The Open University

LiteMap

LiteMap Outreach and Usage by Brazilian Universities

Dr. Alexandra Okada

Dr. Anna De Liddo

Executive Summary

LiteMap is a cloud-based application for collaborative and individual knowledge mapping developed by the Knowledge Media Institute team led by Dr. Anna De Liddo in 2012. It was translated to Portuguese by the Colearn Community as part of the European ENGAGE project in Brazil in 2015.

This report analyse data gathered from the COLEARN Community over two years - November 2015 to November 2017. It describes the range of users from Brazil who accessed LiteMap, their interests and expectations for the tools, some issues they have reported when using it and how was solved.

They key outcomes of this report are:
- Growing interest of LiteMap in the postgraduate courses
- Adoption of LiteMap by undergraduates led by a group of lecturers
- Adoption of LiteMap for professional development of teaching staff
- Adoption of Litemap by research communities and PhD students
- Key factors for engaging users with LiteMap from case studies reported by users
- Obstacles faced and recommendations

Table of Contents

1. Introduction

1.1 Definition

LiteMap is an online collaborative tool for individuals or teams to make sense of complex issues or topics through knowledge mapping. They can use LiteMap to map face-to-face and online discussions through mind maps, concept maps, argument maps and dialogue maps. These hypermedia maps which are characterised by distinctive icons (question, ideas, pros, cons, arguments and comments) can be used to address different needs of users and communities, for instance, developing common understanding, creative thinking, critical reasoning and collaborative problem-solving.

1.2 Description

The Litemap interface (Figure 1) presents three main screens: Home, Groups and Maps. It also offers five initial options for users: sign in, sign up, about, help and Dashboard.
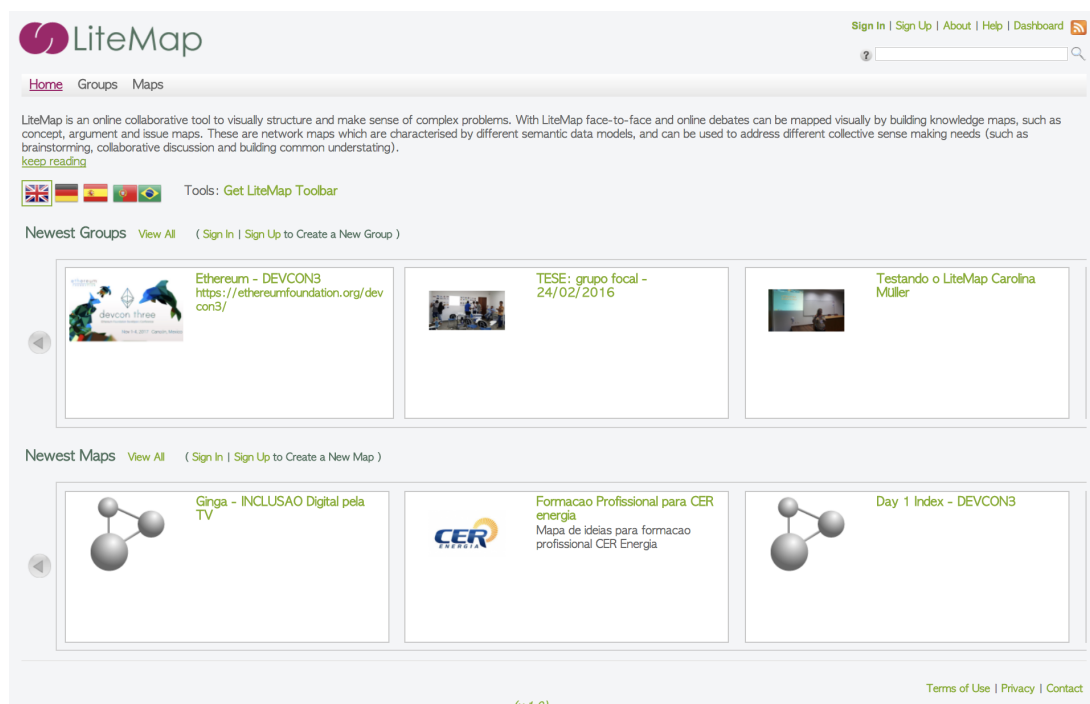

Figure 1 – LiteMap initial screen

LiteMap is constituted by four features:

- A **bookmarklet** to harvest and annotate content while browsing the Web

- 2-D *mapping canvases* to connect ideas and build argument maps.
- A *Community Website* to collaboratively create and share maps.
- A *Visualisation Dashboard* to support sensemaking and reflection.

As it is presented in the LiteMap Help, LiteMap is useful for:

- **Community   Managers:**
  Litemap helps you to summarize the state of a debate and to present it to the community: to trigger further reflection, promote deeper understanding and improve engagement with the online debate. LiteMap is also a tool to organise your community's contributions, reduces idea duplication, and supports content analysis and summarisation. The analytics dashboard onto your maps helps you spot connections between ideas, detect gaps in knowledge, discover new patterns and produce visual summaries of the community debate.

- **Community   Members:**
  Litemap is your way to move from debate participation to community moderation. With LiteMap you can build a visual representation of your own view of where an online debate is going and you can use this representation to communicate your ideas to others.

There are seven video tutorials that can be accessed about LiteMap. The first can be accessed in the page About and the others in the page Help

Video	Time
LiteMap Concept Movie	(2m 30s)
Creating an account and a homepage overview	(5m 28s)
Creating new Groups and Maps	(4m 55s)
Mapping	(20m 12s)
Browser Toolbar	(12m 09s)
Searching	(3m 41s)
Browser Toolbar	(12m 09s)
User Home Pages	(3m 55s)
The Dashboard	(14m 57s)
Embedding Maps in other Sites	(3m 23s)

Table 1 - LiteMap Tutorial Videos

Once a user is logged in LiteMap, two options are displayed in the main top menu: My LiteMap and Edit Profile. The option My LiteMap (Figure 3) shows My data, My Groups and My Social Networks. It also presents a content creation summary, what I am Following and my Followers.
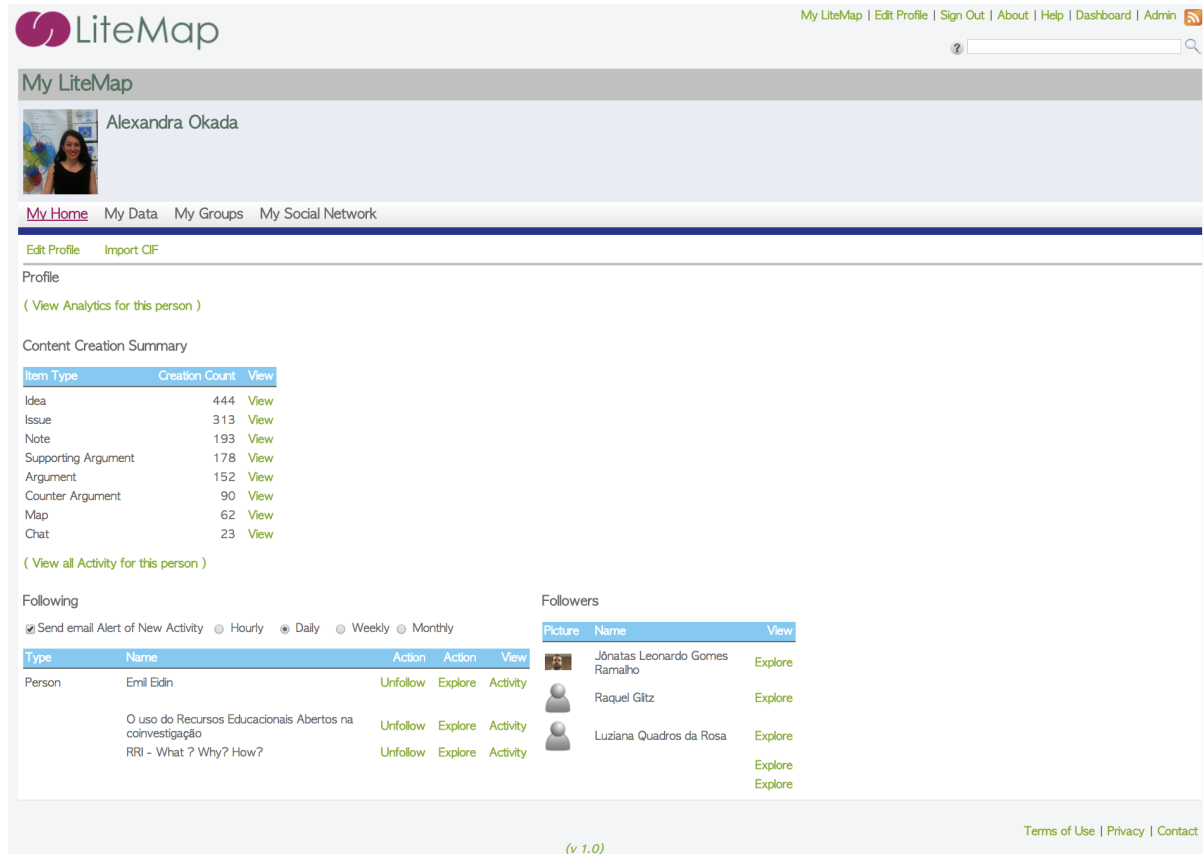

Figure 2 – My LiteMap screen Alexandra Okada

The option Edit Profile enables users to edit their personal data, decide whether by default they want to keep their data private or public and change their password. To access maps in LiteMap, anyone can view public maps without login the system. However, to create or edit a map, users must either create or join a group. The community manager who creates a group can access all maps of the community which are public and the list of group Members. They can search specific content, visualise search results, and view the dashboard.

