

# Umniversity Virtual World Platform for Massive Open Online Courses

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## Abstract

As lifelong learning takes off and simultaneously financing for education is reduced, new educational practices are being explored namely through the use of information and communication technologies. Massive Open Online Courses (MOOC) are a new way to achieve two main goals: 1) reach as many potential students as possible; 2) use few resources, namely in what teachers/facilitators is concerned. To achieve this it must rely on appropriate technology and on a coherent pedagogical framework.

Umniversity virtual world platform aims to better support the particular needs of MOOC. Prepared to manage hundreds or even thousands of students at each course, with asynchronous as well with synchronous tools, it is in the dynamics of the course and the motivation/evaluation of such large numbers of participants that Umniversity makes a difference, integrating seamlessly learning analytics for student self improvement and relying on a connectivist pedagogical approach.

## Resumo

Quando aumenta a aprendizagem ao longo da vida e simultaneamente diminuem os recursos financeiros para a educação, novas práticas educativas estão sendo exploradas nomeadamente pelo uso de tecnologias de informação e comunicação. Os Massive Online Open Courses (MOOC) são uma nova maneira de atingir dois objectivos principais: 1) chegar ao maior número de potenciais estudantes; 2) usar poucos recursos, nomeadamente no que aos professores/facilitadores diz respeito. Para o conseguir deve-se apoiar em tecnologia apropriada e num coerente enquadramento pedagógico.

A plataforma de mundo virtual Umniversity destina-se a melhor suportar necessidades particulares de um MOOC. Preparado para gerir centenas ou até milhares de estudantes em cada curso, com ferramentas assíncronas assim como síncronas, é na dinâmica do curso e na motivação/avaliação de tão grande número de participantes que Umniversity faz a diferença, incorporando ferramentas analíticas para auto aperfeiçoamento dos estudantes e baseando-se numa abordagem pedagógica conectivista.

## Keywords

learning platform, virtual world, MOOC, connectivism, learning analytics

## Introduction

Whether for lifelong learning or to democratize access to education new non traditional solutions have to be found [BESSENYEI]. To enable hundreds or thousand of students to simultaneously participate on a same course and reach their maximum learning potential is what Massive Online Open Courses (MOOC) try to accomplish. Often disposing of scarce human resources, it may seem an impossible task. To meet that challenge we need to tackle two issues: the pedagogical framework that would enable such an endeavor to succeed and the technological tools that the resulting educational practices would eventually need.

Chapter 1 introduces some basic principles of the connectivist theory. As people adopt new strategies to reach for information and as knowledge shifts to networks of distributed resources, appropriate competencies must be developed to explore those new habits and make use of ever more dynamic data.

Chapter 2 will describe how currently MOOC are implemented. The tools strengths and weaknesses are underlined hinting on how some of them could be improved. The importance of learning analytics is introduced and how the level of tools integration is crucial in extracting relevant and timely information.

Chapter 3 introduces the Umniversity 3D platform in its relevance for use in MOOC. Sub-chapter 3.1 explains how a virtual world environment increases the dynamics of a course. 3.2 discusses how a cloud

implementation guarantees infrastructure scalability, the need of push services and autonomy and how they are achieved. In 3.3 we explain the interest of merging data and learning activities from a course with our other data and activities, and how it is tackled. Finally in 3.4 we detail how our special *forum* can facilitate a broader exchange of ideas and support learning analytics so that facilitators can know how the course is developing and students can be coached or self-guided in improving their learning process and success.

## **1 – Connectivism as a Learning Theory and Practice**

Connectivism as a pedagogical theory builds on some recent realities in our changing world [SIEMENS]. As the lifespan of information is becoming shorter, new tools are available to reach for that information. To be able to navigate among data is becoming as important as understanding that same data. The learning process is nowadays much less about acquiring knowledge than it is to have the competencies to reach and organize all those ever expanding resources that, at a certain moment, embody knowledge.

