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| Sarah Eagle. Report on the Meeting of Young Minds. 2012. hal-00722804

HAL Id: hal-00722804

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Submitted on 4 Aug 2012

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D2.5

Report on the Meeting of Young Minds

Edited by
Sarah Eagle



STELLAR

Amendment History

Version	Date	Contributor(s)	Modification
0.1	6/6/2012	Sarah Eagle (UB)	Inclusion of photographs, formatting

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WP2 | D2.5

Report on the Meeting of Young Minds

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public report	final	1.1	9/6/2012	N/A
<i>audience & type</i>	<i>status</i>	<i>version</i>	<i>doc date</i>	<i>due date</i>

scenarios, futures, vision, interdisciplinarity
keywords

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1 Introduction

The Meeting of the Young Minds was held in Leuven, Belgium, on 28th and 29th of November 2011. It brought together researchers aged under 35, representing a variety of institutions and disciplines, who were interested in discussing the future of Technology Enhanced Learning. The justification for bringing these people together was that younger researchers would produce fresh research ideas or bring an alternative perspective to TEL research.

Information about the opportunity was made available through professional contact with STELLAR members and means for wider dissemination including the JTEL summer school, the ISLS distribution list or TEL Europe, and people asked to nominate themselves for consideration. A total of 77 people were nominated from whom twelve were selected. There appeared to be wide interest from outside the STELLAR community, which we might interpret as a confirmation of the community's interest in participating in the STELLAR activities.

Since the expectation was that these younger researchers would bring fresh ideas and alternative perspectives, maximum effort was made to establish the conditions for creative collaboration, for which an informal atmosphere is essential¹. One of the three tasks given participants before the meeting was to write an unconventional introduction to themselves, in the form of a story – the story of how they came to be involved in TEL. The full set of stories was collated, formatted attractively and sent to all participants before their arrival. It had the effect of whetting the Young Minds' appetite for meeting one another and working together, and helped to establish a relaxed atmosphere. The remaining two pre-meeting tasks were designed to familiarise participants with scenarios as a method for future thinking and to engage them in thinking about existing trends and about potential future trends.

Over two days the Young Minds worked together to write scenarios for TEL in 15 years' time, making explicit the future trends on which their thinking was based as well as the values and beliefs that underpinned their imagined worlds in which the TEL examples were set. Timescales for each stage of the task was kept tight since research suggests that a degree of tension is helpful in creative team work (ibid). The final set of three scenarios offers divergent perspectives on the future of learning and of technology, give examples of how technology might be designed and used in support of learning, and comment on the implications and issues that arose in discussion as well as individual reflections on the process and the outcome.

¹ See: Literature Review of Creative Collaboration; In d8a: Research Plan for CoCreat Enabling Creative Collaboration through Supportive Technologies, (EU FP7 Lifelong Learning Programme LLP project, 2010-13). Sarah Eagle (University of Bristol) and Margarida Romero (Universitat Autònoma de Barcelona) who participated in the meeting of Young Minds are also partners in the CoCreat project and co-authors of the review.

1.1 Participants

The MoYM Animation Team was composed of four STELLAR members: **Sarah Eagle**, **Denis Gillet**, **Erik Duval**, and **Ulrike Cress**.

The participants (Young Minds in TEL) were:

Elizabeth Bagley, Post-doctoral Fellow,
University of Illinois Urbana-Champaign, USA

Lyndsay Grant, PhD candidate, Graduate School of Education,
University of Bristol, UK

Maurice Hendrix, Researcher, Serious Games Institute, UK

Davinia Hernández-Leo, Researcher and Assistant Professor at the Information and
Communications Technologies Department of Universitat Pompeu Fabra, Spain

Robb Lindgren, Assistant Professor of Digital Media and Director of the Media and
Learning Lab, University of Central Florida, Orlando, Florida, USA

Andrew Manches, Postdoctoral Researcher, Institute of Education, UK

Nikos Manouselis, R&D director of Agro-Know Technologies, Greece

Mark Melia, doctoral candidate at Dublin City University, EIRE

Jose Quesada, CeO of TEL startup and Former cognitive science researcher working
at the Adaptive Behavior and Cognition group, Max Planck Institute, Germany

Margarida Romero, Associate professor Universitat Autònoma de
Barcelona and Open University of Barcelona, Spain

Jochen Rick, Department of Educational Technology, Saarland University, Germany

Clint Rogers, Co-ordinator of EDULINK Consortium of
African and European Universities for ICT4D, Finland

CVs (Resumes) for the Young Minds in TEL are found in the non-public Appendix 5

1.2 Preparation for scenario building activities

Participants were asked to carry out some preparatory work in advance of the meeting. Three specific tasks were given as indicated in figure 1 below, which gives the text of an email sent one calendar month before the meeting.

Task 1. To familiarise yourself with Scenarios as a future planning tool. You may wish to begin by reading the description of scenario planning provided by [ForLearn \(an European Commission resource\)](#)

Other sources of information are:

[Foresight Horizon Planning Toolkit](#), a good resource which details a wide variety of future planning tools

The [iKnow Innovation, Foresight and Horizon Scanning System](#), which hosts the [Weak Signals and Wild Cards Bank](#).

An example of scenario development in TEL can be found at <http://itec.eun.org>

Task 2. To list some trends and driving forces. In futures work, the development of scenarios begins with a conceptual model of the relevant environment that includes critical trends and forces and maps out the cause-and-effect relationship among the forces¹. A starting point is to identify what are the major trends and uncertainties, which are the most important in determining the key decision factors and which represent underlying or 'driving' forces for significant change in the future. Amongst the resources listed above there are examples of trends and driving forces that have been identified for TEL related areas. You may wish to draw on these and related resource in drawing up a list of the trends or driving forces that, from your professional perspective, may have an impact on a range of plausible futures in Technology Enhanced Learning. The categories you should consider are: Social, Technological, Economic (macro), Environmental, Political and Values.

Task 3. To write a short, informal introduction to yourself, to be returned by 21 November. During the meeting, we will work in groups to develop future scenarios in TEL, pausing at intervals to share developing ideas. Working creatively together is best done in an atmosphere that is relatively informal. In order to 'hit the ground running' we ask everyone involved to introduce themselves in an informal way. In your introduction please tell your personal story of how you came to be interested in TEL, briefly reflecting on the developments in technology and expectations of education during your lifetime and the way in which your own experience and decisions were related to contemporary ideas about technology and learning. An example, submitted by Sarah Eagle, is attached to this email.

The text of documents sent in a follow-up email, giving further detail about tasks 1 and 2, is provided in **Appendix 1**.

The informal introductions written in response to Task 3 and returned by 21st November were collated and a document produced in an attractive format, (non-public **Appendix 2**) which was then distributed to participants a week in advance of the meeting. The remaining introductions were forwarded to all participants as they arrived.

The trends sent by participants in response to task 2 are listed in **Appendix 3**.

1.3 The process of scenario production at the meeting

Given that all participants had read the series of informal introductions and had carried out preparatory work, very little time was needed to introduce people or to introduce the task.

A brief introduction to STELLAR was provided, and an outline of the use of scenarios by the Network of Excellence given. This was followed by a recap of the methodology of working from trends to scenarios, following the outline given by the UK Foresight Office's Horizon Scanning Centre <http://hsctoolkit.bis.gov.uk/Methodology-15.html>

The methodology begins with the identification of trends and drivers from a broad set, which is reduced through methods such as ranking, voting, dialogue and de-selection. The trends or drivers that remain are assessed in terms of impact and uncertainty. The most critical uncertainties (high impact and high uncertainty) – the ones seen as most pertinent to the topic – are used as axes in the construction of a scenario frame or 'matrix' which provides four scenario quadrants. The trends or drivers should be independent of one another. In practice, it often the case that one of the two axes of a 2x2 matrix concerns a societal perspective, with the other a governance, economic, political or technological perspective.

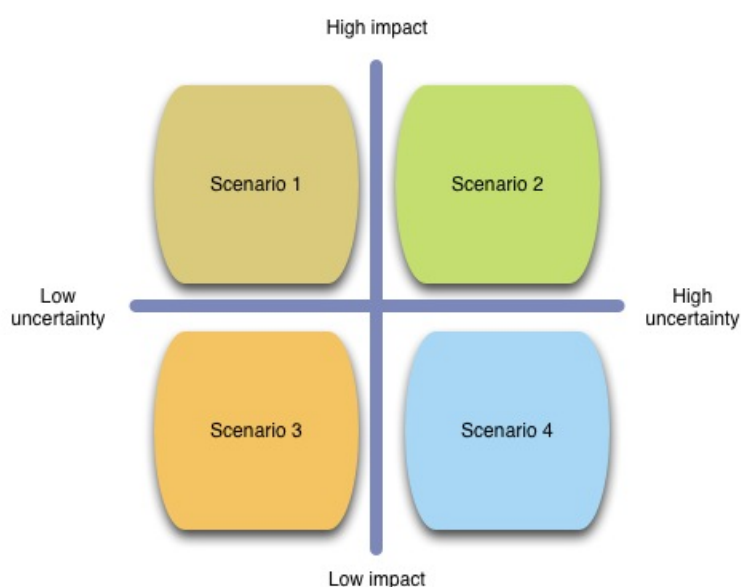


Figure 1: Scenario axes and scenario quadrants

In order to provide an example, a matrix was drawn up with axes representing an educational trend (relating to assessment of learning) and a technological trend that could shift interaction away from screens and towards the use of the body (an

example of a possible future trend articulated by Brett Victor in his Brief Rant On The Future Of Interaction Design² (8 November 2011) and had been circulating widely in the design and HCI community in the weeks prior to the Meeting of the Young Minds). Each of the three groups was asked to identify drivers and develop axes. Given the time available, they were expected to produce only one (rather than four) scenarios; they were welcome to choose whichever quadrant they felt they would like to develop.

The trends returned by participants in advance of the meeting did not fall into the system of categories that had been suggested (*Social, Technological, Economic (macro), Environmental, Political and Values*). The result was that the task of collation proved to be more difficult than anticipated, and in place of a document summarising the trends, a verbal outline was given.