Figure 3 presents an example of the COLEARN community in Brazil who created the group Global System Science to annotate and study together the course in the FutureLearn offered by the Open University UK.
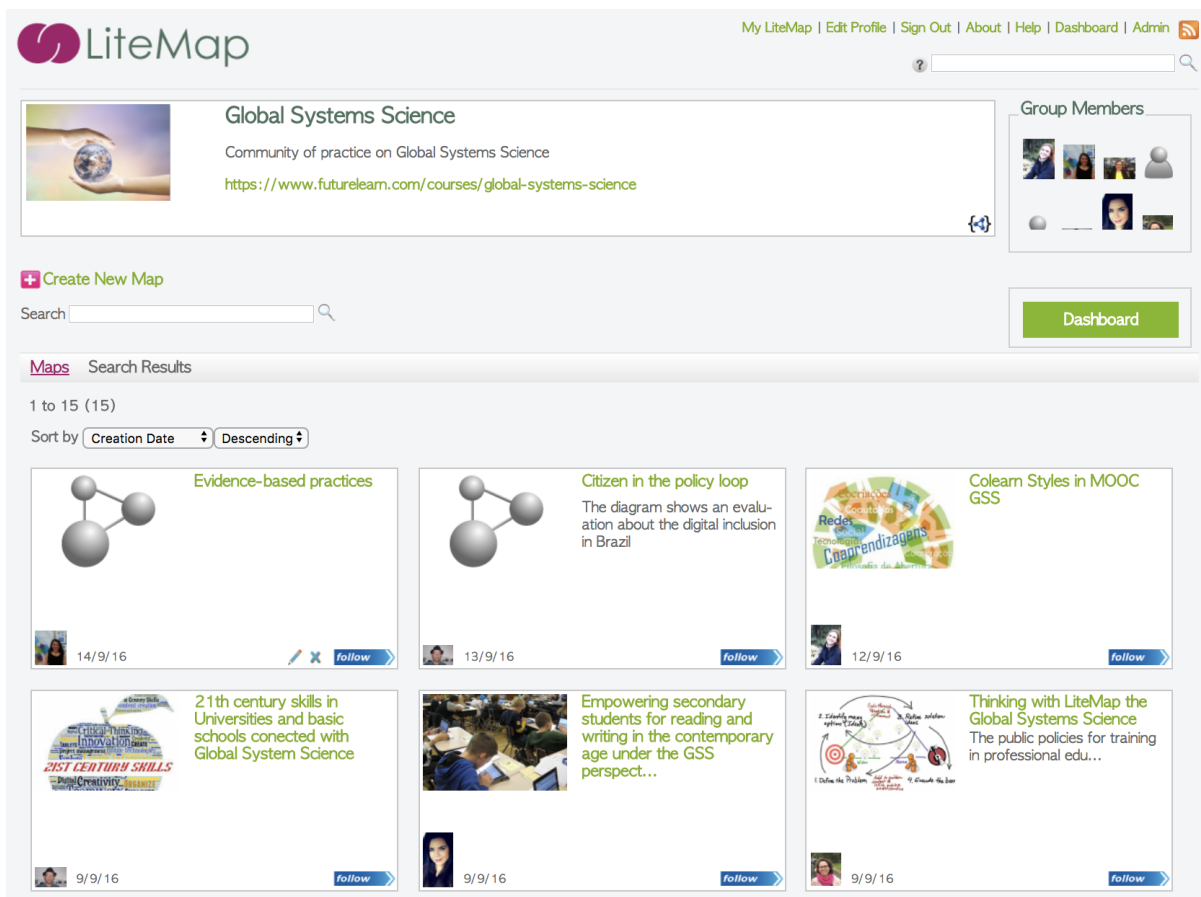
Figure 3 – Global System Science Group

Figure 4 presents an example of the main screen of LiteMap that allows users to edit or extend a map collaboratively. A joined member must be logged in LiteMap to contribute to a map. It is also important for the group manager to define if the group is open for anyone to join or moderate, only the manager can accept the members. It is also important for the participants to be aware that any member of the group can change the layout of the map and delete the node from the Map. However, the node won't be deleted from the Inbox area of the author and it can also be added again.

It is really recommended to the group manager to discuss some rules and roles for the participants to contribute and understand how they can collaborate without problems.

The main screen of LiteMap for editing a map offers three areas:

1. **The Head area (on the top):** it contains the User Menu (My Litemap, Edit Profile …), Group Menu (Dashboard), and Map menu (Map, Alternative

6

Views and Visual Analytics). This area can be hidden to maximise the mapping area in the arrow (Figure 5, n.1).

2. **The Inbox area (on the left):** it offers the six types of icons to be dragged and dropped into the map, to create a node for representing respectively: ❓questions, 💡ideas, ➕pros, ➖cons, ✂arguments and 💬comments. The content added by the author is displayed in the inbox area and can be searched.

3. **The Main Map area (on the right):** it offers an empty canvas for the group to add nodes and connections using the right click of the mouse on the node and drag and drop the arrow on the top of the other icon. The map can also have a background image or video that are specified on the properties of the map when the map author creates the map.

Figure 4 – *GSS Course map*

A Node (Figure 6) contains the icon, description, extra information and a tool bar with options to access its 📄content, 🌐links, 🔗(URL of the icon), 👍0 like, 👎0 dislike and ✖delete. The options like and dislike appears only for icons who have connections and it is related to the relations established rather than its own content.

Figure 5 – GSS Course map

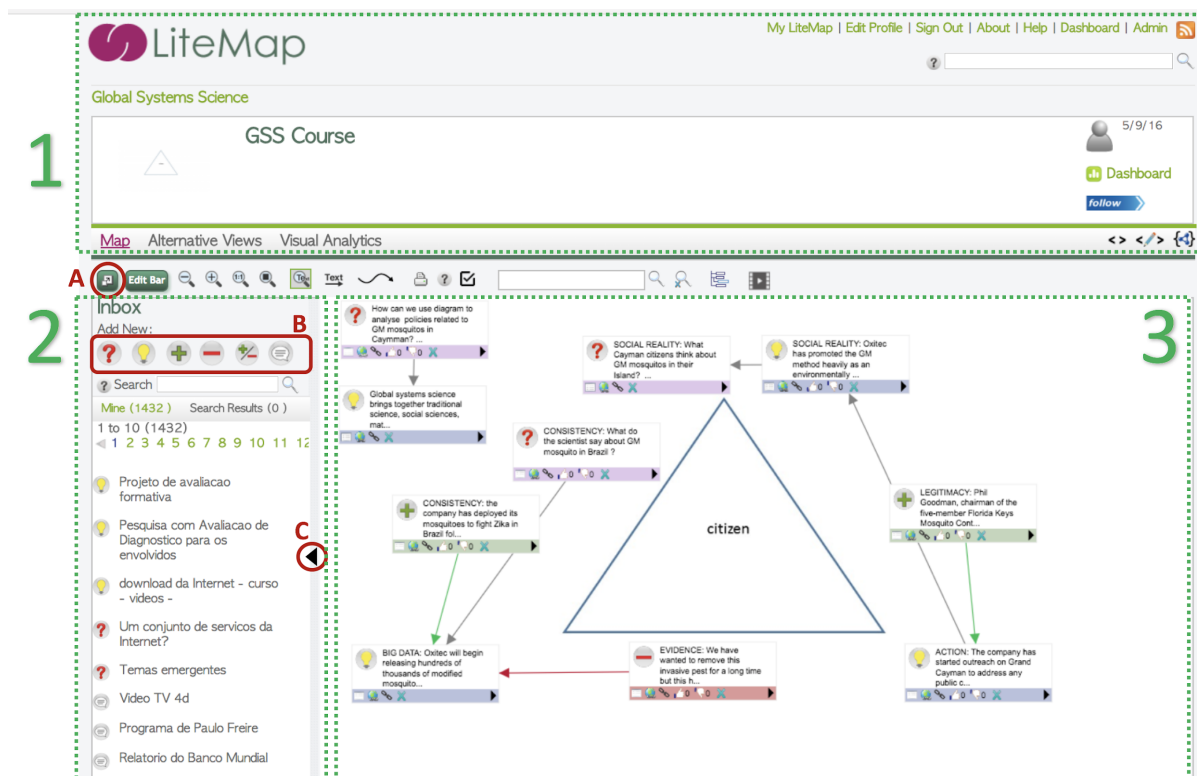Each content of icon (Figure 7) can be accessed to explore more by users: full description, URLs, author and data of creation. It also includes a Menu of options: print, chat about the node, outline view and map view.
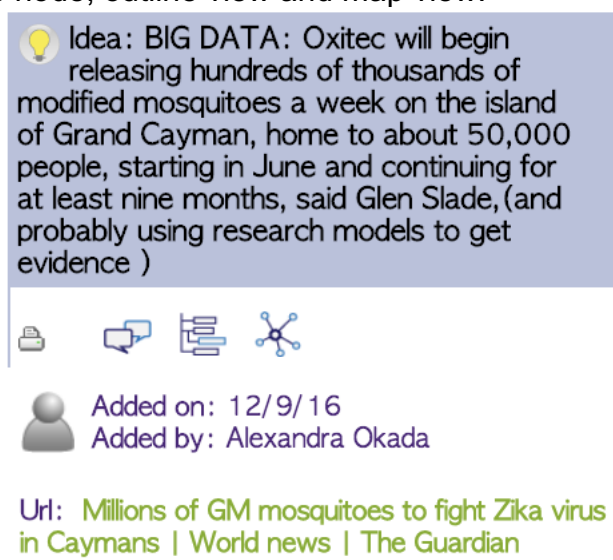
Figure 6 – GSS Course map

1.3 History

This cloud-based application tool was developed in HTML5 by Michelle Bachler and designed by Dr. Anna DeLiddo for collaborative and individual knowledge mapping part of the Collective Intelligence and Online Deliberation research of the Knowledge Media Institute at the OU UK. This research is conducted by the IDea (Intelligent Deliberation) group lead by Dr. Anna De Liddo, and was founded in in 2012 in the Context of the Catalyst project, within which LiteMap was first developed. LiteMap is also a direct evolution of previous research on Hypermedia Discourse led by Simon Buckingham Shum, who launched the Compendium Institute website and the Compendium software tool. Compendium is an open source desktop application running on Windows, MacOS and Linux. It was written also by Michelle Bachler in Java, and it was licensed in 2002.

This software tool was built based on the system called gIBIS during 1980s and QuestMap developed by NYNEX Science & Technology Labs in New York also known as Verizon. A history of Compendium's development is documented by Selvin in the Knowledge Art blog and many case studies and research can be accessed at the Compendium Institute Library.

1.4 Research Team

LiteMap was developed considering similar features of Compendium, however extended based on cloud computing for communities to connect ideas and knowledge synchronously or asynchronously to foster "contested knowledge". The hypermedia research group developed various research studies that contributed to the development of the idea, concept and software tool LiteMap, including its predecessor Compendium. The studies that supported Compendium development were funded by the Research Councils and e-Science programme in the UK from 2002 to 2005. The group also developed international research funded by the Hewlett Foundation via the OpenLearn and OLnet projects. The funding for LiteMap was led by Anna DeLiddo who coordinated two major research projects Catalyst 2013 - 2015 and EDV 2014 - 2016.