On the limit, connectivism defends that the networks that are available linking data become part of the knowledge themselves. As such, the learner being part of the network accessing it with several tools and bridging data and establishing connections to other people, becomes himself part of the body of knowledge. Thus, our collaboration skills and our use of collaborative tools and environments become essential in our daily activities and should be improved at the same time we are learning a specific subject or domain.

The connectivist approach also defends an increasing role for informal learning. Isn't our blogging, chatting and participation on social networks means to develop useful connections and skills on managing and making sense of such a great amount of information from all those disparate information sources?

The technological tools we use, again according to connectivism supporters, are "altering (rewiring) our brains" eventually defining and shaping our thinking. This could sound limitative if there were few tools available but the fact is we get a wide choice of tools to choose. We can accept that tools gaining wider acceptance are those that fit better with a mix of the skills we have been developing for centuries, with new ones needed at the present, and that are able to offer us more connections and ways to explore them.

Living in a society where institutions are still the basis for collective sustainability and development, this new way of mastering knowledge and applying it to daily life situations reflects on how learning happens inside organizations. It is now often the case that the needed knowledge resides outside corporate walls. It is the links to external sources, often in competitors, where increasingly the answers may reside. From a culture of closed knowledge we are moving to a culture of connected collaborative knowledge so the associated learning practices must inevitably adapt.

## **2 – Current implementation of Massive Open Online Courses (MOOC)**

In trying to adapt to new realities and needs, the idea of a MOOC arose [MCAULEY]. If part of the skills we want to develop are in collaboration and networking then the role of the teacher must change. One's learning is now centered on oneself and on the tools that are used and on the connections developed. The term facilitator is replacing teacher/lecturer/professor and the more each student gains in autonomy to interact with others and to choose the means through which to conduct those interactions the better.

This choice of tools depends on the number of participants, on the exchanges being synchronous or not, eventually on the subjects discussed (for instance needing more or less multimedia resources) and naturally on personal preferences, creating what is called a personal learning environment [DARREY]. As we will see, this plethora of tools can mean both a blessing and a curse. It is always good to being able to choose the tool we feel as most appropriate or with which we are already familiar. But in a way, it makes integration of all the information and interactions within a course more difficult for its data is spread among many often incompatible tools.

The emerging field of learning analytics uses information from previous and current courses so that indications of what is going on are available as soon as possible [ELIAS]. Actions can then be undertaken to improve the overall course methodologies or individual participant's behavior. If only one toolbox with diversified but integrated tools is available for the course then data mining becomes easier and more meaningful conclusions and guidance can be obtained. In doing so, however, we hinder informal activities in other popular tools so, definitely, the right balance must be found.

In practice, a MOOC has a syllabus such as an email, a web page, or a more formal setting on an LMS like

Moodle or Blackboard. It may then have some synchronous sessions based on stand alone tools like Elluminate or using plug-ins to popular LMS platforms, like DimDim for Moodle. These tools have usually some kind of a chat system, a slide show or whiteboard system, and often audio/video conference capabilities. The possibility of recording all that happens in a session is essential so that students who could not attend can catch up to the information and dynamics of the course as well as enabling a later recall of past sessions. Asynchronous sessions are mainly based on the use of the *forum* paradigm. Course resources distribution, whether as files or as links, and eventual evaluation moments, can be done using email, web pages or LMS.

Some synchronous sessions, not mandated nor organized by course facilitators, may happen among groups of students. Virtual worlds such as Second Life are available for use in synchronous sessions although, due to technical and spatial issues, are not yet systematically used in MOOC.

The harder in a MOOC is maintaining participants motivation to follow on and so they tend to be short in duration. Let us not forget that being open, with all that openness may represent [DOWNES], it also means that it may include simple enthusiasts in a greater proportion than if it had, let's say, a tuition fee. It has happened that a MOOC starts with 500 enrollments, the first synchronous session having less than 100 participants, and six weeks later the last synchronous session is reduced to a dozen people.