Participants worked in a lecture room at the Computer Science department of the Katholieke Universiteit Leuven, with a good view over the campus. In order provide more informal working atmosphere, tables and chairs were moved out of their arrangement in rows. The twelve 'Young Minds', who were assigned to three groups of four on the basis of the informal information provided before the meeting, were encouraged to use the space in the way that they felt best supported collaborative work, and encouraged to take a change of scene from time to time. All three groups chose to walk and talk outside the building as well as to work sitting at their tables, and reported that they found that this was helpful in developing their work.

Groups were provided with flipcharts, pens, post-it-notes and care was taken to replenish their coffee, tea and water as they worked. Deadlines for aspects of the work were given, and groups were encouraged to keep to time. In the first phase, during which they worked to identify trends and drivers and construct their matrix, they were asked to work using flip charts and pens and to keep their laptops closed; the purpose behind this was that that sketching and writing by any member of the group would be visible to all members in a forum that also allows non-verbal communication (gesture, eye contact). Having got to know one another a little during this first phase, in the second phase they were welcomed to use their laptops, and each group then produced a collaborative document using Google docs.

Each stage was punctuated by the requirement to give a brief presentation to the rest of the group on work carried out thus far.



2 Scenarios produced by the Young Minds in TEL

The following scenarios are taken directly from the Google Documents returned at the end of the meeting, with minimal editing. Each of the three scenarios is followed by a set of comments. These comments were written individually by the members of the group, in response to a set of questions provided at the end of the meeting. The comments were returned to the organizers by email. Again, editing of these comments has been kept to a minimum.

1.4 Scenario 1: 2020 – Control of TEL

Group 1: Lyndsay Grant, Maurice Hendrix, Davinia Hernández-Leo, Nikos Manouselis

1.4.1 From Trends to World

After reflecting about trends and driving forces under the categories: *Social, Technological, Economic (macro), Environmental, Political* and *Values*, most of the issues discussed in our group had to do with “control in TEL” at different levels. Finally, two axes were identified:

- The **purpose of education**: Intrinsic value vs. Job oriented, with the question who will decide this.
- The **accessibility of technology** (infrastructure, connectivity, hardware, software, cost etc.: will access be Widespread and available to all or will it be limited or controlled for example by cost (e.g. not everyone can afford the hardware or subscriptions) or by tight regulation (e.g. only approved learners enrolled in official programs have access, only employees of certain organisations have access etc.)

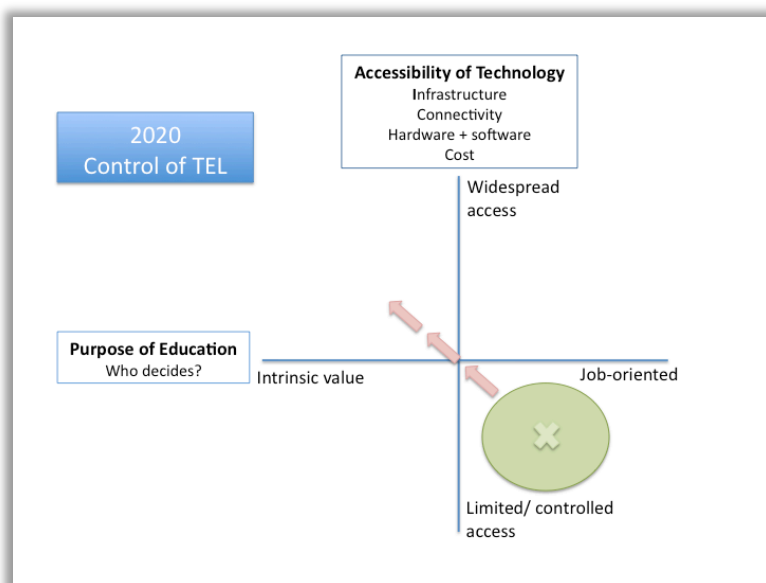


Figure 2: “2020: Control of TEL” Scenario quadrants

The selection of axes leads to 4 possible alternative worlds (quadrants). We have selected the following world, located in the bottom right corner of the axes diagram as plausible future world:

Education is very job-oriented, access to technology is controlled by cost. Education providers control access to their resources to their students who are accepted into their courses and have paid their fees.

In order to be able to come to a scenario there are a number of **assumptions** we are making. Below we list these assumptions. Making these assumptions, allows us to focus on the impact of our axes.

1.4.2 Education

We assume that **education is skills oriented**. It is all about training people for a particular job. Most education, or at least past primary school years education, is short term. The courses on offer are created as a response to employers' needs and learners demand a way to acquire the job-related skills that employers need as quickly as possible, in order to maximise their return on investment. As a result most of the studies that do not directly lead to a particular job (e.g. many of the humanities studies) are disappearing, due to dwindling demand. Many learners being prepared for a particular job. The training is geared towards jobs available in the richer countries, as this is where the demand comes from. This is where people want to work and have the money to pay for the education. Competition is fierce.

1.4.3 Technology

The **technology** in this world is very advanced and pervasive in the "richer" countries. Most of the physical objects are smart and connected. These objects can understand what happens in the environment and respond to it, also with the aim of fostering social interaction and triggering learning. In so doing, the objects take into account the profile of the individuals and their previous actions with other objects so as to support coherent learning processes. For example cutting edge interactive surfaces, which integrate an ambient intelligent environment, connect people/visitors seamlessly, depending on their interests and preferences.

All the network-available resources, including services and data, are provided by a private cloud infrastructure. Access to the infrastructure is very expensive. Rich countries control the selection of the materials to be used for the creation of technologies and decides also on the price and distribution of the technology.

1.4.4 Political/Economic relationships

In the **political/economic** domain, there is a **core group of richer countries**. Much of the education focuses on jobs available in these countries, and they are selling this education to other countries. While immigrating may or may not have become easier, but outsourcing has increased to such an extent that workers in the other countries need the education offered in the richer countries.

Governments of the richer countries have taken a **protectionist approach**. Meaning that access to Technology Enhanced Learning is tightly regulated and controlled. It is

limited to approved and registered learners and there are stringent checks on these learners in terms of criminal records, character and possibly other factors. The institutions also limit the access based on the ability to pay fees.

At the same time there is an alternative, almost **underground world**, where people can find information. As this does not follow the tight regulations set out by the authorities, it is frowned upon. However there are opportunities for people to study, both for self fulfilment and to gain specific, if unaccredited, skills. In this world, members of the community communicate and learn from each other in very informal ways. This opens up opportunities for TEL, to support the sharing of information and the process of learning collaboratively from peers.

Especially for those learners who are after specific job related skills, this raises the issue of how this informal process can be assessed or even validated. New institutions emerge, offering just a validation of skills i.e. the assessment.



1.4.5 Story: George, Amelie and the Bar Incident

George was born in Germany, since his parents have been living and working there during the 70s. His parents decided to take him through the Greek educational system, and therefore sent him to stay for some years with his aunt in Greece until they returned to Greece. After finishing school he managed to get into a Technical College studying Computers & Electronics, nevertheless he never actually attended any courses. Eventually he found a part-time job as a waiter in some restaurant, something that was more fun than studying and paying some part of the bills. With time, this type of job got better and better as he started working for bars and clubs in very touristic islands of Greece - making some good money during the summer season and then keeping expenses low during the winter season.

Now, in his mid forties, George is still in the same business but not having the same fun. Since bars and clubs usually hire younger people, he has been working for years in hotel bars. He completed some professional development programme on Food & Beverage Logistics, but this was never taken into consideration by any of his employers. After working for several years in Greek hotels, the crisis made him explore additional options and eventually seek for employment in Germany. This is where he is working now, at a very trendy hotel that is built using cutting edge interactive surfaces, which integrate an ambient intelligent environment, connect people/visitors seamlessly, depending on their interests and preferences.

George has always had a passion for history. He has spent endless nights over historical books and he was always trying to connect places and people with their historical context. His favourite gadget these days is a ancient second hand iPad 2 that some friend gave him over, which is quite outdated (and not reliable any more) but still good enough to browse online and read digital historical books. Since he cannot afford a fast and reliable connection at home, he is usually finding some time during his work shift to connect through the hotel's network (he found his boss's password)

and browse through interesting material. He is also a member of various groups interested in history in a couple of popular social platforms. Nowadays he is interested in ancient Greek history and its connection to Chinese one, particularly exploring the commercial relationships and trade routes between the two countries. The online groups share and suggest readings to each other and George is well respected as something of an expert on the topic. There is no formal accreditation as the learning here is for pleasure rather than employment, and some of George's friends have suggested that he might better spend his time trying to earn credits towards a vocational qualification.

While these platforms are very popular their use is frowned upon by the powers that be, as it does not adhere to the same tight control. Therefore this community is somewhat underground and not well known by most mainstream learners.



Amelie was born into a privileged family in France, which is now part of the new **CoreEurope** group of countries that emerged relatively unscathed from the economic and political crisis of 2011-12. She and her family want to make sure that she is prepared for a successful working life in a time of rapid change. There are no jobs for life, so she needs to learn the **skills** that she can take with her to be successful in many environments.

Amelie took her first degree at "Elite University" in France and then after a period of working in banking decided that she needed a further qualification to move ahead in her career. It is a very competitive world and she needs to be able to stand out from the crowd, so she sees gaining a good qualification from an international university as a worthwhile **investment** even though it is very expensive. Because her family have a good credit rating she can get a loan on good terms. As well as leaving "Elite University 2" with a first class MBA, perhaps more importantly, Amelie also leaves with a strong **network** of other business students from USA, Europe, Asia who she keeps in touch with online.

"Elite University 2" asks all students to bring with them their own personal digital devices, which are very expensive. All her course content - including reading, lectures, placement - is available on the device.