The COLEARN Research Network and Knowledge Cartography research team led by Dr. Ale Okada also received also various grants from the European Commission such as weSPOT 2013 – 2015 and ENGAGE 2014 - 2016. The team also received funding from the Brazil Government who sponsored 7 PhD students and 4 PostDoctoral researchers under Dr. Ale Okada supervision who contributed to the LiteMap users tests and translation for Portuguese Language as well as the integration of LiteMap in the weSPOT platform and Open Edx MOOC of the ENGAGE project.

1.4 Research Projects

There are four main large research projects funded by the European Commission by which LiteMap was used by the Hypermedia and Knowledge Cartography research team. These projects are:

1.4.1 Catalyst

This project funded by the European Commission was developed by the world-class researchers, such as The Open University and MIT centre for collective intelligence, and testbed partners, leaders in running international social innovation online networks. Its aim was to provide technologies for collective intelligence such as LiteMap and DebateHub to very large communities of citizens. Examples were developed in various fields such social and environmental practices (by Ashoka, Imagination for People and Wikitalia) ; sustainable lifestyle (by CSCP) participatory democratic processes   (by Purpose and Euclid Network) and educational communities (by the COLEARN network and RRI Brazil project)

1.4.2 EDV

This project was funded by the UK EPSRC *provided new ways for the public to replay the televised debates from the next UK general election using various methods and technologies such as LiteMap*

1.4.3 weSPOT

This project was supported by the European Commission. Its aim was to propagate scientific inquiry as the approach for science learning and teaching in combination with today's curricula and teaching practices. It offers a "Working Environment with Social, Personal and Open Technologies" that supports users (from 12 to 25) to develop their inquiry based learning skills by means of:

- a European reference model for inquiry skills and inquiry workflows,
- a diagnostic instrument for measuring inquiry skills,
- smart support tools for orchestrating inquiry workflows including mobile apps, learning analytics support, and social collaboration on scientific inquiry,
- social media integration and viral marketing of scientific inquiry linked to school legacy systems and an open badge system.

Users in weSPOT used MindMeister and LiteMap to create inquiry workflows.

1.4.4 ENGAGE

This project is part of the EU Science in society agenda to promote more Responsible Research and Innovation' (RRI). Its aim is to equip the next generation to participate in scientific issues to change how science is taught. Traditionally students gain an image of science as a body of content, whereas RRI deals with uncertain areas of knowledge, where values and argument matter as much as facts. This shift is hugely challenging. ENGAGE focuses on a more inquiry-based methodology, which gives students opportunity for self-expression and responsibility for coming to informed decisions. LiteMap was a knowledge mapping tool used by educators and students during ENGAGE project. Okada was also responsible for the teachers professional development through MOOCs in Europe during the ENGAGE project, and used LiteMap as part of the course content as a pedagogical tool for foster evidence-based dialogue maps.

2.Users

There are currently 1346 users, 169 are members of COLEARN Communities from Brazil and Portugal universities including 6 PhD students from the OUUK Milton Keynes who supported weSPOT and ENGAGE projects.
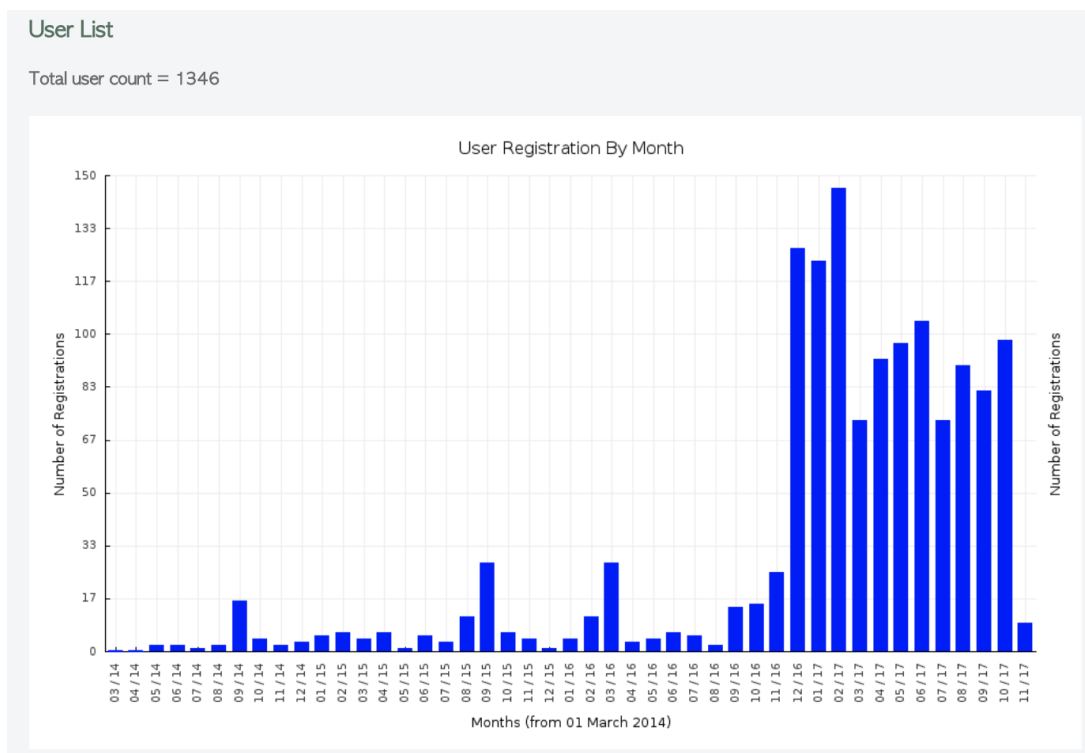

Figure 7 – LiteMap Users

2.1 Content Produced

In terms of the production developed by the global LiteMap community, there are 97 maps, 515 maps, 1587 Issues, 3085 ideas, 2019 supporting arguments, 904 counter arguments, 313 arguments, 1539 notes and 131 chat. (See also Table 1)

There are many factors that might engaged a significant grow of the number of users from 11/2016 such as events promoted by Catalyst Dr. Anna DeLiddo and Michelle Bachler during its last year and also the MOOCs with Face-to-face workshops organised and delivered by Dr. Ale Okada during the last two years of the ENGAGE project.

The Brazilian community also started to grow after the translation of the LiteMap to Portuguese which also available in 2016.

Groups	Total
Issues	1587
Maps	515
Issues	1587
Ideas	3085
Supporting Arguments	2019
Counter Arguments	904
Arguments	313
Note	1539
Chat	131
Total	10093

Table 2 – LiteMap Content

2.2 Content produced by month

Figure 8 also shows the content created by month. There are 2 months which content were added more intensively November 2015 and September 2016 and December 2017 which were the period that the course, workshops and seminars were delivered for the ENGAGE project in Europe and Brazil.
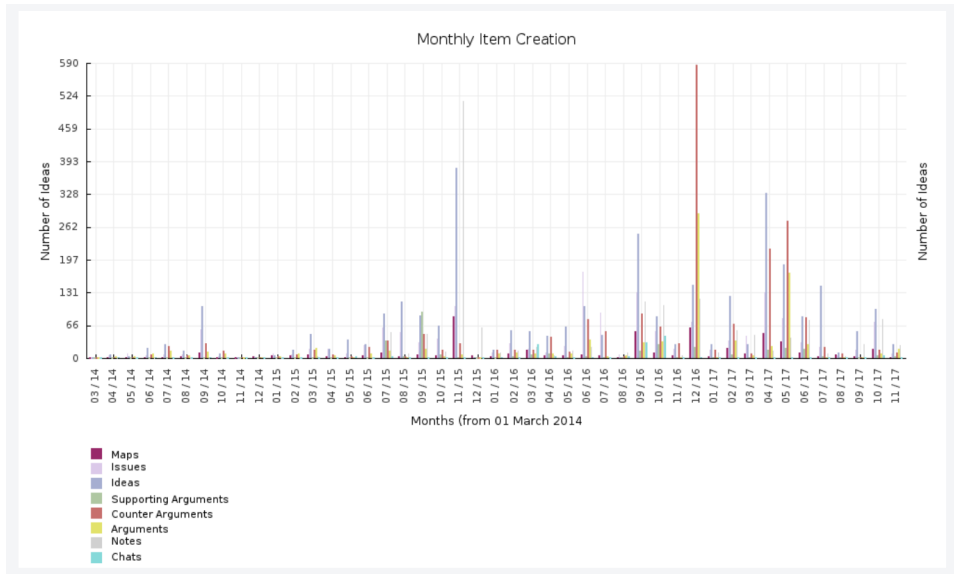
Figure 8 – LiteMap Users

2.3 Universities

There are 22 Universities using LiteMap in Brazil, which are presented in Figure 10.

PUC-PR
PUC-RS
PUC-SP
UAB
UECE
UEMA
UERJ
UFBA
UFJF
UFMT
UFPE
UFPR
UFRGS
UFSC
UFSCAR
UFSM
UFT
UNEB
UNESP
UNICAMP
UNIFEI
UNIFESP

Figure 10 – LiteMap Universities part of the COLEARN network led by Dr. Ale Okada

There are various academic communities from Brazilian Universities who attended the weSPOT and ENGAGE workshops provided by Dr. Ale Okada about LiteMap

13

and created and are managing their groups in LiteMap. Their users are initiating new groups that will start their work in 2018.