The radical novelties in a MOOC, from the sheer number of participants from different geographies and cultures to being fully online and freely open to anyone, does not allow solid conclusions about this kind of drop out rates. In this paper we explore if new kinds of tools can stand up to the challenge of increasing the efficiency of MOOC without sacrificing openness, its online nature and its connectivist roots.

### **3 – Umniverse 3D platform for Massive Open Online Courses**

As a platform for learning, Umniversity does not exist by itself but is part of a general purpose environment called Umniverse. Umniversity can be viewed as the use of Umniverse features in educational settings. We will detail some of those features that have the potential to bring MOOC experiences to a whole new level.

How each student feels in regard of the course has two clear sides. The first one relates to how easily he or she can contribute to the course and how that contribution becomes visible to the group. The second one relates to how the system and participants respond when someone is falling behind. Is each individual's success taken care of? Are there appropriate tools to support massive collaboration and self-guidance?

These questions will be tackled in the following sub-chapters describing some of Umniversity features.

#### **3.1 Extended virtual world in 3D**

The advantages of virtual worlds in what the sense of belonging is concerned is already well documented [CROSS]. The use of spatial orientation that was developed through thousands of years, such as to ease tasks like organizing a large number of objects for later retrieval and to represent hierarchies or relations among them, is also well known. How can this be used when dealing to "gather" such huge communities such as it happens in MOOC is what our virtual Umniverse tries to achieve.

Let's focus on the most challenging synchronous moments where the largest number of attendees are expected to be present at a certain scheduled time. How do we manage 1000 avatars trying to share the same space? Umniversity has more than one answer to that and it is worthwhile to remind that Virtual Worlds, being inspired by the real world, they do not have to be limited by real world constraints like laws of physics. In Second Life, avatars can fly and that becomes handy in many situations.

Besides the three degrees of liberty that a 3D space presents, which let us pack 1000 avatars in a 10 by 10 by 10 cube or spaciouly on a 32 by 32 square area, Umniversity gives an extra possibility dividing from the beginning the available space in 9 different places together with nine independent user's avatars as depicted in figure 1. We call them Omnatars for through them the user can be omnipresent in many places. This opens up many possibilities and we will describe two of them having a direct impact on learning practices:

1. A user can participate simultaneously in more than one activity, for instance on a MOOC and on working group from college. For this to happen it associates one of its nine places to the MOOC virtual place, a virtual place object created by the MOOC organizers, and associates another one of the nine places to a virtual place that was created by one of his colleagues. The handling of simultaneous activities in virtual worlds will become necessary as it is

nowadays common to have simultaneous chat sessions.

2. More than one virtual place can be created and linked by the MOOC organizers so that during a synchronous session students can choose, at any time, which they want to join. A typical characteristic of a MOOC is that, even on the same course, many different specific themes arise caused by different participants backgrounds, cultures and interests. Even while a facilitator or a special guest are lecturing, it is common to assist in parallel to many conversations on different subjects mainly through chat systems.