As a "Elite University 2" alumnus she is also entitled to a **discount subscription** rate for **EliteUniversity2Connect** - this allows her to access to any business course offered by "Elite University 2" in the ten years following her graduation, including participation with other students, holographic one-to-one meetings with business experts and all the data, tools and resources developed by the university. They use the iRoom software, which means that you can interact gesturally with other participants as if in the same room. Even with the alumnus discount, Amelie is still paying nearly half the European average salary every month to be part of this elite walled garden of continuing education, but she considered this essential to keep herself ahead of the game in terms of learning about new developments in her field,

cultivating her network of contacts, and having some influence in policy and business circles. **Data storage and always-on broadband connectivity are available, but very expensive** and Amelie pays for a premium package which she sees as a utility like water or electricity. It is also highly regulated, and citizens require background, criminal record and credit data checks in order to be given access to these resources; the CoreEurope government sees this as necessary in order to guard against cyber terrorism.

Amelie's investment pays off and on her return from the USA she follows up an opportunity suggested by one of her new friends in Germany, where she sets up a business commercialising new technologies developed in China and India. Much of CoreEurope's trade is with China, and so Amelie enrolls on an intensive online course in Chinese business culture to enable her to work more smoothly with her Chinese contacts. One of the modules that she is studying is on Chinese trading history. She is not particularly enjoying this module, but works hard on it because she thinks it will be important to cultivate good contacts in China.

Amelie does not tie herself to one employer or business venture, she is an international, global flexible knowledge entrepreneur. Amelie sets up a bar in Germany designed to help people network. Using wearable devices and sensors embedded in the physical environment that communicate with each other, the technology looks for similarities between people and makes introductions and suggestions for who you should talk to.

The bar incident

The bar of the hotel was always a place to meet and socialize, especially for the business travelers usually staying there (see Figure 2). Amelie's idea to take advantage of existing social platforms and the information that they keep in relation to the interests and activities of the members (something like the ancient LinkedIn platform that was popular a decade ago), in order to build a really interactive space, that would connect visitors with their peers that are visiting the hotel, suggest collaborations based on mutual interests or simply recommend joining someone for dinner or a drink - always on a strictly business dating context.

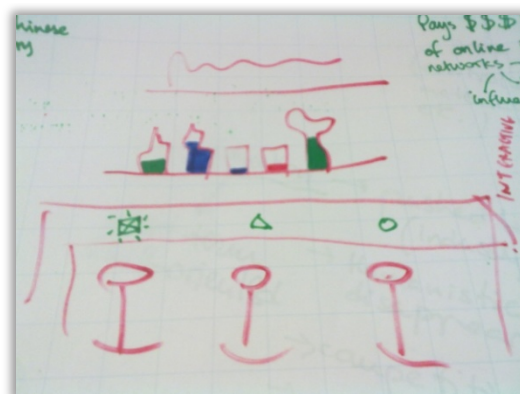


Figure 3 "Smart bar" in 2020, fostering social networking for informal learning

That night, Amelie was anxious about her meeting with some Chinese counterparts that would take place on the next day. She knew that the head of the team (senior CEO at a company that she was trying to get in contact for months) was very much

interested in history and the connections between the European and Chinese cultures, and she was really trying to think about ways to get his attention and impress him.

Her shirt, embedding sensors that were able to identify her stress level by measuring various parameters like her heart beat rate, passed this information as alert signals to her table, that immediately changed its colour from a bright green to a deep, soothing, dark blue. Then the interactive tabletop made a small but rather clear suggestion: "Why don't you go to the bar to meet someone to chat about Chinese and European cultures?"

Amelie took a look: nobody was sitting at the bar, it was only that Greek bartender that they had hired some months ago and who she always found a bit weird and distant. She stood up and walked towards the bar - maybe the table suggested this move because some other hotel visitor started descending the stairs and it was predicted (based on his behaviour during the previous days) that he was heading for the bar. She smiled at the Greek, who made a quick move to hide from the boss that he was reading something using one very old device ("My goodness, was this an iPad 2? Do they still exist?"). Some time passed and nobody joined her at the bar. She was a bit bored, so she decided to tease the Greek: "So, what do you know about the cultural connections between the ancient Greek and Chinese civilisations?". He gave her a (somewhat cute) smile, he leaned towards her, and he started talking. She was astonished.

It's all about education

Amelie and George have both changed a lot since they first met in that bar in Hamburg. Astounded, not just by George's knowledge of Greek/Chinese trade history, but the fact that he loved and enjoyed talking about it, Amelie was intrigued; she didn't think people like George were interested in education at all. When she heard about the underground and ad hoc networks that George used to further his learning she saw the parallels between her own continuous learning, but also how much more difficult it was for George to access the kind of resources and networks that gave accreditation and prestige. She allows George to use her password to access some of the courses that are part of her subscription, which further fuels his love of the subject.

But George remembers his friends on LinkedIn who don't have this access and wants to offer them the same opportunities Amelie has made available for him. But much as she loves George, Amelie cannot risk sharing her password so widely; it is a serious offence if she gets caught. Working together, George and Amelie set up an Open Education Resources university - using open source software and working on principles of Massively Open Online Courses (MOOCs) they form an underground OER University. Initially they are facing tough resistance from the authorities and established learners, who are afraid to lose their control, but eventually they are allowed to proceed.

Access to technologies is still very limited and regulated so people make do with hacking into networks and re-using and modifying outdated software. The OERU means that those who want to study humanities can do so, and those who may have

left formal education with no qualifications can still engage. Recognition and acceptance of the value of this kind of education - and particularly of its unaccredited nature - in the more privileged and elite circles is still very limited.

1.4.6 Comments on scenario and on process

1 What were your feelings about the future world in your scenario? Please write a couple of sentences to express the hopes, expectations and/or anxieties you might have if you were an aunt/uncle/parent/grandparent etc. of a child facing this future world.

- High fragmentation of countries, society, education
- Very advanced educational technologies available only for (or controlled only by) certain population
- Control of technological infrastructures, devices and educational programmes by “rich countries”
- Hopes focused on low cost technologies, sharing of open educational resources, peer to peer support / learning, higher impact of informal learning, collaborative vs. competitive learning towards a more humanizing society
- After setting up two variables providing four quadrants for possible worlds, we chose to focus on the world that we felt was most probable rather than one we preferred - one in which there is great inequality in access to technology and in which the purpose of education was generally thought to be closely aligned to future job and economic prospects for the individual. I think it is fair to say that none of our group welcomed this world for reasons of social justice - this world was deeply unjust. There is clearly great anxiety for children facing this future world from the point of view of those who might be on the wrong end of access to technology or who would want to pursue education for a broader purpose, but I think it also of concern for those on the 'winning' side and societies in general. It is a very competitive world and to maintain a position at the top (individually or nationally) requires constant, focused pursuit of a very narrow goal. Individuals therefore have limited opportunities to broaden their experience or ways of thinking, come into contact with new and different people and ideas and this quite likely greatly limits the potential for change or innovation at a societal and industrial level as well as having negative consequences for individuals.
- Mixed feelings for such a gloomy and controlled world. Difficult to see where change will come from, not very optimistic. This is my real perception of our world and I do worry being a parent of two children that need to face it.
- The world we created (before the positive twist at the end of our scenario) was not one I would like to see become a reality. There was a high degree of inequality in which the next generation may not get the chances I feel they deserve unless their parents happen to be wealthy.
 - I do feel there is some merit in focusing some of the education towards the future job and there is certainly a place for professional courses.

- However I feel that the studying for self fulfilment in search of personal growth is very important, and if we were to lose that we risk creating a generation of narrow minded workers.
- Let's hope it turns out more optimistic like the group that presented last. That would be a great world if we could make it work in terms of employability etc.

2 As you worked, you came up with a variety of ideas, some of which you discarded on your way to building your scenario. Please spend a few minutes listing the ideas you discarded - as many as you can - do this in note form rather than in detail.

- Difficult to identify two opposite values for the axes of some trends
- In many cases it was difficult to separate opposite values of some trends in different worlds since we imagined both options present in future worlds (individual vs. collaboration, tangible portable devices vs. PCs...)
- We selected the most abstract ideas for the axis, all dealing with Social / Economic / Political aspects and then we reflected on their impact on education and technology
- We explored several variables (though they shared a fairly common theme), but did not exclude many ideas from our particular scenario as I remember it.
- Was thinking of a rather more pessimistic view, with TEL being really monopolised by formal systems and procedures. A light of hope managed to enter the picture after introducing the concept of Open Educational Resources.
- Since we had identified that there was a divide between those who have the opportunities and access and those who have not, we quickly decided we wanted a representative from both groups. We first created the barman, and crafted the polar opposite business woman. We then decided that there had to be a way to link them and that's where our technology really came into it.
 - We discussed various different versions of this basic concept. Initially it was going to be a love story but eventually we decided to leave that part to the reader's imagination.

3 Your scenario is 'built' on a consideration of trends that you had identified as relevant. You probably went through a process in which you prioritised some trends over others. Can you give a brief account of how or why your group chose the trends it did?

- Focus of the discussion was mainly at the beginning on the "purpose of education" (given the current economical situation, no jobs for young people, we don't know which jobs will be required in the future, etc.) Then we discuss most of the trends mentioned at the beginning of the meeting. See the previous answer.
- We discussed trends that most interested us as individuals - and discovered that we all shared an interest in the more political and social/economic than the most technical. We tried to construct different quadrants with different trends and discovered that we needed to break some of them down into more specific trends. We also played about with combining trends. We realised that

there was an overarching theme to our discussions - who controls technology-enhanced learning or how is it controlled? This did not work as a variable, but providing an overarching theme to the two variables we eventually chose. Our choice of trends was guided by the current political European situation - it was not a coincidence that one member of our group was Greek - and there was inevitably a lot of discussion about the future of Europe in the light of this crisis, especially as the scenario we were asked to construct was in the relatively near future, less than ten years away.

- We listed and explored different trends in every important dimension (education, technology, political/economical, environmental, ...) and then tried to identify the ones that we considered as most important. Then we selected the 2 that served as axes for our world.
- We went to a group of trends, social, economic and political and eventually identified that they all had some bearing on the 2 selected axes of purpose of education and access to the relevant technology. For some reason we quickly decided to take the new amazing technologies as an assumption. Only at the end when writing our twist we thought of how TEL may be a way out of such a world.

4 Thinking about the ideas about technology in the future that have come up in this workshop, within your group and others.... If you could choose one Research area for the European Commission to fund, which would it be and why?