Table 2 presented 10 examples of communities who are engaged in LiteMap. The main activities of this community are:

1. **Managing research projects**. Examples: weSPOT, ENGAGE,…
2. **coLearning about new topics** that will be included in online courses and workshop. Examples: Business automation, Global System Science…
3. **Designing and delivering online courses and workshop**. Example: Engaging Science Online Course
4. **Developing Case Studies**. Example: Zika Brazil, ENGAGE Brasil
5. **Managing Debates in Conference**. Examples: WebCurriculo Conference,

University	Topic	Leaders	Members
All Universities	ENGAGE Project Community of Members of the ENGAGE project who were facilitators of workshops and online courses	Prof. Dr. Alexandre Marino	42
UFRGS	Business automation discussion group Community formed by students and professors of the course of Administration, of the city of Osório / RS.	Dr. Luziana Rosa Renata Silva	21
OUUK UNEB UA UFSM	Global Systems Science Community of learners of the FUTURELEARN course "Global Systems Science"	Dr. Karine Rocha	15
OUUK UNESP UNEB PUC-PR UFSM	Knowledge Mapping for PhD Students Study Group of PhD students, lecturers, and supervisors interested in Knowledge Mapping	Dr. Sonia Pinto Dr. Silvar Ribeiro Dr. Danilo Rothberg Dr. Alexandra Bujokas	15
UNEB	Zika Brasil Group of researchers who developed the case study about ZIKA in Irece Bahia	Ana Karine Rocha Dr. Silvar Ribeiro Dr. Sonia Pinto	15
PUC-PR UFSC	Engaging Science Course Group of facilitators of MOOC in Brazil of online course and face-to-face workshops	Raquel Glitz	8
PUC-SP	Webcurriculo Conference Encontro PUC-SP	Prof. Dr. Maria Elisabeth Almeida	8
UFSC	ENGAGE BRASIL Group of facilitators of the online course in Brazil provided in the weSPOT environment	Prof. Dr. Alexandre Marino	7
UFSC	weSPOT Group of facilitators on colearning and coinquiry of the weSPOT project	Prof. Dr. Alexandre Marino	7
OU UNEB IBICT UFJF UA-PT	RRI Brasil Group that started with members who attended the EADTU Conference	Bia Rocha	8

| UA-PT | Knowledge Mapping applied to online course | Pof. Dr. Daniela Melare | 15 |

Table 3 –LiteMap Users from the COLEARN network trained and supported by Okada

Figure 10 – LiteMap - Universities that are part of the COLEARN network and projects

2.4 New Users

New groups are emerging with people who attended courses and workshops who will be working in 2018

University	Topic	Leaders	Members
UECE	Chronus Project for doctoral students	Prof. Dr. Julio Ribeiro	(6)
UFJF	Knowledge Mapping applied to a Master Course	Prof. Dr. Eliane Borges Prof. Dr. Marcos Tanure	(6)
UNEB	Financial Education Study group of undergraduates	Dr. Sonia Pinto	(5)
UNEB	Grupo de Estudos Formacao de Professores Group for professional development of teaching staff	Dr. Silvar Ribeiro	(5)
UFSM	Philosophy of education for the teacher training course in Geography with LiteMap	Simone Becher	25
IBICT	Virtual Reality OU BBC	Prof. Dr. Andre Barbosa	15
PUC-PR	Learning Design with Knowledge Mapping for RRI skills	Raquel Glitz	10
UEC	Seaching Mapping Investigating and writing Undergraduate students group	Bia Rocha	10
BB	Brasil Bank – professional development group	Alberto Okada	15
CER energia	Energy Company– professional development group	Rogerio Rocha	5

Table 4 – New LiteMap Users from the COLEARN Research network supported by the members

3. LiteMap dashboard

To analyse the most popular communities, LiteMap offers 10 graphical views from its dashboard. These analytical visualisations are very useful for examining communities' behaviours, interactions, their process of producing and editing content, including contributions, outcomes and moderation. The following description provides and overview of each visualisation:

1. **Quick Overview:** It shows conversation health indicators, for example, participation, viewing activity and contribution activity. It also presents an overview of contributions, user viewing activity, most voted entries, most recently added content.

2. **Conversation Network:** This visualisation shows a network of the contributions to the Conversations in this Group. There are zoom and orientation controls available below and you can also use your mouse wheel to zoom in and out.

3. **Social Network:** This visualisation shows a network of users participating in the Conversations in this Group. There are zoom and orientation controls available below and you can also use your mouse wheel to zoom in and out.

The connections between users can be either green (mostly supporting connections), red (mostly counter connections), and grey (no dominant connection type).

4. **People & Map Ring:** This visualisation shows users and their connections to Maps. The connections between users and Maps can be either green (mostly Supporting Arguments), red (mostly Counter Arguments), and grey (no dominant contribution type). Click on a segment of the visualisation see further information about that member or Maps in the details area panel.

5. **Contribution River:** This visualisation shows types of contributions over time. Rollover the visualisation to view individual statistics for each type for each date. Click on the visualisation to filter by type. Right click on the visualisation or press the "Remove Filter" to unfilter the visualisation. **?? not working**

6. **Conversation Nesting:** present visualisation, which provides an overview of all the Conversations in this Group as nested circles of contributions. Click on a circle to zoom in, click outside a circle to zoom out. Rollover a cirlce to view the item title as a tooltip.

7. **Activity Analysis:** present a visualisation that shows the activity of the Conversations in this Group over time. Click on the timeline to cover a period of time (click and drag). The visualisations below will change and will show the frequency of activity per day, the type of contribution (Issue, Idea, Supporting Argument and Counter Argument), the type of activity (viewing, adding, or editing), and in the table below you can see the data underlying the visualisations. There you can also reset the visualisation to its original state. You can click on the bars of the visualisations to filter for a specific type. You can also select several types by clicking on several bars. Click for example on the Issue and Idea bar and on the viewing bar to filter for all viewed Issues and Ideas

8. **User Activity Analysis:** present a visualisation that shows contributions of users to the Conversations in this Group. Click on the "Users" chart to filter by user. Click the "User Actions" chart to filter the page by Action. In both, you can select more than one. You can reset the page by clicking on "Reset All".

9. **Contribution Stream: ?? not working**

10. **Voting:** It shows the voting stats, top 10 voted on items, voted "for" and "against", top voters and all item voting.

The example provided which explains these visualisations are provided by the engaging science online course
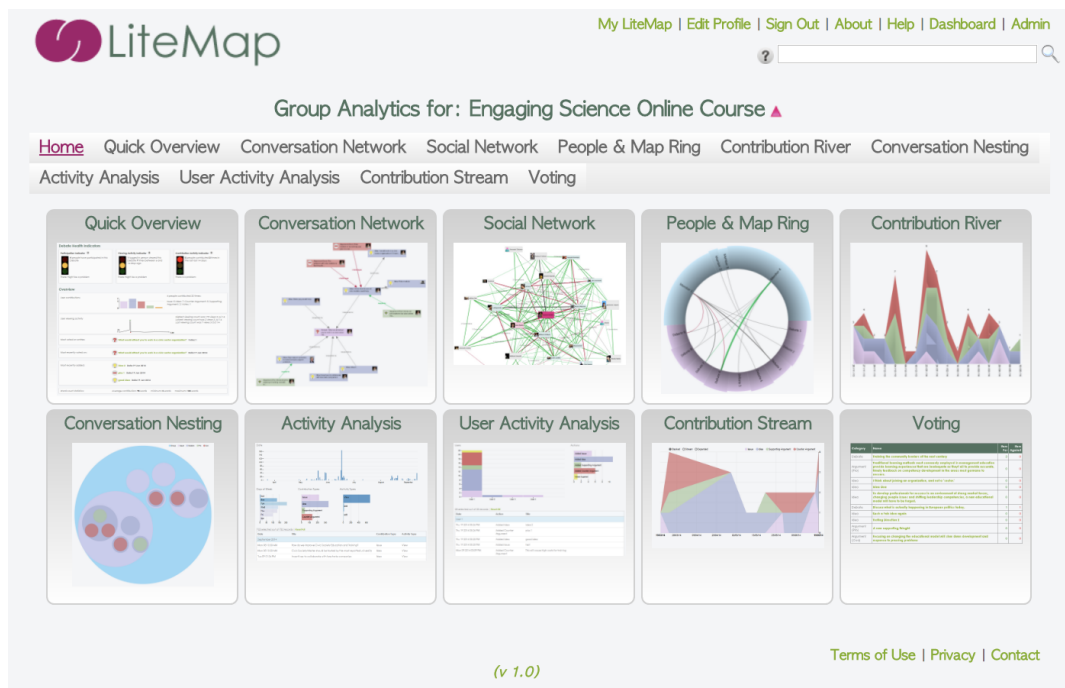

Figure 11 - Group analytics for Engaging Science Online Course.

4. Example of Group analysis

To illustrate a group analysis we describe the most recent community which started at the EADTU conference in October 2017.
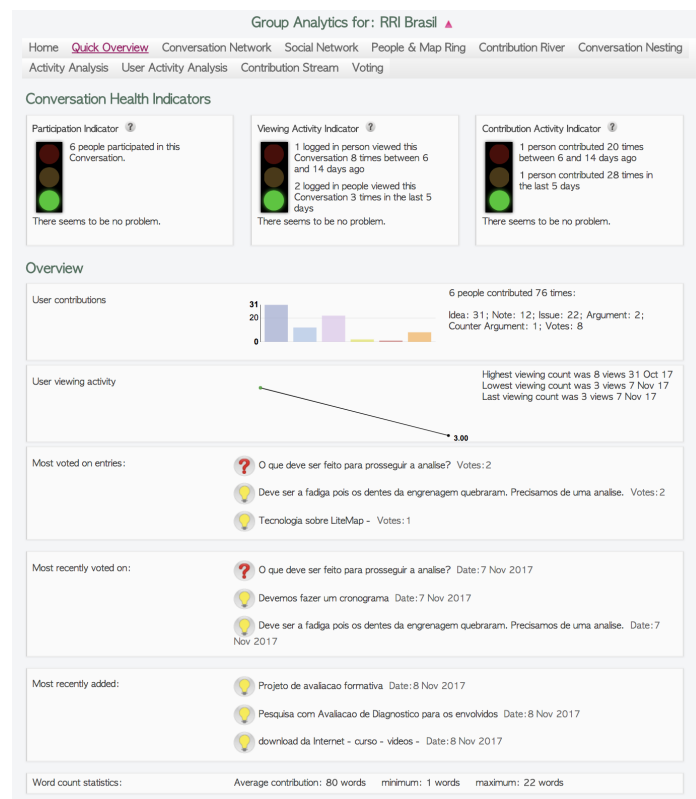
Figure 12 - Group Analytics for RRI Brazil