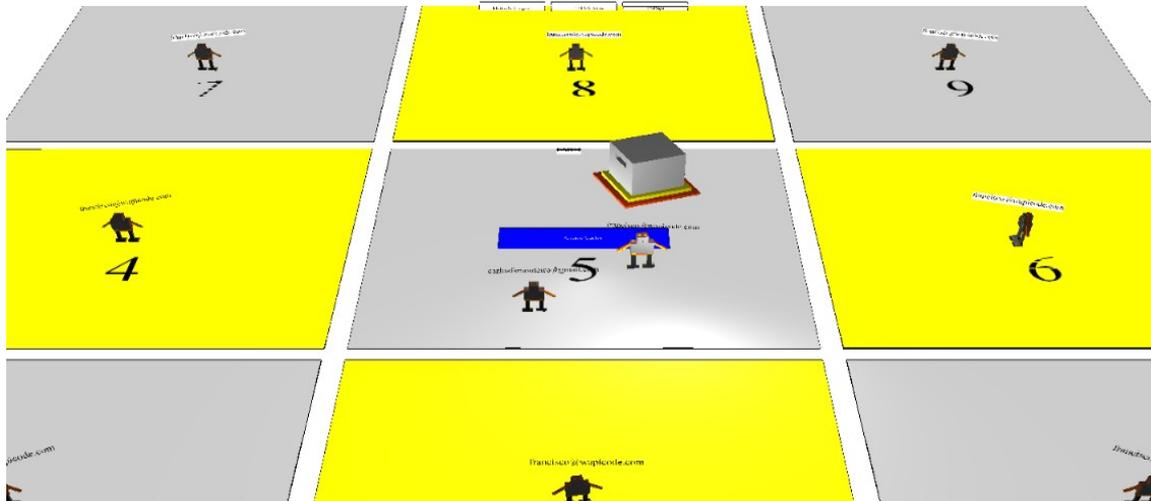


Figure 1: In Umniverse virtual world each user has multiple logical spaces commanding multiple avatars.

Umniversity does not try to limit parallel "noise" to the eventual main happening of a synchronous session, on the contrary, faithful to the connectivist approach, it tries to facilitate those initiatives and, on the limit, even promote them! Many questions, both technical and anthropological arise. How to manage all that cross communication? How to easily setup and navigate in such an "unnatural" setting that enables being "physically" in more than one place? How and what to record on those synchronous sessions so that students can later take advantage of them? Shouldn't a virtual world make us feel more comfortable implementing paradigms that we are already used to instead of making us learn new ways of interacting?

To answer most of these and other questions it becomes essential that user interface design takes a prominent role. With it, inevitably, user experience takes the center stage, and Umniversity can not, for the moment, be tested for it is based in next generation web technologies like WebGL. This was a deliberate choice for it is essential for MOOC success that such a large number of users don't find technical obstacles. This is done using standard browser based features with no need for plug-ins and that can run on current as well as on future device form factors used for learning such as mobile phones and tablets [REIS].

### 3.2 Cloud scalability, push services and autonomy

Technical obstacles have been undermining distance learning. Using Clouds for server side software guarantees scalability if the appropriate service and database models are implemented. Lets us see how why push services and autonomy are important and how they are implemented on the Umniverse platform

For synchronous sessions it is essential that the server, in this case the Cloud, be able to push data to the clients such as when a new chat entry is posted or when an avatar moves so that others clients can update accordingly. Here again, recent web standards come to the rescue such as WebSockets that enable push from the server to the clients replacing expensive techniques like long polling. Unfortunately, WebSockets are already working in most browsers (temporarily suspended by Mozilla Firefox) but not on the big Cloud players solutions.

Taking advantage of a technology by Google's Cloud AppEngine called ChannelAPI, Umniversity is now running in the Cloud as part of the Umniverse general purpose environment. Instead of having full-duplex capabilities like WebSockets, ChannelAPI is unidirectional from server to client (from browser to Cloud normal HTTP methods are still used).

On the autonomy side, relying solely on the Cloud can be hazardous. Not all work is done being connected, or having Internet connection, and can be useful to have our MOOC data accessible even when locally

collaborating with people in other contexts. Umniverse tackles these and other possible situations enabling its software to be run from personal computers or even mobile phones. Relying on the Cloud potential but realising how Internet connection may be unstable, Umniverse has a software ecosystem that enables all kind of connection scenarios as depicted in figure 2, guaranteeing personal autonomy and the creation of local sharing and collaboration networks.