- Empowering practitioners / educators across countries:
- avoiding eventual external control by
- facilitating them the creation of their own educational activities/resources according to their educational circumstances,
- supporting collaboration and sharing of materials among educators, and making them openly available for learners
- orchestrating activity flows and the use of supporting educational technologies depending on the technologies available,
- integrating informal learning actions in formal learning processes and connecting learners across countries
- Presuming this is one Research area within TEL (as opposed to research in any other field) if we are talking 'technology focus' I would look at environmentally sustainable ICT (issues of energy use, consumerism - updating hardware etc, mineral extraction etc, whether our current ICT use is globally sustainable at all and might need to change).
- Opening up education to people that have been excluded due to a variety of reasons.
- Despite being of a technical background I feel the most important issue right now is to decide what the future of educations going to be.
 - When creating (technical) TEL solutions, we can improve the current system somewhat. But if there was a clear vision that would allow us to support it. For example creating tools for the very intrinsic informal learning in the optimistic world, would probably not take off in the current system, as it does not fit in with established curricula and assessment.

1.5 Scenario 2: The world of 'Here and Now': physical trumps virtual

Group 2: Andrew Manches, Robb Lindgren, Jose Quesada, Margarida Romero

1.5.1 World

In this world there's a trend towards 'physicality'. The technology supports collaboration in a physical context. The technology that has made such an impact on people's lives can be broadly described on two levels: Augmented objects, and Augmented social interactions. They reinforce each other, creating and enhanced awareness of the world. First, we can manufacture physical objects cheaply at home using 3D printers. As we will see, a child from any background can access almost any object: from the latest play toy to a musical instrument. This natural progression towards greater physicality in interfaces was foreshadowed by earlier trends such as making digital photos physically manipulable or embedding digital sensors into real world objects. Second, we 'feel' other people much better because biometric information hidden to the naked eye can now be accessible.

Let's see how this works by introducing the concept of augmented objects, augmented social interactions and the story of a 14 years boy and a 60-year-old woman

1.5.2 Augmented Objects

Printed objects collect data and can use those data to provide feedback. Everyday tools (from cutlery to cars) broadcast information about their state. The fridge can tell you when you are running out of milk exactly when you stand in front of the milk isle. Your tools know where you are and what you may need. All the benefits of digital technology are not hidden behind screens and keyboards. The printing makes those objects common-place, and the social infrastructure is ready for the new affordances. Kids can crate the toys they want. Artists can create works of art limited by their taste, not the features of the medium. There's no need to ship manufacturing to 3rd world countries. In minutes, anyone can go from a design to an object 'in hand', and this object will be connected to a larger network that expects some standard behaviour. For example, if the object is identified as a ringing bell, it should be able to make noise. A nearby object that has no such noise-making ability, but needs it (e.g. a fire alarm) could trigger it remotely using nearby objects. People make what they need on the fly instead of carrying objects with them.

1.5.3 Augmented social interactions

All forms of knowledge that transfer well in written or video form, are well worked out. The most valuable forms of knowledge are those skills with a physical component, and skills where face-to-face interaction is necessary.

New forms of interaction make standards such as text messages look primitive. This generation does the equivalent of Facebook, Twitter, and Skype but not in text form. Text and video are limiting factors of the past. Users want to maximize the intensity of personal, face-to-face interaction (gestures, facial expressions, body language,

emotional cues that don't travel well through text). The game-changer was the birth of a new Augmented Awareness technology (AA). New sensors help you perceive a person in a whole new light. You can see when the other person is scared, when she's lying, how happy or stressed they are etc. A dog can do this, but a human in this future can too. We have access to biometric data and they are easy to display.

There is a greater role for 'here and now', physical interactions with those people around you. Your close friends and family get the most time. Teens do no longer value having 500 facebook friends; in fact it is a demerit.

Geography is still an important constraint, even more so than before since the new augmented perception only works face-to-face. The energy crisis makes travelling harder, and the same way the 50's brought tourism to the masses, its population has faded away. People travel for very different reasons now. Since be surrounded by the people you care about.

1.5.4 Stories

A fourteen year old boy

The boy wakes up in the morning and he is excited about the upcoming day. He has been learning violin for the last 2 years in a self regulated way at home, thanks to an augmented reality system that is proving him with feedback in a multi sensory way.

Today he is moving into the next stage of this learning interest and is ready to pick up a violin from a 3D printer that has been processing all the night at the office room in the house he is sharing with his friends. He pick up the instrument and starts playing his new violin. The violin provides him with tactile information about the way to change his position to manipulate in the best way the instrument.

The boy's performance of the day is being updated to his Personal Learning Portfolio. Later in the week, the violin community of learners' are offered the opportunity with other children with similar violin skills. The live performance will be an opportunity to collaborate with peers and also have a formative assessment. The assessment will provide the student with formative feedback about both his technical skills and the ability to integrate his part with other peers.

The boy is feeling stressed about his future violin performance at the end of the week, and, because of the biometric broadcast, his parents are aware of his stress and propose him to share a family moment to help him manage his excitement and stress.

In addition to learning violin skills the boy has expressed interest in entrepreneurship related to music. The violin learning community is aware about this boy interest in this area and the existence of critical number of other children sharing the same interest in music related business. The system identifies a person fitting the expertise profile corresponding to the boy interest among the social network system and request the expert for a workshop session. During the workshop session provides the children with practical information about starting and running a music related business.

Soon the boy will be at the point that he is able to help other children in this area.

A sixty-year-old woman

This woman is part of the first digital native generation and has been always exposed to use of ICTs for professional and academic purposes. In this future, the technology is more oriented to support and enhance physical interaction. In this future there is less virtual and remote communication. She is interested in joining a community in the field of personal well-being, where persons in the area with the same interest meet together.

The workshop she is joining today are focusing on understanding how to interpret real time blood pressure data. This lady feels a bit overwhelmed by this form of biometric data but knows that without it, her doctor would not have been able to diagnose a 95% probable heart failure last winter. In this workshop she hopes to learn how to read her own health data as well own to control who else has access to this.

The biometric sensors help her to be a better granny. She can take care of her granddaughter by being notified when she feels strong emotions (good or bad) and be there to share them with her.

Personal well being workshop - -about learning how to interpret own biometric data. Thankful for this form of biometric data as predict health problem 3 years ago but difficulties now in understanding how to interpret such large amounts of data. Again she appreciates ways to record all this information, augmenting her memory in effect

The woman is interested in enhancing the relations and socially shared memories with her relatives, and especially the younger generation. Technology helps her to collect and organise memories such that she can share them in a meaningful way with her grand-daughter.

1.5.5 Comments on scenario and on process

1 What were your feelings about the future world in your scenario? Please write a couple of sentences to express the hopes, expectations and/or anxieties you might have if you were an aunt/uncle/parent/grandparent etc. of a child facing this future world.

- It was an unhappy world. Lots of doom and gloom. The children have to get by with only community support, not world-class support, even though it was more personalized.
- Based on our current anxieties of being on a virtual and computer mediated communication scenario where a growing number of persons communicate through computer based tools in a remote way, our group have focused the future scenario vision in a lower computer-mediation communication, where the Internet of the Objects and the integration of the technologies allows the persons to increase their face-to-face communication. A future scenario with a lower technology stress for all the citizen, from children to elderly.
- I was optimistic about this world. I think that there is a human drive for communication and this is multimodal. Technology has opened up many opportunities for communication e.g. over large distances, but at a cost of not satisfying others: physical contact. Where there is a demand, technology will be designed to address this.

I think the fast rate of change in technology that we envisioned will always be a cause of anxiety for older generations. It will benefit them and perhaps address concerns about the distant nature of current forms of e-communication; yet new technologies require learning, adapting and ultimately coordinating new streams of information. This can leave many feeling de-skilled. Technology will also reflect and drive new ethical issues such as the role of privacy; I believe that these changes are less easily accepted by those with greater life-experience.

- The scenario that my group put forth was a largely optimistic one, albeit a bit surprising given the current trend towards "virtuality" in almost all of types of activity. We described a world where physicality and the "here and now" is emphasized, and where digital tools serve the purpose of augmenting these face-to-face interactions. As a parent and someone who appreciates the moments of "real world" connections with other human beings I find this vision to be largely a comfort--it's nice to think that we won't all be interacting entirely through computer terminals. This vision also resonates with my intuitions about what makes learning powerful for children and adults alike. Our bodies and our ability to have a tangible interaction with the things we are learning about are so important that including these in our future designs seems essential.

2 As you worked, you came up with a variety of ideas, some of which you discarded on your way to building your scenario. Please spend a few minutes listing the ideas you discarded - as many as you can - do this in note form rather than in detail.

- We didn't discard many. Maybe portfolios.
- Our group started sharing ideas with an important diversity of visions. Everyone shared his vision and then we focused on the "here and now" scenario. Among the ideas discarded :
 - The increase of virtual communication in terms of distance learning and distance work (telework).
 - The use of technologies for replacing human contact
 - An increase of text-based technologies
 - The use of technologies for e-participation and e-government
- We discussed the use of technology for memory enhancement, which was mentioned but not focused upon. We discussed assessment strategies but I believe these were considered too educationally focused given our wider remit.
- I had the feeling that we chose the trends based on our shared values, about how society should be in the next years, and not on a pure rationalistic projection of socio-economic data. All the members of the group were concerned by the use of technology for increasing face to face collaboration and not only distance remote collaboration.

We ultimately focused more on a socio-technical innovation rather than on broader political, economic, or cultural changes. Earlier in the stages of discussion we talked a lot about families and the impact this innovation would have on inter-family communication and relationships, but we ended up focusing more on the impact on learners. We also had discussed early on the distinction between the individual and

the group, but this became less of a driving force as we realized that group interactions were likely to be central in almost any imagined future world.

3 Your scenario is 'built' on a consideration of trends that you had identified as relevant. You probably went through a process in which you prioritised some trends over others. Can you give a brief account of how or why your group chose the trends it did?