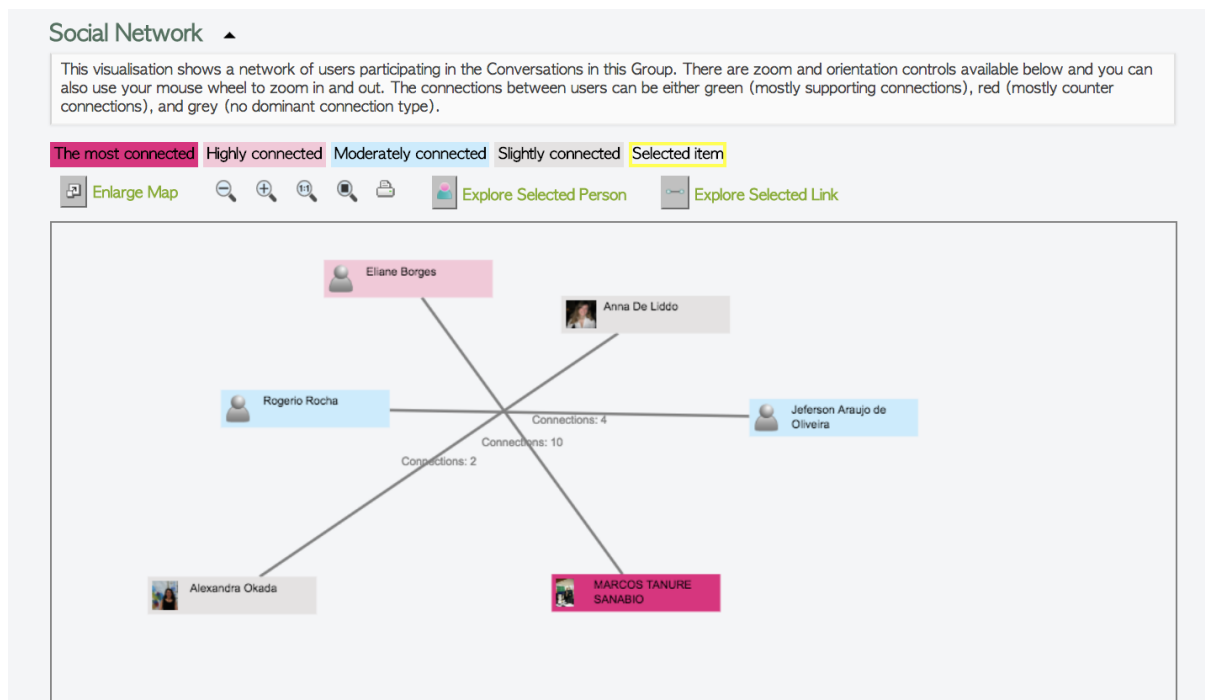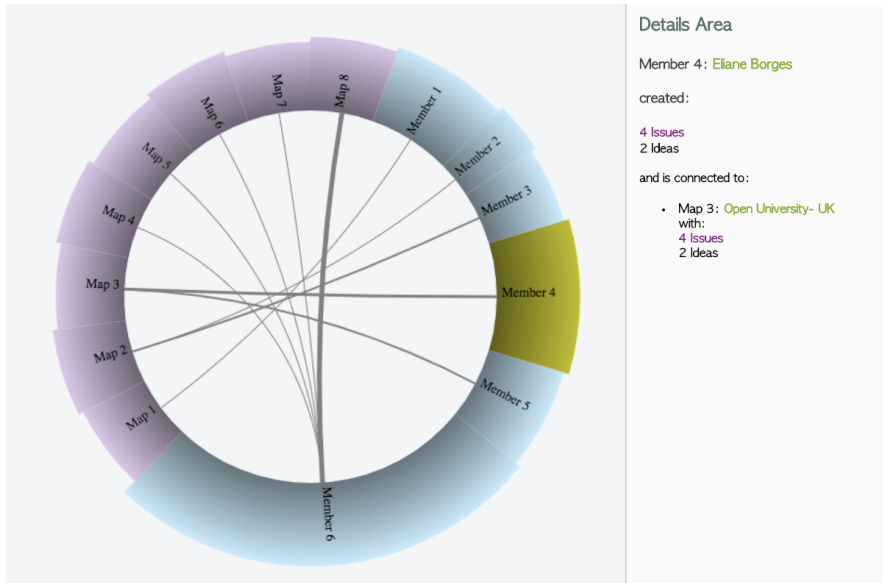*Figure 13 - Conversation network*
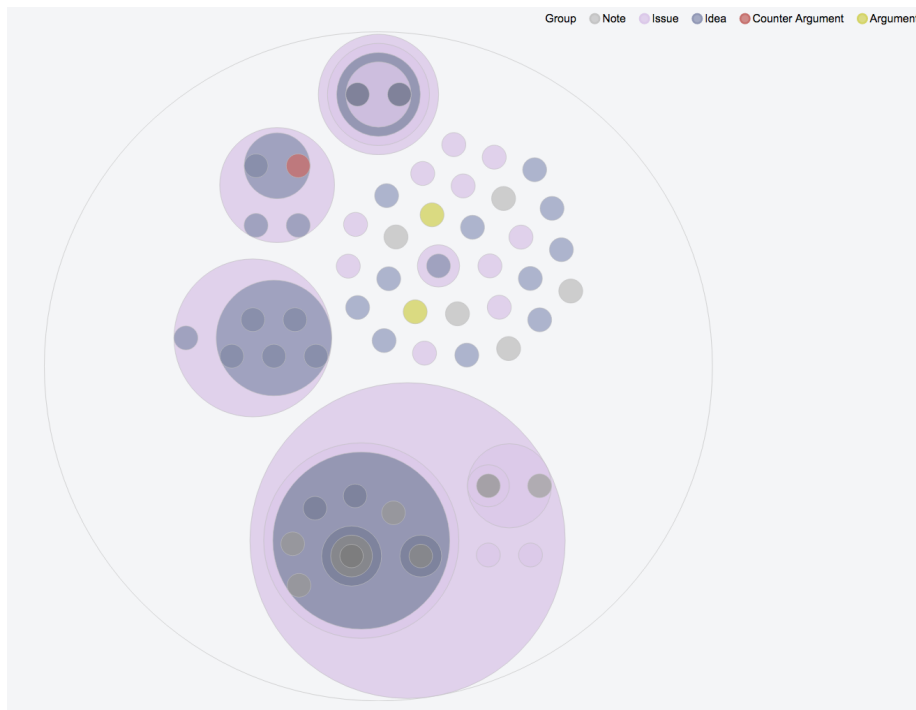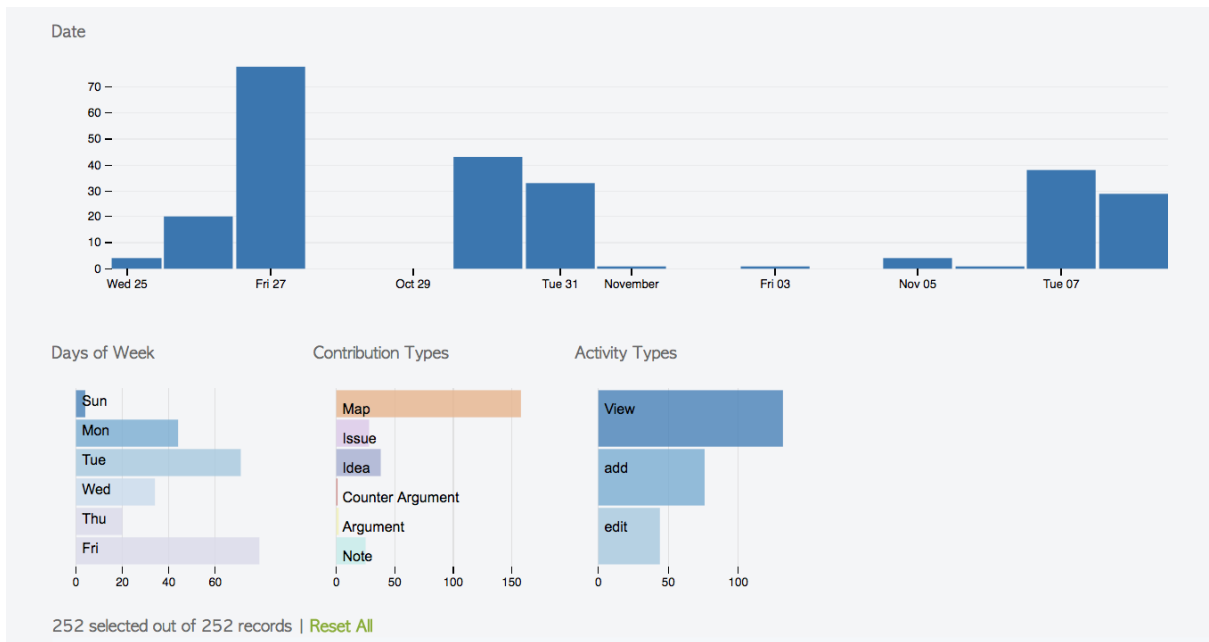