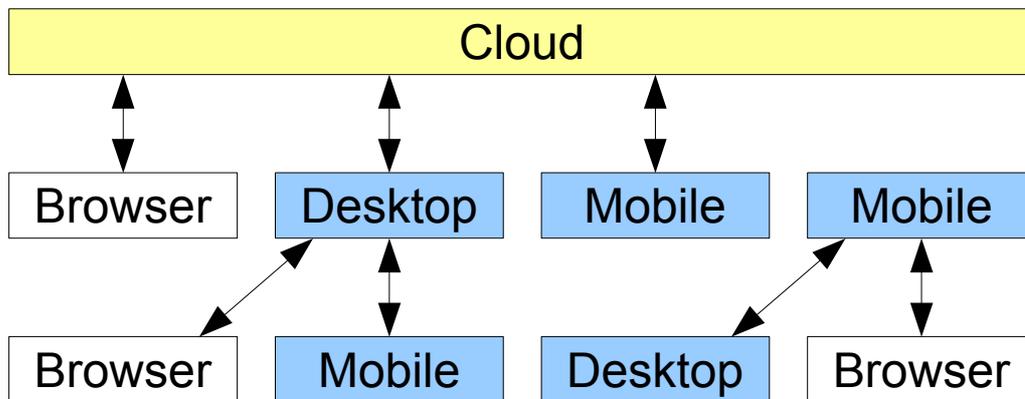


Figure 2: Devices store data locally and can act as servers to other devices and browsers

Our investment on Cloud solutions reinforces, together with WebGL, our commitment to have the best possible solutions for the future. Umniverse takes nevertheless into account internet connection limitations. In terms of usability and autonomy, making life easier for students and teachers in many geographies, and of scalability, investing in new and increasingly competitive Cloud technologies, the long term aim is to eradicate technical problems which are even more essential on platforms for MOOC.

### 3.3 Learning as part of living

Nowhere as with the connectivist approach, namely using MOOC, is learning so well integrated with the rest of our lives. In fact, learning is part of our lives and Umniversity embodies that being part of a large platform named Umniverse. This means, in a simplistic way, being connected to data and activities that happen in life. A goal of this project is to eliminate the walls between so called normal daily activities and learning activities.

What currently happens with LMS systems is that they are clearly targeted for learning. Students switch to Moodle or to Blackboard when they put on their "student" hat and they often close them when they restart working or communicate with friends. In traditional pedagogical practices this becomes natural but not for the connectivist practices where the more connections we bring to our course, even from external events and not enrolled people, the better.

Here again, being able to choose the tools we are more comfortable with conflicts with an approach of having everything integrated on a single environment. A third option between these two exist thanks to the generalization of API which enable different systems to exchange information. We will present for the moment how Umniverse integrates learning with living and leave it for the future one or the two of the following possibilities: 1) Integrate Umniverse on a popular tool like FaceBook the way farmville and others do; 2) Integrate, some call it mashup, third party data and applications into the Umniverse environment.

For the time being let us see how Umniversity integrates with Umniverse as our learning should be integrated in our lives. To start, Umniverse is an information manager that represents in 3D information like documents, pictures, movies, presentations, spreadsheets and so on. Transferring files to the Umniverse virtual environment enables a spatial management more natural and potentially more scalable than typical 2D file browsers. Having a virtual world divided, for now, in nine places also gives another degree of flexibility allowing users to allocate certain places for pictures and other places for movies . Or allocate a place for work related data and another to family related information.

So, up and foremost, Umniverse is an information manager, a place where users can organize their data. No matter if it is related to work, to family, to friends or to learning activities. To succeed, Umniverse must be a great environment in giving the user a way to naturally and easily manage information. Only then it should integrate collaborative tools for collaboration increasingly means exchange of data. Whether this data consists of pictures, PDF files, musics or links, the important is information to be easily accessible and shareable. To start with a good information manager in Umniverse becomes crucial.