- It was ridden with 'social' problems. Some members would not accommodate any thinking but their own, and the rest would just get along to keep moving. This was discussed after the session was over.
- I think we were significantly influenced by the example provide that raised collaboration and embodiment as key factors. Personalities will ultimately play a role in which paths to choose but there seemed to be reflection of the research areas of the majority of the group in the aspects settled upon. The main issue was the extent to which we focus upon trends that seem predictable or not predictable.
- Ultimately we went with the "physicality" and "here and now" trends because 1) it wasn't obvious that things would go this direction, 2) it would have such a transformative impact on all aspects of learning and communication, and 3) many of the exciting innovations in technology that are currently occurring (sensors, touch interfaces, wearable computing, etc.) would make this future world possible.

4 Thinking about the ideas about technology in the future that have come up in this workshop, within your group and others.... If you could choose one Research area for the European Commission to fund, which would it be and why?

- machine learning and data miming connected to e-learning.
- Technologies for supporting life-long learning, and the intergenerational collaboration. Technologies that avoid loneliness (especially in elderly). Technologies for promoting entrepreneurship competencies among young and adults for increasing Europe competitiveness.
- Tangible and embodied social communication. I was highly influenced by work at Nottingham looking at the effect of bio-data on enhancing personal leisure experiences and in Brighton on using feedback to identify children's emotional states. I think tools such as facebook highlight how quickly personal information can become shared pervasively. It would be good for research to be ahead of the game and understanding how more tangible and embodied devices can connect with use through bio-metric data and for this to enhance interaction – in the field of education for example.
- Well, obviously I'm biased, but I think a sincere and rigorous research initiative into the effects of tangible and embodied interactions with learning content would serve the EU (and everyone) very well. There is no doubt that these technologies will be ubiquitous in the relatively near future, but there still is not a very good understanding of how these interactions affect learning beyond surface assumptions like 'using your hands can good for learning stuff.' A concerted effort to discover the types

of physical designs that enhance learning and how to scale these experiences up to a large population of learners seems like a very worthy research endeavour.



1.6 Scenario 3: Intrinsic motivation in education

Group 3: Clint Rogers, Jochen Rick, Elizabeth Bagley, Mark Melia

1.6.1 Overview of "Nature-System" World (2025)

Markets crashed, Euro failed, unemployment soared. Social technologies made transparent and visible the truth behind the monetary system and how very few people (1%) benefited at the expense of the many (99%) - and how it actually inhibited people thriving, by keeping them in a fear/survival mentality. Out of the different fluctuations, protests, emerged one idea that took hold - looking at how synergistic and symbiotic nature and natural systems Thrive - and how to create society that follows more these natural systems. Through this focus on nature, everything from housing, to energy, to food, to medicine also focused more on green, organic, nature-based solutions and innovations to modern challenges. Values in this world captured in words like: Transparency, Innovations based on nature, Organic, Sustainable, Understanding and strengthening whole system, intrinsic motivations, Aesthetic experiences, Symbiosis, Synergy.

1.6.2 Overview of Education in this World

Purpose of education in the past: individualism, materialism, and survival "I go to school so I can get a job"--not to figure out what we naturally love doing, and how that synergistically fits with the organic systems. Going to school was to get a job in the past, but when people go to school and don't get a job, the purpose for schooling was questioned, and changed. Additionally, people didn't know what jobs would exist in future, so didn't know how to prepare students for a specific set of jobs.

In looking at natural systems, the discovery/realization was that the best thing each could do was finding out your own nature - what you were naturally, intrinsically drawn to. So education in this world helps facilitate: 1) overview understanding/exploration of how synergistic systems work in nature, 2) discovery of what are each student is naturally drawn to, interested in, good at - how to excel in that (connecting with mentors and resources that can help with that) - and how this passion/intrinsic motivation can fit in and thrive in the overall system(s).

As the systems broke down (economic, energy, profit-motivated ways in which we use resources), people turned to natural systems for answers/opportunities. Focus on education shifted towards understanding nature, complex systems, depth-based (rather than breadth-based) topics based on individual interests. Part of understanding natural systems is understanding what you are naturally good at. Rather than preparing you for a job that might not exist, education helps people discover what they love and what they're best at.

Primary education provides wide exposure to a lot of different things so that kids can see the interconnected nature of the systems and can discover what part of the natural system they are most drawn to. Secondary education allows them to go deeper connect to mentor, resources, etc. on that topic.

1.6.3 Technologies in this world

- Transparency--in the old system, the profit-motivation meant that a lot things were kept private/secret about how the governments/corporations worked
- Big emphasis on having technologies that either discover or mirror, blend-in with nature, and connect with/magnify natural systems (systems in nature that naturally thrive synergistically and/or symbiotically).
- Show/reveal interconnection between parts in a system, as well as options for your optimal role(s) based on helping you discover your nature.

Educational technologies will need to support:

Cultivating an Interest: Since learners are meant to do projects based on that interest, there will need to be technology to help cultivate that interest. There will be systems to help you discover more about your natural abilities and intrinsic interests. For instance, learners could have access to a repository of interlinked videos that cover a wide variety of topics.

Personalized Browsing: There will be a lot of resources available. Learners will need additional support in finding the resources that best engage their interests, backgrounds, goals and abilities. To assist this, the computing ecology will know a bit more about each individual. For instance, a technology could monitor how excited learners are in different areas and then add that to their digital profile.

Providing Rich Resources: In addition to resources increasing in quantity, they will increase in quality. Instead of simply having text about a subject, learners will have access to hypertext, videos, simulations, construction kits, games, 3-D immersive worlds, augment reality, tangibles, etc. That content can also be more tailored to specific user needs (e.g., reading ability of the learner, native language). For instance, these technologies will make it visible and understandable how things are connected in connected systems.

Connecting Learners: As people will be doing projects suited to their individual interests, they may have fewer people in their immediate vicinity to collaborate with. Technologies will be able to connect people around the world based on their interests and relationships that they have to the material. Technologies can also help break down the normal barriers, such as different native languages, that divide us. In addition, technology can help to form local teams, based on competencies and interests, to work together. These systems will help to connect learners to each other, to mentors, to a larger community, and to local resources.

Assessing Learning: As we move towards interdisciplinary learning, where defined subjects disappear, and towards individualized learning, assessment of students will need to change drastically. Software systems need to assess both the strengths of the

learners and what they contribute to a team. As learners are to take charge of their own learning, the assessment needs to provide them feedback on what they are doing well and what they need to improve upon. For instance, the system could show how the learner has improved on contributing to groups.

1.6.4 Story: Pepe's education

Pepe's primary education:

Pepe's teacher brings him, both live and through audio-visual experiences, into hands-on contact with nature and how it works. He went to ocean, mountains, jungles, in simulations and for real - but his favourite fascination was with ants and bees. Through augmented technologies, he could learn such interesting things about each individual bee - how old the bee is, how it communicates with other bees through pheromones and dance to point out where and how far is the pollen, and what its role was in combination with the whole hive. Through tracking technology placed on the bee, he saw the entire path of the bee in one day, what plants it pollinated, and how those plants supported the ecosystem. He couldn't stop talking about them with his mom and dad that night.

Pepe's secondary education:

Pepe's teachers and parents supported this interest as he got older. They matched him up with a local bee keeper, and also he connected in a virtual forum with many bee keepers. He applied and was accepted to be mentored by the top bee keeper in the world, even though he lived in a different country, and could participate in the apprenticeship virtually for a lot of it. In the process, he discovered the molecular structure of honey, and how it was created from pollen. He asked a lot of questions about different types of bees and through a technology responder system was also matched up with a mentor in genetics. He asked questions about why the hive was shaped the way it was, learning about geometrical structures, and even won a contest for designing school and work space based on what he learned from the bees.

Post graduate:

In all the work, he was learning more about not only bees, but chemistry, geometry, genetics, ecosystems, non-verbal communication, life-cycles, and organic-inorganic interactions and symbiosis. He learned more about the plants that attracted the bees, and why. In tracking each bee he identifies alterations that signal led new ways to improve transportation, housing, production, reproduction, pheromones, aviation, and community living. As honey was a scarce resource, he also discovered what strains of bees created the most honey, different flavours of honey, and different types of honey that even had health benefits. In each of these discoveries the technologies helped match him up with people that specialized in housing, transportation, health, and flavour. He began mentoring other young students from around the world (China, Turkey, Peru) - many of whom asked questions that sparked ideas in him that led to new exploration and discoveries.

Table 1 provides an overview of the **goals, technologies** and **assessments that** Pepe experienced at each of the phases of his education.

Table 1: Overview of the goals, technologies and assessments Pepe experienced

	Old world	New world
Primary	<p>You must do this curriculum in this time frame and because it's standardised - we can assess you against your peer.</p> <p>You are an age - that way I can put you in a box</p> <p>Why must you learn this - because the system says so.</p> <p>You learn x but are never shown how x relates to the bigger picture.</p> <p>Essentially you are a cog in the bigger machine - you don't need to know about the bigger machine – your responsibility is to focus and implement your part – in the modern world, Taylorism is alive and well.</p>	<p>Goal: Exposure to breadth of experiences, how natural systems work, are interconnected, and how all the parts contribute to and work with the whole - as well as help them discover what naturally drawn to - in order to cultivate intrinsic motivation</p> <p>Technologies:</p> <p>3D immersive Environment - place in a natural environment - can change and alter system in safe environment - dynamic immersive environment</p> <p>Technology for guides/parents help students expand their interests - help students navigate rich systems</p> <p>Technology that measures students' brain activity during experiences and produces output that can be tracked over time to see changes</p> <p>Assessments: Different styles, processes are recognized and valued by teachers which mean that assessments are individualized and tied to specific time points</p>
Secondary	<p>You REALLY should do science and math cause that's where the jobs are - you do want a job don't you.</p> <p>No/bad job = no love/respect :(</p> <p>Here you go - here is a standardised test - that way we can say where you come in a grouping of learners.</p> <p>At the end the big decision is "What do I want to be when I</p>	<p>Goal: Allow the INDIVIDUAL delve into THEIR interests. Supports the individual and facilitates their learning in providing learning resources and connections.</p> <p>Technologies:</p> <p>Interest inventory software - o/p show our interests during specific activities</p> <p>Flashing labels on forehead - tell the world what you are interested in</p>

	grow up”	<p>Assessments:</p> <p>Assessed by peers</p> <p>Value placed on connections and how those connections are nurtured</p> <p>Value placed on how much you added to discussion around your interest</p> <p>Value placed on getting it wrong and reassessing your conceptions about the world around you</p>
Post graduate	<p><i>“Make me an engineer/doctor/scientist”</i>: the label defines what skills, values, and competencies that person has – the task of education is to make you a highly functional carbon copy.</p>	<p>Goal: Apply and give back/mentor novices</p> <p>Technologies:</p> <p>Systems that connect mentors with students and provide guidance on ways to mentor novices and collaborate based on individual differences and interests</p> <p>Assessments:</p> <p>Ways to value the contributions of novices and mentors</p>

1.6.5 Comments on scenario and on process

1 What were your feelings about the future world in your scenario? Please write a couple of sentences to express the hopes, expectations and/or anxieties you might have if you were an aunt/uncle/parent/grandparent etc. of a child facing this future world.