Figure 14 - Social Network

Figure 15 -

Figure 16 -

Figure 17 - Users activity
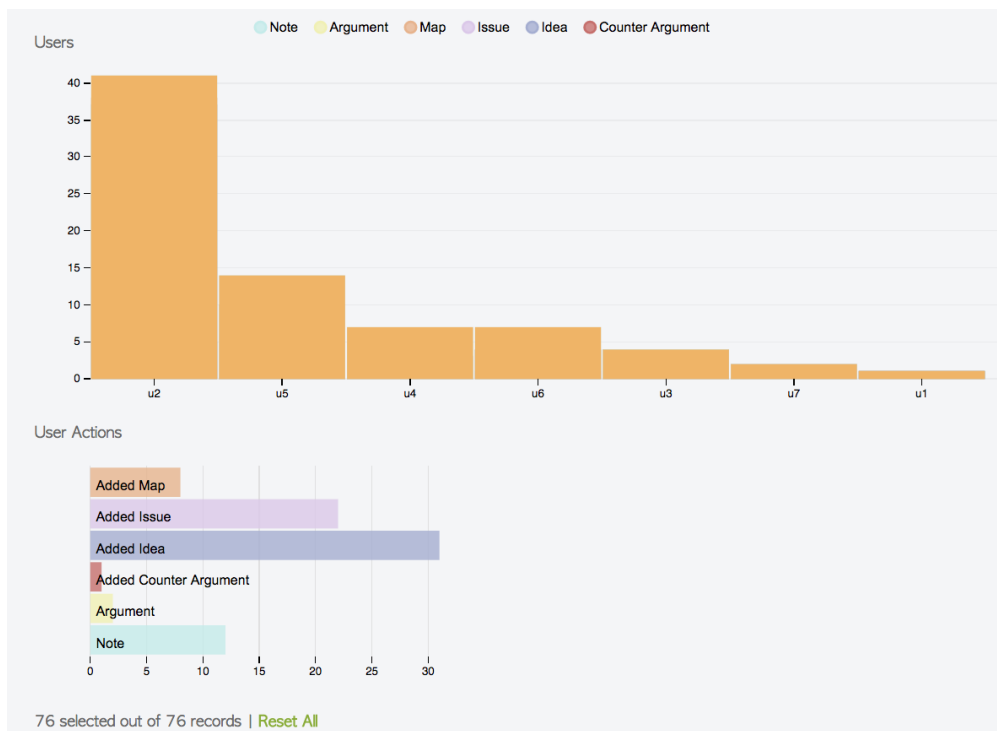
Figure 18 - Users activity
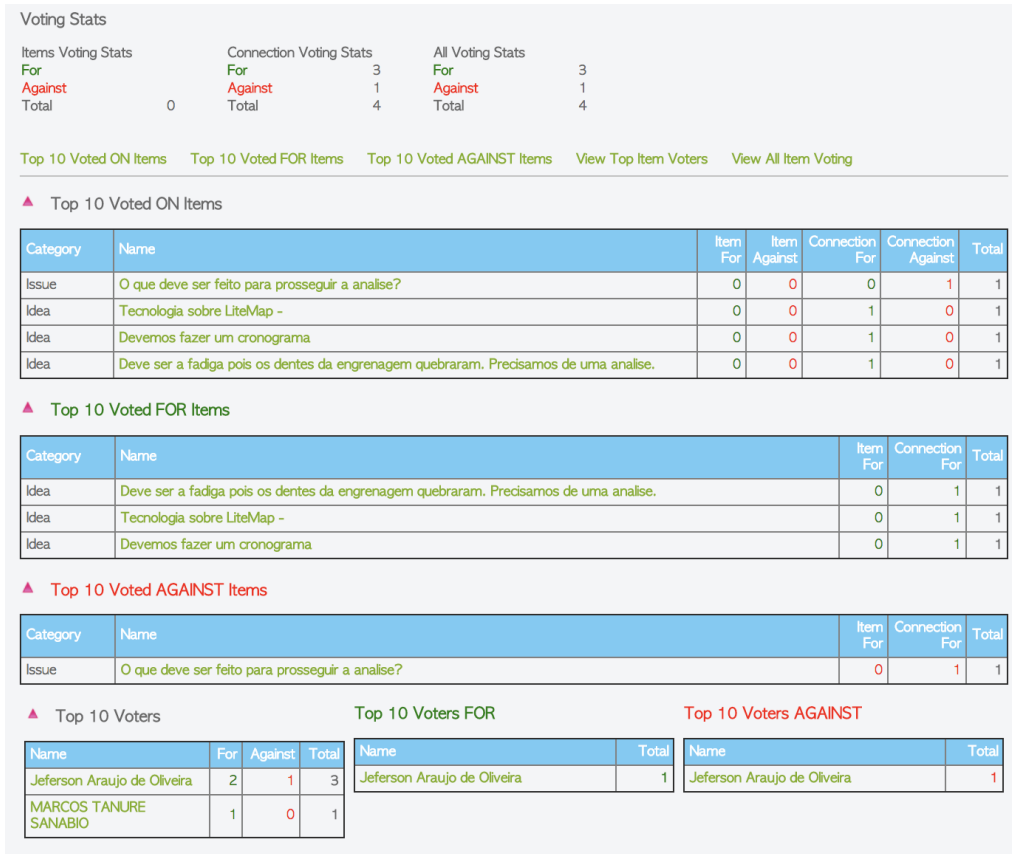
Figure 18 - Voting analytics

5. Most popular Communities

5.1 Large communities
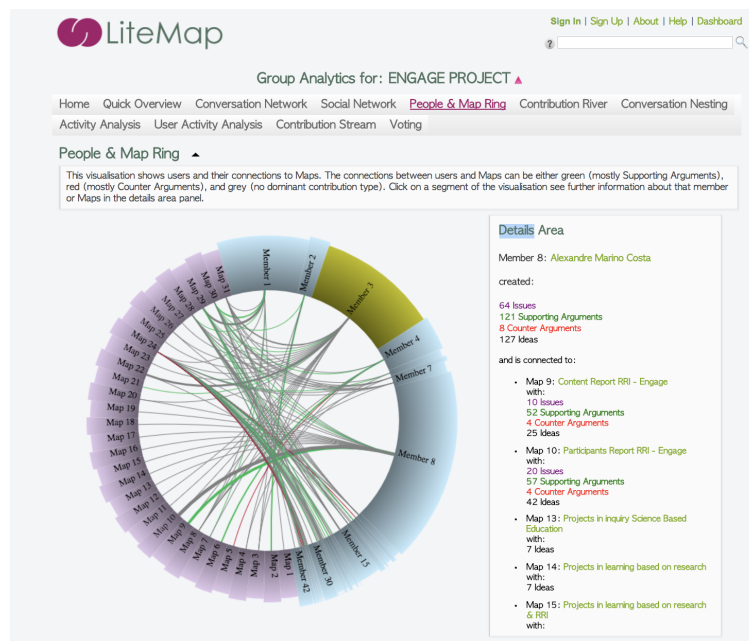
Figure 19 - Group Analytics for ENGAGE Project

5.2 Medium communities
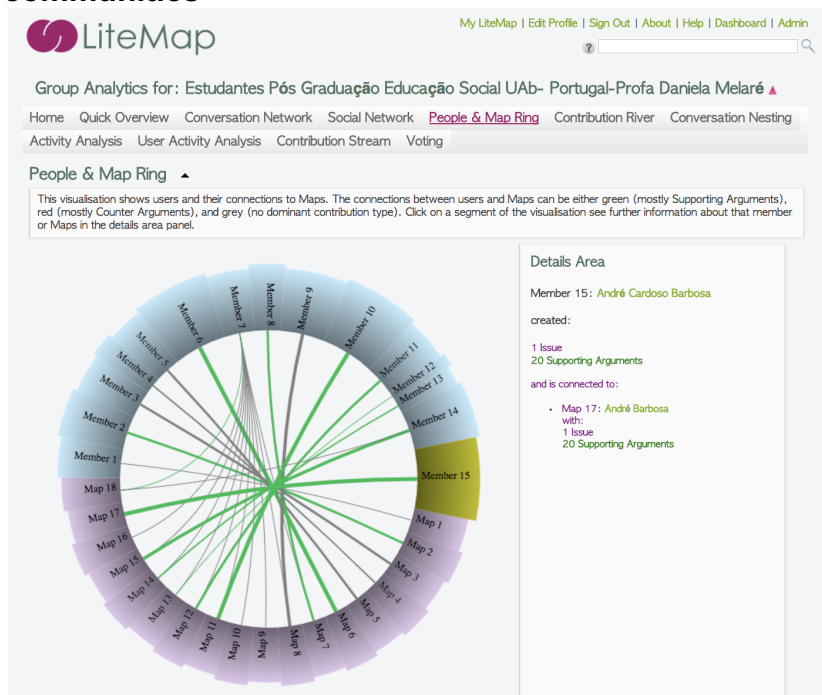
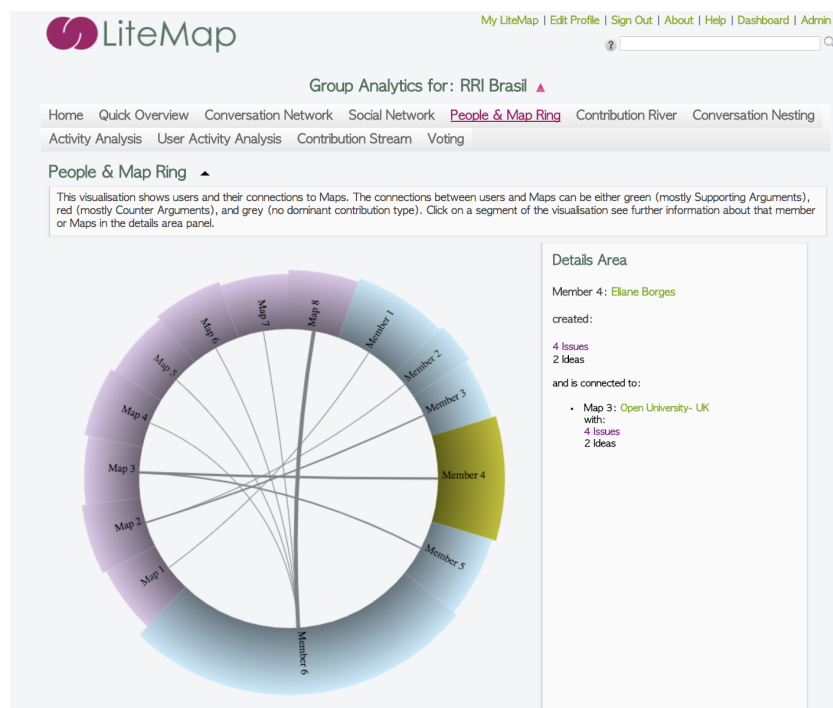*Figure 20 - Group Analytics for Postgraduate Students - UAB/Portugal*