Two collaboration tools are for the moment developed in Umniverse: the Whiteboard and the Super Forum. These are tools with obvious application in educational settings and namely the forum, as we have seen, is of great usefulness for MOOC implementations. But these tools can also be useful in other than learning activities such as for discussing with friends a certain subject. Why make an environment specific for learning when information management and collaborative tools are also useful in other activities? Second Life is a good example for it wasn't build expressly for learning nevertheless it has been in use successfully for varied learning activities.

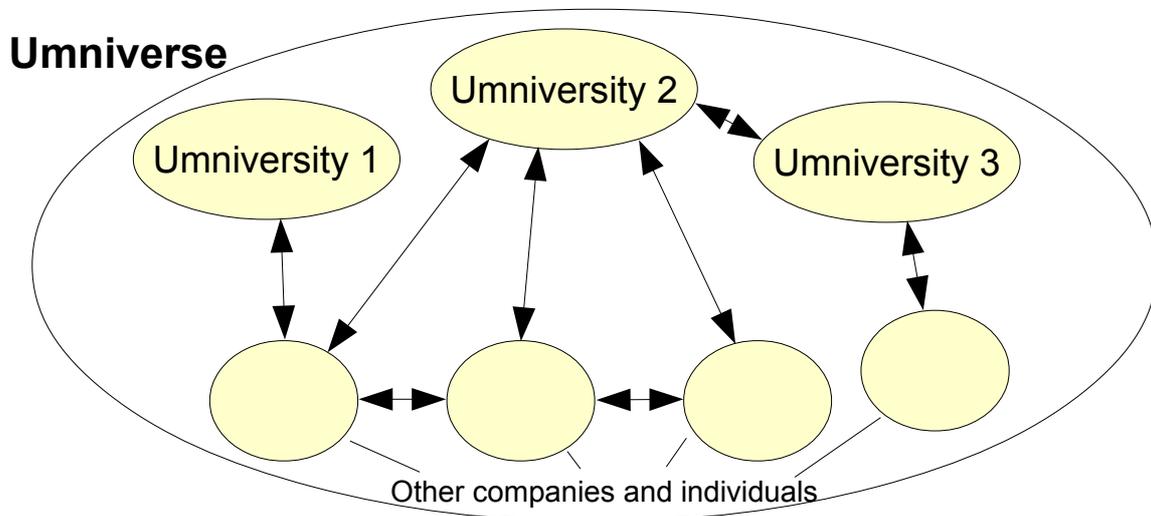


Figure 3: Umniversity is part of Umniverse which can integrate other companies and individuals

Umniverse wants to make data easily available from, let's say, our hobbies to MOOC synchronous or asynchronous sessions, and put information from our MOOC sessions within reach to use in work contexts. Umniverse, as represented in figure 3, allows the use of a virtual world setting for simultaneous learning and non learning activities. Not having to completely change the users habits when he or she decides to participate on a MOOC's activities is a goal that will be further tuned as real tests take off. This can be achieved integrating general purpose features in current LMS or adding learner specific tools to general purpose environments. In this Umniverse-Umniversity project it is a strategy that was defined from the start.

### 3.4 Super Forum with Learning Analytics

What we call Super Forum is a *forum* integrating features helping MOOC students navigate among thousands of posted entries and providing feedback on their participation dynamics.

Umniversity Super Forum object enables tagging through a UDRIVE (Unread, Deleted, Read, Important, Very Important, Exceptional) system where one can rate any of the entries, later allowing filtering by those rates. It is also useful for analyzing how our entries are rated so that we get a feedback about the interest our contributions deserve. Another use of ratings is to give an indication of who are the people more active in tagging, perhaps meaning they are dedicating more time to the course. What level of interest each one is finding in others' post contributions can be a sign of the overall interest for the course.

The possibility of adding topics to the Super Forum is also useful for MOOC, removing the need to create various *fora* which are hard to relate and keep track. To define what a certain *forum* entry is about, participants can associate it to one or more topics previously defined by the course organizers or added as and when users see fit. An entry in a MOOC about sports that is related to Clubs and Refereeing can have those two topics checked leaving unchecked topics like Football and Players. A reply to that entry may check only Refereeing and Football because it is entering the specifics of, for instance, a football refereeing scandal. In addition to filtering *forum* entries by tags, we can also filter by topics and by who posted them.