- At first our future world was bleak, then due to the anxiety that was creating for members of our group, we gave it the kind of positive spin that we think is possible, and is more fun to imagine and create. Parents could feel at peace, anticipating a better future for their children than exists in the world at present.
- I think the future is going to be a very challenging place. In our scenario we highlighted just some of the challenges that must be faced and overcome over the next few years - sovereign debt, lack of resources with a growing world population, global warming. Another challenge is how fast the world is changing - our traditional industrial revolution view of the world no longer holds. A running theme of our future world was that we needed to stay away from specific careers as we are training people for jobs that don't yet exist. We need to train people to train themselves.
- The idea of basing a curriculum pervasively around interest has been around for a long while (e.g., goal-based scenarios, project-based learning, Montessori); however, our current model of schooling is so ingrained that it is very difficult to see how we make the leap. Even if our economies collapse and we are able to completely rebuild the system, it is not clear how we rebuild the system to match today's society, rather than the industrial revolution society that produced this schooling system. So, my biggest anxiety would be that we don't know how to pervasively build such a world.
- I am concerned that there won't be enough caring, thoughtful, well-trained education professionals to help children realize their potential and to cultivate intrinsic motivation in individuals in our future world. I hope that people will value the talents of others instead of try to standardize everyone within a monolithic education system.

2 As you worked, you came up with a variety of ideas, some of which you discarded on your way to building your scenario. Please spend a few minutes listing the ideas you discarded - as many as you can - do this in note form rather than in detail.

- Went through several iterations of the dimensions that would frame the four options of future worlds: e.g. purpose of education (self vs. community oriented), system (trusting it vs. challenging it)
- We considered coming up with a new job - a bee consultant. In the future bee consultant are extremely important as they can figure out how to increase pollination and save crops. The bee consultant is a multidisciplinary role - needs to understand genetics as they will be creating bees to cope with various environmental conditions (the world is a lot more polluted and warmer). A bee consultant also needs to understand international relations as

the EU has broken down, extreme left and right wing governments have taken power and movement between countries is extremely difficult.

- We considered two axis - reinvent systems <-> content with systems and Working for self interest <-> Cohesive society
 - The impetus to get back to nature
 - The need to understand natural systems
 - Dealing with collapsed economies
 - The need for interdisciplinary activities
- We discarded ideas that focused on different versions of teacher training and student assessment. We also discarded ideas about future technology innovations (all listed in our Google document for future reference).

3 Your scenario is 'built' on a consideration of trends that you had identified as relevant. You probably went through a process in which you prioritised some trends over others. Can you give a brief account of how or why your group chose the trends it did?

- I think we all had priority issues, conscious or subconsciously.
- Some issues were discarded as they made members of our group feel anxiety or awkward: some issues were discarded as they were considered too outside the box
 - Trends in order
 - Training will be personalised to personal interest - you can set what you are interested and work towards your own goals
 - Need to train people to train themselves
 - People will need to be skilled in a variety of skills
- We went through a process of stating our different trends, finding common interests, and then putting them on a graph. Once we identified a clear space along that graph, we spent some time talking about how other trends would impact that space.
- We wanted to focus on a positive scenario, and from personal experiences, we decided to focus on building intrinsic motivation using technology enhanced education. We also decided to focus on cultivating systems thinking.

4 Thinking about the ideas about technology in the future that have come up in this workshop, within your group and others.... If you could choose one Research area for the European Commission to fund, which would it be and why?

- Technologies that facilitate more government and financial transparency
- Facilitating personalised learning using the abundant information available to people. Also look at how assessment could work if everyone had their own curriculum. I think we will move away from the standardised test to one that celebrates individuality.
- Focusing on interest in regards to learning: How do we allow learners to discover an interest? How do we foster that interest? How do we allow depth-based work on that interest? A recurring theme in both the participant profiles and the research groups was that the current model of education is ill suited to helping learners discover what they want to do with their lives. One major

problem is that most curriculum is breadth-based. Once you gain any kind of understanding, you move on.

- I would suggest that the European Commission fund research on interdisciplinary education...training teachers to think, teach, and assess in interdisciplinary ways.

3 Commentary

This exercise in scenario generation brought young researchers who between them had considerable breadth of experience in Technology Enhanced Learning, and their work raised questions that other members of STELLAR might not have considered in relation to Technology Enhanced Learning.

Across the scenarios, there is a vision of the future in which the skills that are needed are soft skills; thinking skills that will help people survive in economies in which formal education has declined and in which there is very uneven spread of provision through informal systems. The scenarios articulate the idea that human interaction is important for learning, both for learning how to use the technologies of the time, for learning skills of interacting with one another, and for passing on knowledge about how to survive/thrive. The scenarios inspire us to raise questions of our own. For example, we may ask: at a time of economic downturn, should governments make some kind of planned response to help people develop their resilience to living gloomy times? Should the education system work towards this end? And what place would TEL have in this?

What is particularly clear is that the Young Minds were concerned with rethinking, or repurposing education, asking questions about the future: *what do we teach*, and *for what purpose*?

Scenario generation activities seem to engage people in thinking about the 'purpose of education', a subject which doesn't otherwise come to the fore in STELLAR work; and, of course it was not the purpose for which the Network of Excellence was established. However, it is possible for work in STELLAR to be contextualized in relation to studies that *have* examined potential conceptions of Education in alternative future worlds. Examples of large-scale scenario generation activities include the OECD Schooling for Tomorrow project, and the Futurelab Beyond Current Horizons futures study (www.beyondcurrenthorizons.org.uk) . Both involved scenario building; both invested considerable time and energy in generating sets of assumptions about the purpose of education. Behind both projects is a guiding assumption that it is important to acknowledge that political, social and economic change are large and unpredictable forces that strongly influence what the purpose of education is held to be.

The example set out in table 2 is an illustration of the varieties of possible identity of schools in relation to wider society, amongst which the reader will recognize ideas that are in broad sympathy with some of the thinking seen in the scenarios produced by the Young Minds. The table, and the scenarios that it summarized, were produced by the OECD Centre for Educational Research and Innovation (CERI) - Schooling for Tomorrow project. More information is available from:

http://www.oecd.org/document/15/0,3746,en_21571361_49995565_35773263_1_1_1_1,00.html

Table 2: Outline of Scenarios of possible identify for schools (OECD Schooling for Tomorrow)

<p>BUREAURATIC SYSTEM</p> <p>One scenario depicts schools unaffected by external trends and reforms. They are impervious top-down bureaucracies, closed to outside pressure:</p>	<p>Schools in 'back to the future'</p> <p>This scenario shows schools in powerful, bureaucratic, systems that are resistant to change. Schools continue mostly with 'business as usual', defined by isolated units - schools, classes, teachers - in top-down administrations. The system reacts little to the wider environment, and operates to its own conventions and regulations.</p>
<p>RE – SCHOOLING</p> <p>Two scenarios depict strong, dynamic schools in strong cultures of equity and consensus about their value, following system-wide, root-and-branch reform:</p>	<p>Schools as focused learning organizations</p> <p>In this scenario, schools function as focal learning organisations, revitalised around a knowledge agenda in cultures of experimentation, diversity, and innovation. The system enjoys substantial investment, especially to benefit disadvantaged communities and maintain high teacher working conditions.</p> <hr/> <p>Schools as core social centres</p> <p>In this scenario, the walls around schools come down but they remain strong, sharing responsibilities with other community bodies. Non-formal learning, collective tasks and intergenerational activities are strongly emphasised. High public support ensures quality environments, and teachers enjoy high esteem.</p>
<p>DE-SCHOOLING</p> <p>In these two scenarios schooling moves from formal institutions into more diverse, privatised, and informal arrangements. Schools themselves may even disappear. These changes are demand-driven or result from the growth of alternatives:</p>	<p>The extended market model</p> <p>This scenario depicts a wide extension of market approaches in who provides education, how it is delivered, how choices are made, and resources distributed. Governments withdraw from running schools, pushed by dissatisfaction of "consumers." This future might bring innovation and dynamism, and it might exclusion and inequality.</p> <hr/> <p>Learning networks replacing schools</p> <p>This scenario imagines the disappearance of schools per se, replaced by learning networks operating within a highly developed "network</p>

	society." Networks based on diverse cultural, religious and community interests lead to a multitude of diverse formal, non-formal, and informal learning settings, with intensive use of ICTs.
<p>SYSTEM MELTDOWN</p> <p>The last scenario depicts a crisis with authorities unable to respond to an exodus of teachers, resulting in a breakdown of the system</p>	<p>Teacher exodus and crisis</p> <p>This scenario depicts a meltdown of the school system. It results mainly from a major shortage of teachers triggered by retirement, unsatisfactory working conditions, more attractive job opportunities elsewhere.</p>

We can, at this stage, only speculate as to the nature of new questions for TEL researchers that arise in the course of debate and decision about the purpose of education in the years to come. The following gives two examples of ideas for the framing of future research in TEL both of which were provoked by reading the scenarios generated by the Young Minds:

If technology (as it currently exists within schools and educational institutions) fails to be renewed or updated, becoming obsolete in 5 years; and if teachers and schools as we know them disappear in 10 years time, then might societies suffer from de-skilling? According to this vision of the future, technology should help to empower family and friends respond to the need for peer teaching / learning to coach learners, supplying resources that complement and build on personal heritage and social memory.