5.3 Small communities
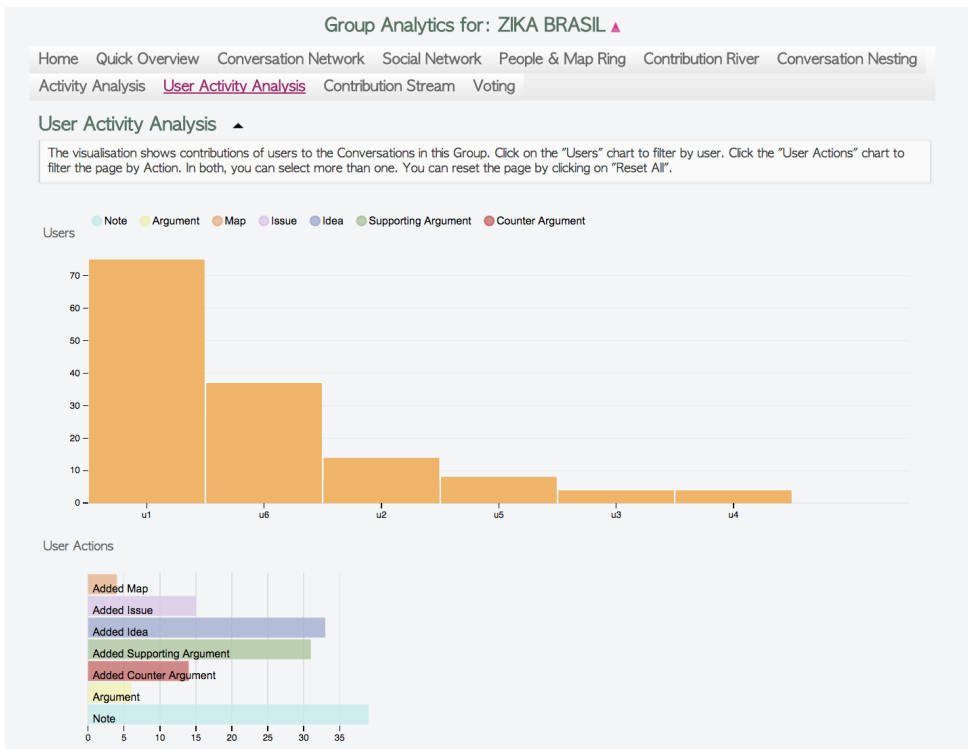

Figure 21 - Group Analytics for RRI Brazil

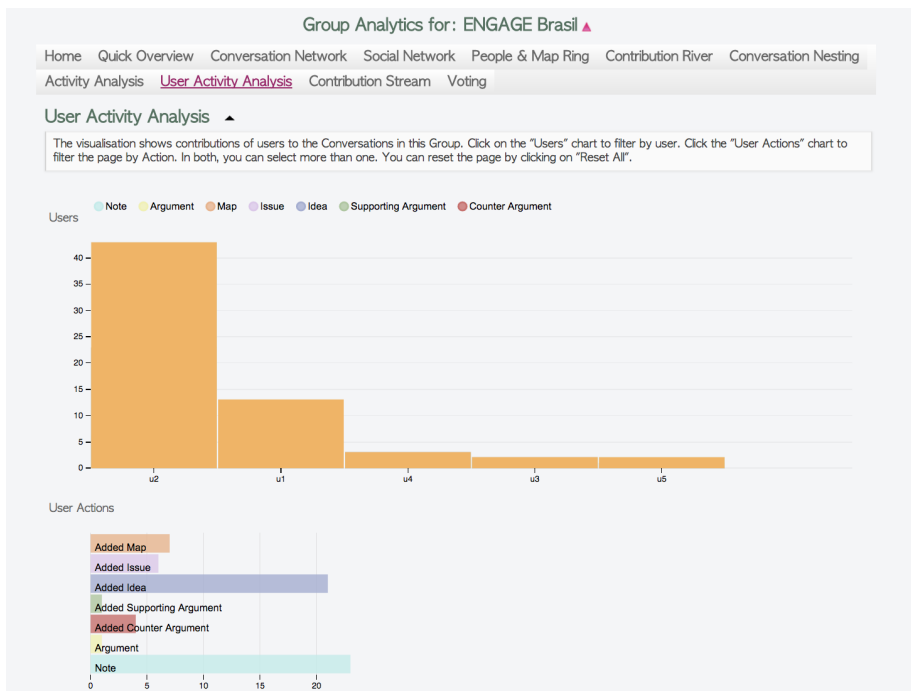*Figure 22 - Group Analytics for Zika Brazil*

Figure 23 - Group Analytics for ENGAGE Brazil

6.   Peer Reviewed Publications

Authors	Category	Title
Zargayouna, H., Amara, Nejla	Book chapter	LiteMap: An Ontology Mapping Approach for Mobile Agents' Context-Awareness
Okada, A.	Book	ENGAGING SCIENCE: Innovative teaching for responsible citizenship
Ribeiro, Silvar Ferreira, Pinto, Sonia M. da C.Okada, Alexandra.	Paper	Formação continuada de professores para o uso de dilemas sócio científicos com elementos de ubiquidade.
Hoven, Jeroen van den, Dignum, Virginia		MOODs: Massive Open Online Deliberation
Okada, A., Costa A.,Kowalski R., Torres P., Nakayama, M. Souza K	Conference	Open educational games for responsible research and innovation: a study with brazilian universities and open schools.
Okada, A., Bayram-Jacobs, D.		Opportunities and challenges for equipping the next generation for responsible citizenship through the engage hub.
da Rosa, Luziana Q., da Silva, Renata O., Nunes, Lucyene L. da S. T., dos Reis, Zaida C., Souza, Márcio V		Uma Discussão Colaborativa com o uso do LiteMap na Disciplina de Administração da Produção: um estudo de caso
Costa, Alexandre Marino. Okada, Alexandra	Websites	Design do Curso Online de Coaprendizagem na formação de Gestores Públicos.
De Liddo, Anna. Buckingham Shum, Simon.		Collective Intelligence for the Public Good: New Tools for Crowdsourcing Arguments and Deliberating Online.

Table 5 – LiteMap Publications

7.   Case Studies developed by Brazilians

Data from the maps and publications revealed that the groups have conversations in multiple (public or private) spaces - it is not easy to find and follow important information - remarkable ideas, initiatives and skills are not being noticed - ability to visualise such conversations in attractive presentations might help in decision-making processes - ability to visualise information might help in building conversations and preparing events.

8. Technical issues and Recommendations

The users who were interviewed provided an overview of the requested changes, features, bugs and ideas for future development. Users are aware that some of these suggestions might be technically complex, therefore it might be not possible to implement all recommendations within the scope of the project. Nevertheless these ideas are reported for a follow-up development to continue the improvement of the tool and its functionalities.

Category	Description	Observation
Community XXX	It will be very useful if the admin could manage the collaborations with distinctive roles for members such as	Access users (vote) Editors (vote, add & link nodes) Facilitators (move and delete content in the map) Admin (all functionalities)

Table 6 -

9. Group security, user privacy, collaboration and engagement.

Appendix

Examples	Authors	Maps	Observation
Post-graduate Course coordinator	Eliane Borges	Opportunities for partnerships	EADTU Conference
Supervisor	Marcos Tanure Sanabio	Guidelines for modelling dissertation	EADTU Conference
Lecturer	Simone Becher	Reflecting on the concept of Education	EADTU Conference
Examples developed by Communities			
Community of 25 students High School	Luziana Rosa & Renata Silva	Collaborative Discussion with undergraduates form Business School	Paper published in Portuguese Book chapter and Brazilian journal paper
Community of 30 students lead by 7 members secondary school	Bia Rocha & Karine Rocha	Evidence based dialogue mapping of the ENGAGE debate of Exterminate A	Paper Published in English Springer and Brazilian Journal paper

Table 7 - LiteMap New communities
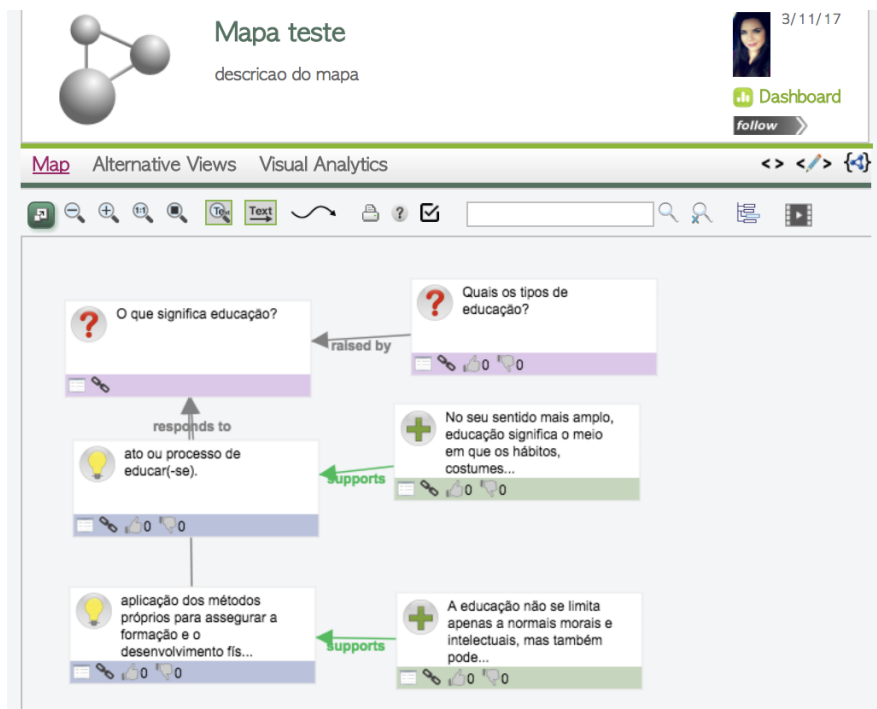
Figure 25 - Education test map by Simone Becher
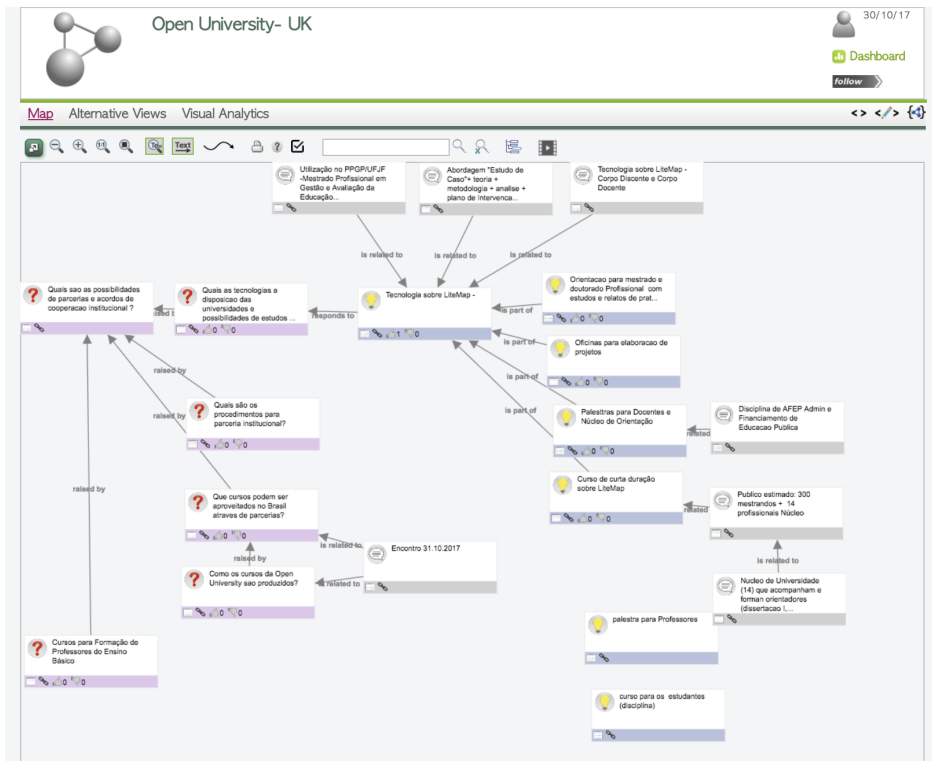
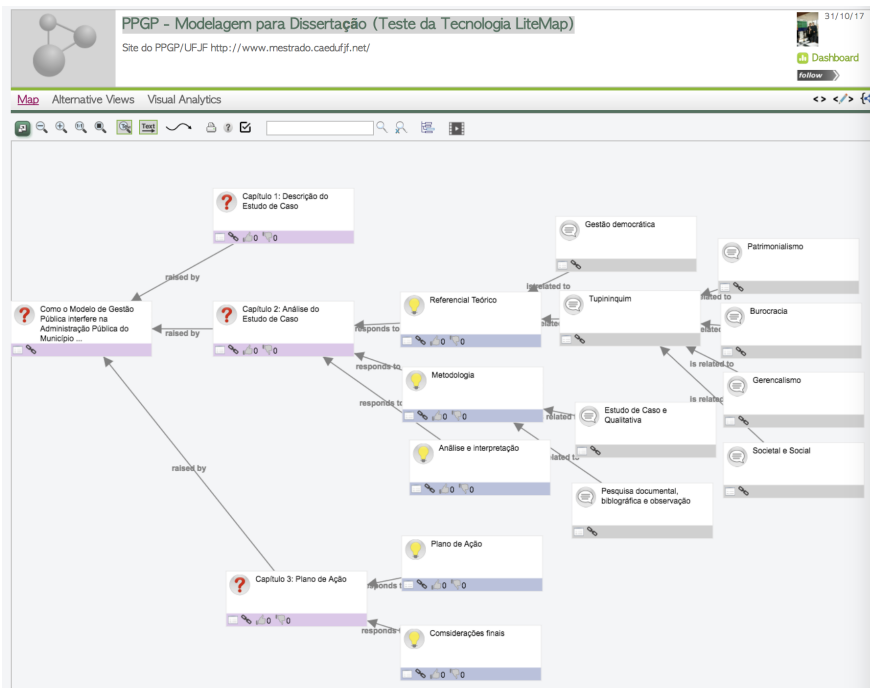*Figure 26 - Map about Open University by Eliane Borges*

