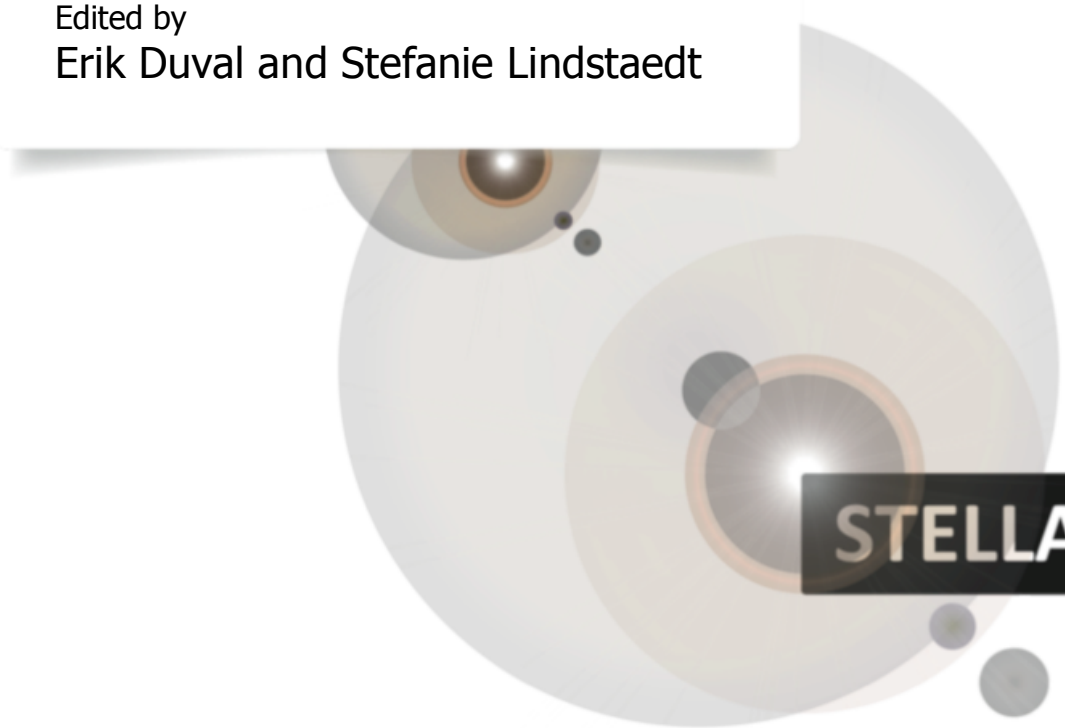
# D2.2A

## Annex: Evaluation of the 2nd Meeting of Minds

Edited by
Erik Duval and Stefanie Lindstaedt



SEVENTH FRAMEWORK PROGRAMME

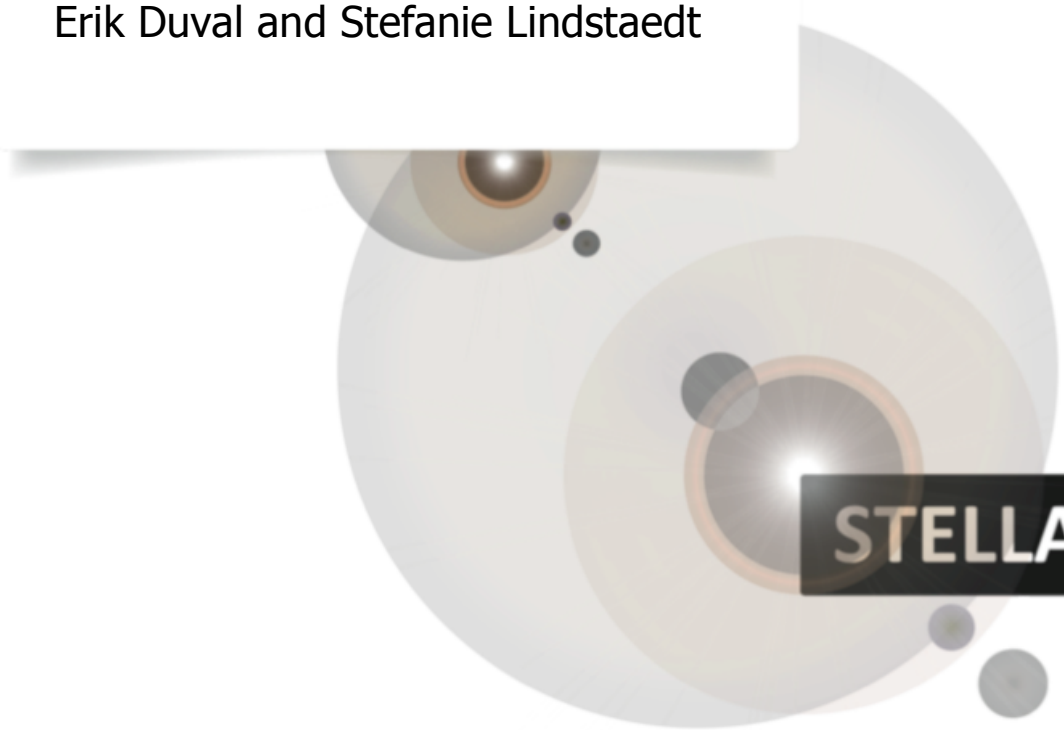
STELLAR

# D2.3

# Evaluation of the 2nd Meeting of Minds

DRAFT

Edited by
Erik Duval and Stefanie Lindstaedt



SEVENTH FRAMEWORK PROGRAMME

STELLAR

# Amendment History

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| | | | Moved section with reflections from WP's after outcomes. |
| | | | Added introduction to section on Outcomes. |
| 15 June 2011 | 0.3 | Stefanie Lindstaedt | Added input from Florian Schultz-Pernice (Scenario) and Denis Gillet (WP4 perspective + annex scenarios from summer school), reworked section on WP6 perspective, reworked meeting minutes of day 1 |
| 20 June 2011 | 0.4 | Erik Duval | Added input from Stefania Aceto (WP5 perspective). Removed pictures of whiteboard for Sweetskills session. |
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| | | | Reworked participants section, added explanation on background of external participants. |
| | | | Removed agenda from section 1, integrated it in section 2. |
| | | | Reworked section 2: condensed and added scenarios submitted before the meeting in appendix. Moved details of some of the sessions to appendix. |
| | | | Fixed smaller issues in other sections and removed names of people who contributed specific sections. |
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| | | | relationship to grand challenge problems (from ARDV) |
| | | | relationship to areas of tension (from Delphi Study) |
| | | | relationship to core research areas (from Delphi Study). |
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| | | | Reworked section 3.4, as provided by Florian Schultz-Pernice. |
| | | | Added executive summary placeholder, as suggested by Stefanie Lindstaedt and Peter Kraker. |
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| 1 September 2011 | 1.0a3 | Erik Duval | Addressed comments from Gerhard Fischer. Editorial comments throughout. Added executive summary. |
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WP2 | D2.3

# Evaluation of the 2nd Meeting of Minds

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# 1 Executive Summary

This deliverable presents the main outcomes of the Meeting of the Minds 2 (MoM2), which took place from 24 to 26 May 2011, in Semmering, Austria.

The focus of this meeting was on building scenarios of how learning could take place in the future – say around 2020.

Work on the development of such scenarios is presented in detail in Section 4 of this report.

For the scenarios, we considered the following contexts:

- School learning,
- Higher education,
- Workplace learning,
- Lifelong learning.

We also considered more horizontal aspects, related to deep learning.

The report explicitly addresses how the MoM2 scenarios are relevant to the Grand Challenge Problems, the outcomes of the Alpine Rendez-Vous meeting and the different STELLAR work packages.