This could be the basis of a future iteration of STELLAR's "Orchestrating Learning" and connecting learners frameworks; we might see a move from orchestrating in the classroom to orchestrating in the wild, connecting teachers, family, and friends and enabling them as tutors and teachers.

If, at a time when travelling is not energetically sustainable anymore, people may come to find that they have to resource their lives using what is available locally. This would include education, or the preparation of the younger generation for their own futures.

This could be seen as the future iteration of STELLAR's former "strengthening contexts" framework (interaction between people, away from the computer, but supported and resourced by technology).

Appendices

Appendix 1: Tasks sent to MoYM attendees in advance of meeting

Preparatory task 1: familiarise yourself with Scenarios as a futures tool³

The core assumption underpinning the use of scenarios as a futures tool is that the future can differ greatly from what we know today. Straightforward projections of the future from current circumstances are inadequate and should be replaced with something more complex.

"Qualitative scenarios can have a richness that is not bound by quantitative methods. They can explore relationships and trends for which little or no numerical data is available, including shocks and discontinuities; they can more easily incorporate motivations, values, and behaviour; they can create images that capture the imagination of those for whom they are intended." [COST 2002]

Scenario planning is most widely used as a strategic management tool. It is a process which encourages the exchange of knowledge and the development of mutual deeper understanding of central issues important to the future of an organisation. The process can also be used for enabling other types of group discussion about a common future. The method is based on creating a series of 'different futures' generated from a combination of known factors, such as demographics, with plausible alternative political, economic, social, technical, legal and environmental trends which are key driving forces. The goal is to craft diverging worlds by extrapolating these heavily-influencing driving forces.

Scenarios identify some significant events, main actors and their motivations, and they convey how the world functions. Building and using scenarios can help us explore what the future might look like and the likely changes of living in it: decision makers can use scenarios by asking the key question, 'what do we need to do (now) to be ready for all scenarios?' Thus, scenario planning can inform the formulation of strategies to cope with the maximum number of possibilities.

Example 1: Scenario Planning and Education futures: 'Beyond Current Horizons'

This very readable example is an exploration of the future for education in the UK beyond 2025 (see <http://www.beyondcurrenthorizons.org.uk>). Following an analysis of trends and drivers, three alternative worlds were envisaged. The distinction between the worlds is terms of the social values that might conceivably have developed in a future affected by the demographic, environmental and socio-technical forces identified. Each of the three worlds is described in considerable detail, and then, for each world, two scenarios have been built, of about 800 words in length, describing a way in which education function would function. In each of the

³ The text here is adapted from introductions to Scenario planning by the European Commission resource, FOR-LEARN <http://forlearn.jrc.ec.europa.eu> , and from the resource provided by JISC www.jisc.ac.uk

six scenarios there is a focus on *technology*, and also on *learner identity, curriculum and motivation*.

The Beyond Current Horizons visioning exercise took population ageing, climate warming and energy issues as pre-determined elements of change, and put its focus on socio-technical developments (in which social actors are working to exploit the affordances of technical and scientific developments). The following is a brief (and incomplete) outline of those trends⁴:

- There will be an increased expectation of high levels of detailed information about all elements of the world
- People will get better at working together at a distance
- There will be increased expectations of the capacity to connect to a network/personal technologies and decentralisation of technology systems
- People will become increasingly accustomed to machines taking on more roles previously occupied by humans
- Location and geography will become increasingly important in terms of constraints and opportunities
- Neuroscience, bioscience and computer science will continue to be perceived as providers of 'solutions' as will the potential for drugs that enhance cognitive functioning.

Example 2: Scenario Planning and Education futures: JISC infoNet

JISC provides a detailed description of a slightly simpler version of scenario planning, one that appears to be more frequently used by business organisations. In this version, four alternative worlds are envisaged, based on the driving forces which are considered to lie behind trends. For each force, an opposing force is determined, arriving at pairs (driving force plus opposing force). Two pairs are chosen, treated as axes, separating out four global perspectives or 'worlds'. The diagram below illustrates this for an exercise considering the future of IT in Higher education. Here, the pairs of driving/opposing forces considered most important were 'globalisation versus regionalisation' and 'individualisation versus social integration'. The alternative 'worlds' were termed 'strong Europe', 'regional communities', 'global market' and 'transatlantic market'. Detailed information about the trends, drivers and scenarios for this exercise are available from <http://www.jiscinfonet.ac.uk/tools/scenario-planning>

⁴ The full list appears on pp203-4 of the Beyond Current Horizons final report: <http://www.beyondcurrenthorizons.org.uk/outcomes/reports/final-report-2009/>

Scenario Quadrants



In another example, drawn up in 2004 as a vision for e-learning in 2014, the forces considered most important were 'acceptance and adoption of technology in society' (for which the pairs were empowered vs. frustrated) and 'sources of power, influence and new ideas' (for which the pairs were establishment vs. emergent). The four global perspectives (worlds) are characterised as 'virtually vanilla', 'web of confidence' 'back to the future' and 'you choose', and a set of scenarios developed for e-learning within those four worlds.

Preparatory task 2: identify a set of trends and driving forces

You will be able to find good sources of information and descriptors on the web to inspire your own list of trends and driving forces, which should include **Social, Technological, Economic, Environmental, Ecological, Political** and **Value-based** issues. In addition to the trends identified by Beyond Current Horizons and the examples available from JISC you may find the following useful/interesting:

- [Trends Shaping Education 2010](#), produced by the OECD Centre for Educational Research and Innovation (CERI)
- The GLIMPSES database (see Free Stuff at www.trajectorypartnership.com) which collates trends on Globalisation, Lifestyles and consumer behaviour, Identity and values, Media and technology, Politics and government, Socio-demographics, Economy and employment and Sustainability. For each area, forecasts and implications are explored as well as trends. (note: database is free, but passwords are issued by administration, so expect to wait 1 day)
- If you become interested in futures thinking, you may like to look at the work of the iKnow project <http://community.iknowfutures.eu/pg/file/popper/view/11841/iknow-policy-alerts-2011>. The focus of this project is on *Wild Cards* – situations/events) with perceived low probability of occurrence but potentially high impact if they were to occur (for example, a tsunami). Trends, drivers and Scenarios are regarded as *Weak Signals* – observables warning about the probability of future events.

Anticipated output from MoYM workshop

The output of the workshop is expected to be similar in form to that in the attached document, named From Drivers to Scenarios⁵. As is clear from this document, the write-up from each group should consist of four sections:

- As well as the final scenario, which is brief and in narrative form,
- the 'workings' are included, i.e. the output from brainstorming and discussions, probably in the form of lists and notes. The lists and notes you make will fall under three headings: (1) the imagined 'world' in which the scenario is built; (2) expectations and systems for education within that world, and (3) how technology might be used with respect to education in that world
- After writing the scenarios, each group will be asked to finish by revisiting the notes they drew up during their discussion of the imagined world ((1) above) and writing a narrative description of that 'world'. This narrative will give a clear description of the assumptions that have guided the development of the scenario.

When you read the document From Drivers to Scenarios, which gives an example of a plausible world, education within that world, technology within education, and a scenario, please bear in mind that the scenario workshop in which it was produced was of considerably longer duration than the Meeting of Young Minds. So, we will not be expecting participants to produce documents that are quite as long as the example!

⁵ This document provided a summary of an example of scenario generation taken from the JISC website see <http://www.jiscinfonet.ac.uk/tools/scenario-planning/scenario-sets>

Appendix 3: Trends sent by attendees in advance of MoYM

Lists of trends were submitted by nine participants: Davinia Hernandez-Leo, Robb Lindgren, Andrew Manches, Elizabeth Bagley, Clint Rogers, Mark Melia, Jeff Rick, Lyndsay Grant, and Maurice Hendrix. They appear here as categorised by Sarah Eagle during the evening before the meeting. There were further trends, labelled “as yet uncategorized” and not included in this document.

Technological trends

Technological recognition and adaptation to human emotion

Rise in gesture recognition embedded in everyday devices

Larger *multi-touch devices*, such as tablets and tabletops, enable multiple concurrent inputs from multiple users

The way we interface with technology will become increasingly physical and spatial; using gestures, touch, and other embodied interactions with computers will begin to displace keyboard and mouse controls

Internet of the things Objects can sense the environment and communicate, they become powerful tools for understanding complexity and responding to it effectively

Increased support for object tracking and wireless communication

- Increase of Mobile device proliferation
- Further reach of Wireless
- Increase of Connection (in almost all areas of the world)
- Better 3D technologies
- technologies for Augmented reality
- even more global video games, and gaming focus
- Embedded chips (for identity, banking, etc)

“The long tail” theory ... The way forward is to design high quality (software, goods) for a small numbers of users and then facilitate uptake by other consumers, rather than to produce one.size.fits.all goods

Increase in location based social networking / fostered by commercial potential

Image based processing allowing real time identification and information search on people and places

Environmental trends

Green ict becomes a more mainstream issue .. Is the cloud part of the problem or part of the solution

Fair trade ict comes on the agenda

Outdoor experiences: (environmental, values) Lack of opportunities to engage with the natural world in structured and/or unstructured ways, which could lead to weaker connections and affiliations to the environment and lead to fewer people

environmentally aware and active. One solution to consider might be virtual environmental education

Political trends

Greater adoption of Internet to poll public opinion (mock referendum on major issues)

Global concern over decreased population rates

Dramatic defence funding moves to cyber terrorism

Cyber terrorism used as a means for government involvement in public virtual spaces

Rise of the celebrity politician

Social trends

Systems thinking: (environmental, economic, political) Given the complexity of the challenges in today's society, students need opportunities to develop systems thinking. Technology can provide students with access to complex interconnections at appropriately scaffolded levels.

Connecting education to society: (technological, economic, political) Technology enhanced learning can be utilized to empower students to become civically involved in local, regional, national, and global causes.