Figure 27 - Modeling map for dissertation projects by Marcos Tanure Sanabio
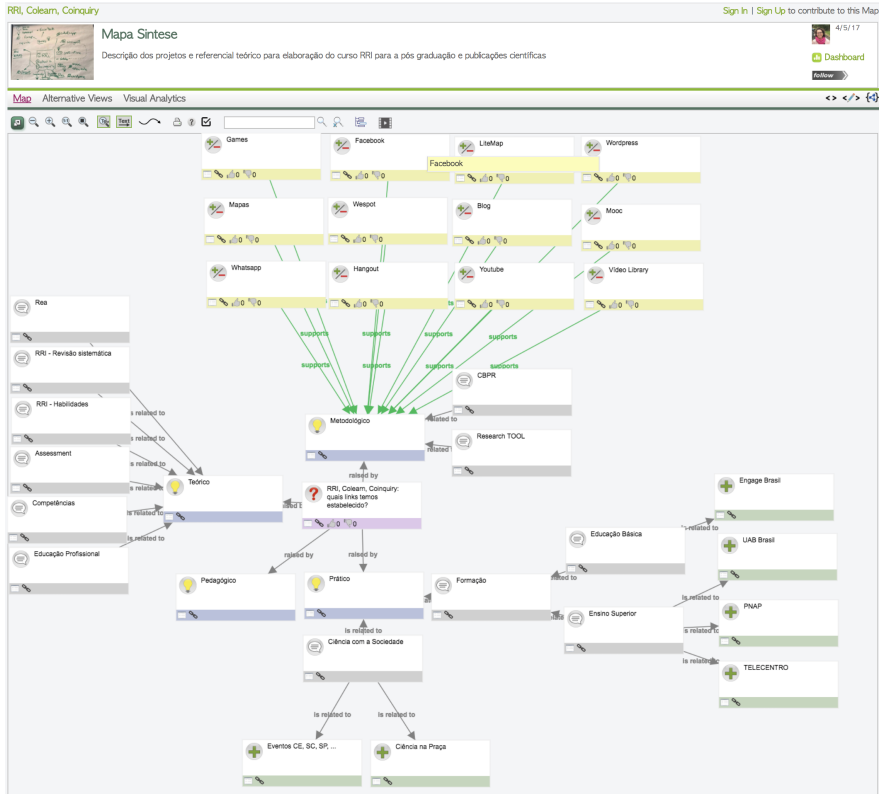
Figura 28 - Discussion group map on automation in companies 06/27/17

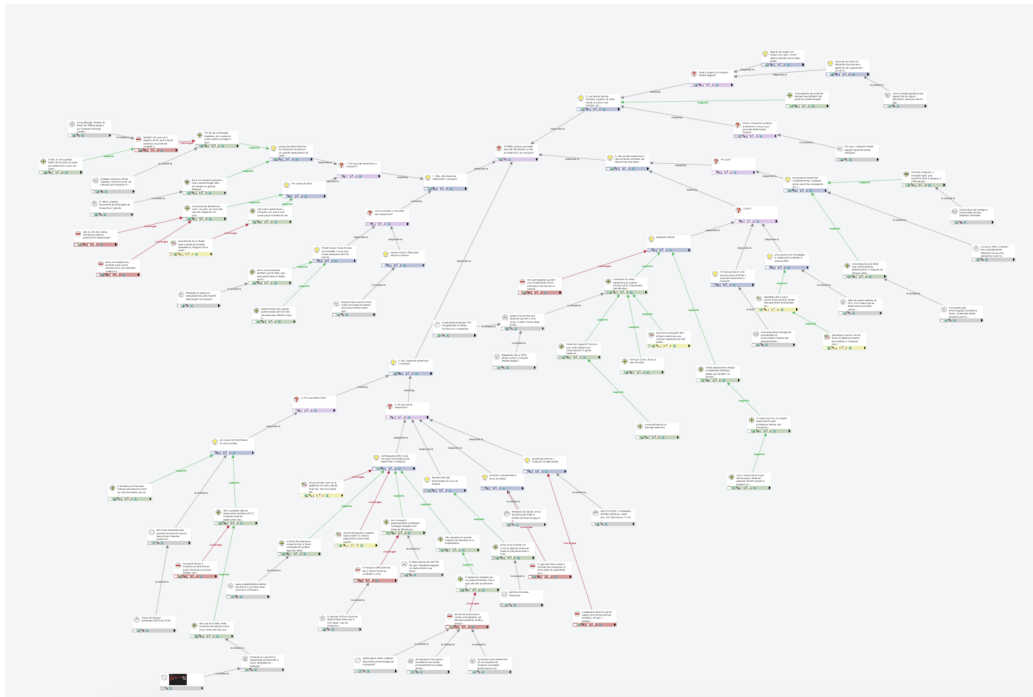*Figure 29- Discussion group map on automation in companies 06/27/17*

Figure 30 - Discussion group map on ZICA Brazil - CETEP -Irecê

Figure 31 - Philosophy of Education for the Degree in Geography with LiteMap by Simone Becher

References

Costa, Alexandre Marino. Okada, Alexandra. Design do Curso Online de Coaprendizagem na formação de Gestores Públicos. https://projects.kmi.open.ac.uk/colearn/wp-content/uploads/2017/03/MARINO-PT-2016.pdf

Da Rosa, Luziana Q., da Silva, Renata O., Nunes, Lucyene L. da S. T., dos Reis, Zaida C., Souza, Márcio V. Uma Discussão Colaborativa com o uso do LiteMap na Disciplina de Administração da Produção: um estudo de caso.https://www.researchgate.net/profile/Gleizer_Voss/publication/320719472_O_papel_dos_personagens_nao_jogaveis_nos_mundos_virtuais/links/59f872c7a6fdcc075ec984bd/O-papel-dos-personagens-nao-jogaveis-nos-mundos-virtuais.pdf

 De Liddo, Anna. Buckingham Shum, Simon. Collective Intelligence for the Public Good: New Tools for Crowdsourcing Arguments and Deliberating Online. http://ipp.oii.ox.ac.uk/2014/programme-2014/track-a-harnessing-the-crowd/design-ii/anna-de-liddo-simon-buckingham-shum

 Hoven, Jeroen van den, Dignum, Virginia. MOODs: Massive Open Online Deliberation. https://www.researchgate.net/profile/Jeroen_Van_den_hoven/publication/305984800_MOODs_Massive_Open_Online_Deliberation/links/57a8859008aef20758cb77da/MOODs-Massive-Open-Online-Deliberation.pdf

Ribeiro, Silvar Ferreira, Pinto, Sonia M. da C.Okada, Alexandra. (2017). Formação continuada de professores para o uso de dilemas sócio científicos com elementos de ubiquidade. Interfaces Científicas - Educação • Aracaju • V.6 • N.1 • p. 107 - 124 • Out. 2017. https://periodicos.set.edu.br/index.php/educacao/article/viewFile/4847/2431

Okada, A. (2016). ENGAGING SCIENCE: Innovative teaching for responsible citizenship.http://oro.open.ac.uk/46456/1/Engage%20COURSE%20BOOK.pdf

Okada, A., Bayram-Jacobs, D. (2016). Opportunities and challenges for equipping the next generation for responsible citizenship through the engage hub. https://lsme.ac.uk/files/Research-Book-Jan-2016.pdf#page=42

Okada, A., Costa A.,Kowalski R., Torres P., Nakayama, M. Souza K., (2016) .Open educational games for responsible research and innovation: a study with brazilian universities and open schools. https://lsme.ac.uk/files/Research-Book-Jan-2016.pdf#page=42

Zargayouna, H., Amara, Nejla (2006). LiteMap: An Ontology Mapping Approach for Mobile Agents' Context-Awareness.https://link.springer.com/chapter/10.1007%2F11915072_101?LI=true