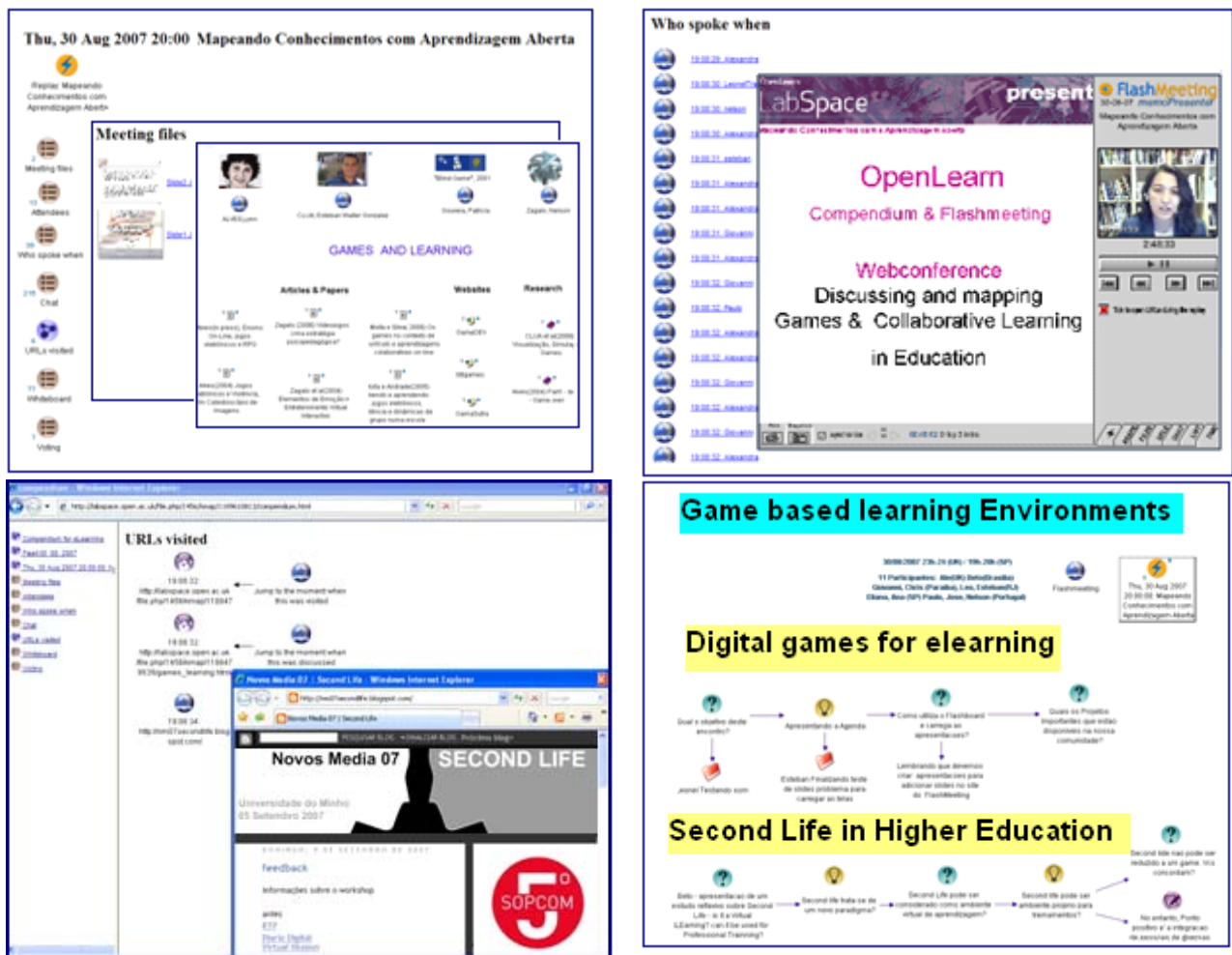
Figure 7: Web Maps for Better Event Understanding.

6 Conclusions

During one year of existence, the OpenLearn project has engaged a critical mass of over 30,000 registered users and over one million unique visitors, taking advantage of the OERs to learn at their pace and time. So far, the knowledge media tools have been proved useful to help users connect with other open learners with similar interests and participate in online communities of practice. Our research focuses on how knowledge media tools can improve communication and support the collective construction of knowledge. We wish to give some insights into fostering open sensemaking communities and encouraging them to produce learning objects, especially in combination with the available OERs.

Compendium has been used for studying, remixing and developing OERs and has been integrated with the FM videoconferencing tool not only to enhance peer-to-peer collaboration amongst learners, but also to support virtual seminars and presentations. Several of these resources produced in FM and Compendium have been reused world-wide by individuals from different corners of the world. The combination of the media tools for knowledge mapping and videoconferencing indicates that further learning scenarios, such as the assessment scenario introduced in this work, may emerge in open formal or informal learning contexts.

References

[1] J. Willinsky. "The access principle: the case for open access to research and scholarship". Cambridge: MIT Press, 2006. ISBN: 0262232421.

[2] S. Buckingham. "From Open Content Repositories to Open Sensemaking Communities". <http://cosl. usu.edu/conferences/opened2005/docs/opened2005-proceedings.pdf>, accessed August 10, 2007.

[3] P. J. Scott, E. Tomadaki, K. A. Quick. "The Shape of Live Online Meetings". International Journal of Technology, Knowledge and Society, Vol 3, 2007, Number 4, pp. 1-19.

[4] A. Okada, E. Tomadaki, S. Buckingham Shum, P. J.

Scott. "Combining Knowledge Mapping and Videoconferencing for Open Sensemaking Communities". Open Education Conference, Logan, Utah, Sept. 2007. <http://cosl.usu.edu/events/opened2007>.

[5] K. Weick. "Sensemaking in Organizations". Sage Publications, 1995. ISBN: 080397177X.

[6] J. Andriessen, M. Baker, D. D. Suthers. "Arguing to Learn: Confronting Cognitions en Computer-Supported Collaborative Learning Environment". Springer, 2003. ISBN: 1402013825.

[7] A. Okada, S. Buckingham Shum, T. Sherborne. "Knowledge Cartography". Springer, 2008, in press. <http://kmi.open.ac.uk/books/knowledge-cartography>.

[8] J. D. Novak. "Learning, Creating, and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations". Mahwah, NJ, Lawrence Erlbaum Associates, 1998. ISBN: 0805826262.

[9] T. Buzan. "The Mind Map book". London: BBC worldwide, 1993.

[10] J. Conklin. "Dialogue mapping: building shared understanding of wicked problems". Wiley, 2005: Chichester. ISBN: 0470017686.

[11] T. van Gelder. "Argument Mapping with Reason!Able". <http://www.philosophy.unimelb.edu.au/reason/papers/arg_mapping_with_reasonable.pdf>, accessed August 10, 2007.

[12] A. Okada, S. Buckingham Shum. "Knowledge Mapping With Compendium", in Academic Research and Online Education. 22nd ICDE World Conference, 3-6 sept. 2006, Rio de Janeiro <http://kmi.open.ac.uk/projects/osc/docs/KnowledgeMapping_ICDE2006.pdf>, accessed August 10, 2007.

Links of Interest

Compendium Institute. <www.CompendiumInstitute.org>.
Compendium (Open University). <http://compendium.open.ac.uk>.
FlashMeeting. <http://flashmeeting.com/>.
OpenLearn Initiative. <www.open.ac.uk/openlearn/>.
Open Sensemaking Communities. <www.kmi.open.ac.uk/projects/osc/>.