- International connectivity
- Language learning & translation
- Intercultural/interfaith clashes and solutions
- Sex/Entertainment/Marriage
- Spiritual searching & Intentional communities

International carbon credit scheme enforced

Green" Natural movement - at odds with techno pollution (and alternatives to oil energy)

Increased demand for natural disaster warning systems

Acceptance of nuclear energy

Trends in Values

A tension between the way people see themselves... As individuals or as members of groups (-age, class, ethnicity, nationality)

Alternatives to nation states, and rise of more "Intentional communities"

Increase in privacy becoming an asset to gain access to technologies

Anti-Capitalist revolution leads to transparency in social value of jobs

Acceptance of virtual promiscuity within real life monogamy

Trends specific to education

A shift to Group thinking, or renewed emphasis on collaboration...

- The unit of analysis for understanding how people learn with technology will shift more towards the “group” or the “team” rather than the individual as a reflection of the increasingly collaborative nature of our work.
- *Collaborative intelligence and social networking:* (technological, values, social) Young people are learning in peer-driven groups. The Internet provides new kinds of public spaces for youth to interact and receive feedback from one another. Young people respect each other’s authority online and are more motivated to learn from each other than from adults.
- *Active knowledge making:* (technological) Digital media allow a style of learning that is less about consuming knowledge and more about interaction and participation.

...Versus an adherence to the idea that cognition is an individual activity

(mind is equated with brain, thinking as a mechanistic activity)

- Increase in local spaces to allow individuals to work remotely in a community
- Accepted use of cognitive neuro-enhancers

Perceived relevance of education at time of economic downturn

Economic crisis – the current economic crisis means that education is becoming more expensive, students will want more ‘value for money’ so the degrees that lead to jobs more easily are set to do better. Retirement ages are going up. All this in contradiction to trends that have happened of the past years. This may or may not be temporary, How do we support students in these uncertain times?

Youth unemployment – an issue through Europe: The BBC news announced last Friday that now the number of 18-24yr olds ‘not in education or work’ has reached 1 million, meaning that 1 in 5 is unemployed, calling it a ‘lost generation’. Some people choose further study because they are unable to find work. Unlike in previous times, where the lowly educated have struggled to find jobs, it is also recent grads who struggle to find work without experience. How do we support current students in building the best possible profile? Will the trend led to a group of people choosing to delay studying or study while working? How can we support students who may have a career or family better?

Value of formal (degree) education being questioned - Rising cost of studying coupled with recent grads finding it hard to find work has made the media question the value of education in the first place. Recent grads accepting lower level jobs, further devalues the worth of a degree. There are increasing news reports of bright kids choosing not to go to university, but to take a job or traineeship and try & work their way up.

Tension between knowledge economy and renewed valuing of manufacturing skills: the trend has been moving towards a knowledge based service economy. However more recently, at least in the UK, there is somewhat of a revival of more traditional industries such as engineering and manufacturing. These sectors are now actually facing difficulties finding quality employees, mainly because of the trend towards services has meant that few students have undertaken education and training for the more traditional areas of the economy. How do we better support students in making

a realistic assessment of future prospects? Is there anything TEL can do taking into account that it involves predicting the future?

Changes in Assessment

- Despite an expansion of the ways people can learn as a result of new technologies, the need to quantify what and how well people are learning will persist. New metrics and measures of learning that use the abundance of data that can be collected from a TEL experience will be needed.
- Move to electronic rank order assessment using data generated in virtual immersion project based activities
- New assessment approaches: Iterative learning assisted by ongoing, structured feedback from peers and teachers used daily to diagnose and dynamically adapt teaching. That approach challenges the traditional roles of teachers and students and requires time and support.

Expectations for informal learning

Demands on schools will increase and their resources will decrease, putting new pressures and expectations on more informal ways of educating students such as museums, clubs, and the family.

Increased commercialization of learning

Aggressive commercialization of digital learning tools for young children (including babies)

Gaming

People will continue to look to video games as a benchmark for what could and sometimes should be available in TEL. The need to bring game designers and educators together will become more and more pressing.

Multimodality and changes in literacy

Multimodal media readily available from plain text to hypertext, diagrams, movies, and applications (e.g., interactive simulations, modelling environments).

Multimodal expression: (technological, values, social) Giving students the ability to represent their knowledge and ideas using the latest new media tools

Appendix 4: Feedback from participants following MoYM

Please briefly comment on the experience of working on this open-ended, creative task, and how you felt you gained from it. If you were running a similar event for academics, what conditions would you hope to provide to facilitate informal, relaxed collaborative work?

- Enjoyed it a great deal.
- Enjoyed the process and the people very much.
- For the limited time we had, I think the resulting relaxed collaboration was quite successful.
- A whirlwind experience. I found it thoroughly enjoyable but I have to say I was apprehensive at the start. I think it was a bit rushed - more time on the task would have helped. I know it was part of the task for it to be open ended but some parameters would have helped. I think we were at a place where our imaginations went all out - perhaps a bit more time would have allowed us to get to more practical targeted future cases - perhaps not, maybe that's the point?
- It was nice to think different. In general, TEL research is confined to small / evolutionary concerns. Given my limited research funds, what can I do? What gains can I show with a study? What can I get funded? From whom, with what compromises? In this meeting, we got to think about large-scale / revolutionary concerns. How would we rebuild education to match today's society? What if this was pervasively implemented? That said, we have to do research in the former world, so it is not easy to see how the ideas we generated impact our current or near-future research. If I was running it, I would concentrate more on identifying what trends are important in the near-term future. There were many trends that were brought up in the meeting that were not well argued and which I didn't agree with. It seems a bit unproductive to build on those. That said, it was still an interesting experience. Concentrating on trends would just be something that I would find more useful in moving the agenda of TEL forward. STELLAR has the grand challenge model. An alternative that I would find useful would be to identify important trends and ask researchers to address these trends.
- I think the informal introductions were a very good idea. Probably a short attached bio would have also helped

I liked very much the methodology and was impressed about the productivity achieved. Open-ended creative tasks are typically risky in terms of outputs. On Tuesday I felt I was out of Barcelona for a week! (vs. a day!) The meeting was very intense, but at the same time relaxed! If I were running a similar event, I would try to facilitate similar conditions.

I gained many things, but I would emphasize the thoughtful discussions with the members of my group, meeting the whole group of very special young minds with different visions and profiles, and the methodology and perspective of Stellar

- I really enjoyed the conversations with my group and found the process of imagining a scenario in a near-future world worked well to bring us together

despite our different cultural and disciplinary backgrounds, drawing on our 'personal' experience as much as any 'professional' expertise. It enabled me to see things from others' points of view in a way that would have been more difficult in a more professionally bounded context. However, I also think our group was perhaps more similar in outlook than some others may have been. It's difficult to comment on the 'validity' of our world and scenario - the narrative drive and desire to have some kind of ending sometimes took us away from the key variables - e.g. technology arrives as a 'saviour' to the social/economic situation in a way I did not think was very likely in the world we had imagined but this had narrative satisfaction. We had very little time to interrogate the particular trends and think through their consequences. The relatively near-term future, limited opportunity to explore where particular trends/drivers were taking us, and the focus on only one world meant that in essence we projected forwards from our present concerns rather than thinking how things could be different or more unexpected. On reflection, *I think that making several worlds might have been interesting* as it would have provoked discussions about how worlds might have been different from each other and defining worlds against each other.

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- With 'academics' (though I'm not sure we weren't in that category ourselves) I think it will be important to get people into the imagining and story-telling mode quite quickly, rather than attempting to elicit an 'expert view' about the likelihood of particular futures. A two-phase workshop with a clear separation between them might work - one in which serious thought is given to possible trends that may emerge (and distinguishing between possible and probable trends - i.e. so that it is not a business of predicting the future with accuracy) and one that is more imaginative where the worlds are described and scenarios realised. I don't think we would have been able to maintain the energy as a group for a lot longer than this recent workshop however.
- I was very surprised with the task in a good way. Before coming I was sceptical of the approach, and the predictions it was going to generate. I was sceptical in general about predictions, although that may be mainly due to the media coverage of predictions.
- I learnt how the method worked and I can see that it can generate some useful possible scenarios that can be useful to prepare for at least the expected parts of the future. (And prevent cases where one can question why we weren't prepared for the snow this year which was just a bit more than last year :))
- I also gained a lot from discussing issues with the others in an informal setting and it turned out to be a lot of fun.
-
- Sarah did an amazing job at keeping the atmosphere relaxed and informal, yet keep us engaged. In really informal settings, often there is a tendency to switch off and go and read emails on the laptop or something
- The introductions certainly helped to break the ice between people even before we got to Leuven, and I felt that the preparation task also helped a lot, as we had some idea of what was expected of us.

- Even though it's a bit odd at a TEL event to ask people not to use their laptops initially it worked. Until we had to produce a written document upon which we decided to divide the rough scenario and let different people write up different things. We did start reading and adding to each others parts, but I don't think we could have done that straight away.
- Perhaps the informal scribbled overview on sheets of paper is much more important than I realised.
- This was a great experience, could be facilitated with a bit less of technology and a bit more of colourful hands on tools (post it notes, diagrams etc). It was a pleasure to work with you guys.
 - Longer time, smaller groups, a whiteboard.
 - I really appreciated the format of the session. We had difficulties to start sharing ideas in the first minutes, but everything started to flow one hour later.
 - Given time constraints, the workshop was led fantastically. I perhaps would have place more onus on people identifying trends before and for some form of formal process to identify the most significant / less predictable as per future scenario planning tools.

If there had been more time, it would have been lovely to have more opportunity to comment / reflect upon the scenarios presented at the end.

- I would really appreciate to have more time at the end of the other group presentations for a peer review process of the other group ideas, and a more systematic sharing of each of the scenarios produced by the groups.

Overall I thought this was a very good experience. The conversations within our group were lively and provocative, and I think we ultimately came up with a pretty good scenario. It was challenging, however, given how different our perspectives were. It's not that we really disagreed that much, but we were all interested in different parts of a very large problem. This made writing things down in a coherent way that represented the whole group a bit challenging. Nonetheless it was certainly a good way to get a lot of creative ideas on the table. I would definitely consider participating, and perhaps running, and event like this in the future.



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