Using the Forum integrated statistics window, as in figure 4, we can also easily sort entries by the tags that collectively all participants gave to them enabling us to view the most appreciated ones. Statistics can be obtained by entries, by topics, by users who tagged or those whose entries were tagged, or by time (days, weeks, week days, time periods in a day and so on). Graphics are available to illustrate most statistics as well the possibility to highlight or hide data from a chosen participant. Finally, having all the entries in one Forum with indication of each one relevant topics, we can also represent graphically how strongly different topics relate to one another (figure 5). All this data, can now be used to help each student compare its own

involvement to the average or to the involvement that past or present identified successful students have.

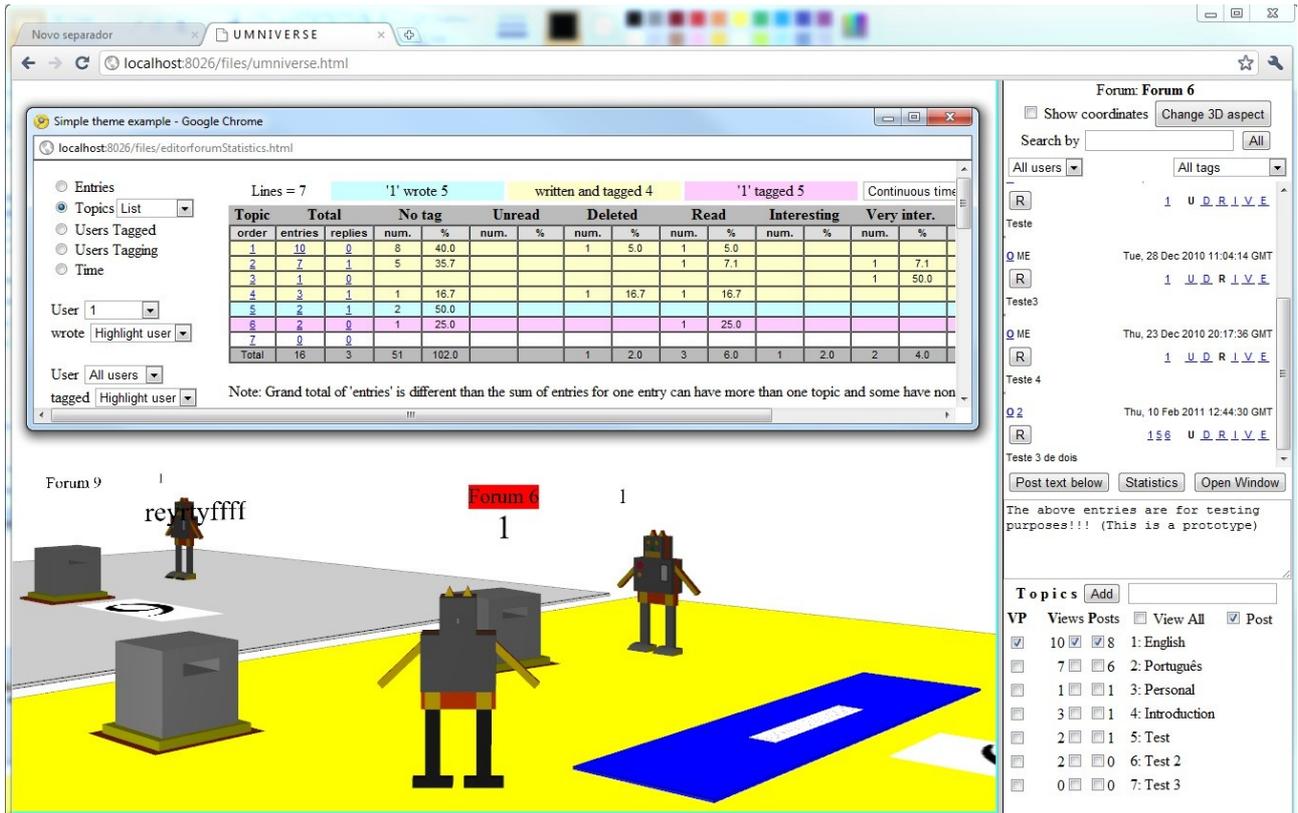


Figure 4: Umniverse forum includes statistics and a 3D representation facilitating synchronous exchanges

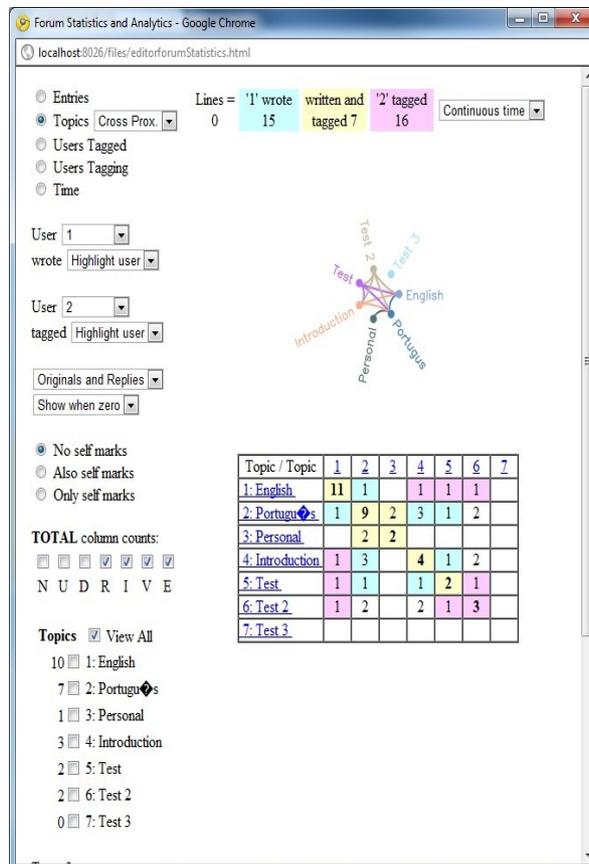


Figure 5: Managing many topics on one Umniverse Super Forum allows more relations to be analyzed

Being a *forum* represented as a 3D object, a natural exchange of ideas can occur through it when two or more avatars from different users are placed near by. How this spatial virtual encounter can add dynamics and change the characteristics of traditional *fora* is yet to be analyzed but the large number of students involved in a MOOC turns here into a definitive advantage: with hundreds or even thousands of participants it is much more probable that having an avatar in a virtual world, in this case near a certain 3D representation of a collaborative tool, will lead to more frequent interactions. This can also contribute to the sense of belonging and being supported by a learning community naturally increasing MOOC success.

#### 4 – Conclusions

The main virtues of the Umniversity project is trying to facilitate MOOC implementations, which have a long way to reach their full potential, exploring not one but many vectors towards that goal. In dealing simultaneously with participants motivation, sense of belonging, management of massive amount of data and data sources, and bridging synchronous with asynchronous sessions makes this platform unique.

Development is based on both technical and pedagogical expertise aiming for the best and most efficient learning experiences. Future technologies are taken into account as well as future educational scenarios. No new theories are introduced but only the tools, integrated in innovative ways, to test those theories.

The main Umniversity drawback is, due to the choice of having next generation browser based standards with no current stable implementations, not being possible to evaluate its virtual world environment in a real test scenario with hundreds of students.

As case studies become feasible they are the top priority for future work. Other important areas will be developed such as responding to data privacy concerns when using learning analytics and integrating the Umniverse platform with other popular collaborative tools where informal learning increasingly takes place.

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