An additional concrete result of the MoM2 meeting is a series of podcast recordings with each of the external meeting participants. These recordings will be released in the STELLAR podcast series.

# 2 Practicalities

## 2.1 Participants

The external participants to MoM2, invited from outside the consortium, are listed in Table 2, which also lists the main area of expertise and experience for these participants (corporate, policy, formal education or lifelong learning).

Please note that:

- As illustrated by Table 1, we reinforced the participation of policy level and corporate training oriented participants – in line with the strategic nature of the discussions and the recommendations made in the March 2011 STELLAR review. The internal STELLAR participants adequately cover formal education and lifelong learning and represent all work packages active in STELLAR (see also Table 2).

- Other Advisory Board members were not available for a face-to-face meeting in May 2011. We had already been forced to re-organize MoM1 as a virtual meeting due to the volcano eruption, so we decided against virtual participation this time, in order to stay close to the original idea of a retreat like setting.

The internal participants, from within the STELLAR consortium are listed in Table 2, which also indicates who acted as the main liaison person for which WP in the meeting.

| Name | Affiliation | Country | URL | Corporate | Policy | Formal Education | Lifelong Learning |
|---|---|---|---|---|---|---|---|
| Gerhard Fischer | Center for LifeLong Learning and Design (L3D), University of Colorado | USA | http://l3d.cs.colorado.edu/~gerhard/ | | | | X |
| Allison Littlejohn | Chair of Learning Technology, Glasgow Caledonian University | UK | www.academy.gcal.ac.uk/people/littlejohn.html | X | | | |
| Lisa Petrides | President, Institute for the Study of Knowledge Management in Education (ISKME) | USA | http://www.iskme.org/ | | | X | |
| John Alonso | Founder-CTO, Outstart | USA | http://www.outstart.com/about-us-bod.htm | X | | | |
| Pascal Lardeux | Corporate Human Resources, Nestle | CH | http://www.linkedin.com/pub/pascal-lardeux/4/36a/792 | X | | | |
| Michelle Selinger | Education Director, CISCO | UK | http://www.linkedin.com/pub/michelle-selinger/1/738/97 | X | | | |
| Florian Schultz-Pernice | Lehrstuhl für Empirische Pädagogik und Pädagogische Psychologie, Ludwig Maximilians-Universitat Munchen | D | http://www.psy.uni-muenchen.de/ffp_en/persons/ag-fischer/schultz-pernice_flo/index.html | | X | | |
| Ayleen Driver | ICT Strategic Manager, Bristol Local Authority | UK | | | X | | |
| Elisavet Linou | Special advisor to the Greek Prime Minister | GR | | | X | | |

**Table 1: Participants from outside the STELLAR consortium**

| Name | Affiliation | Main WP liaison |
|---|---|---|
| Peter Scott | OUUK | |
| Fridolin Wild | OUUK | |
| Lena Hofmann | LMU | |
| Ros Sutherland | UB | 1 |
| Christian Voigt | ZSI | 7 |
| Denis Gillet | EPFL | 4 |
| Erik Duval | KUL | 2 |
| Rosa-Maria Bottina | ITD | 3 |
| Peter Van Rosmalen | OUNL | |
| Stefanie Lindstaedt | KNOW | 6 |
| Peter Kraker | KNOW | |
| Stefania Aceto | SCIENTER | 5 |
| Hans Spada | ALU-FR | |

**Table 2: Internal stellar participants**

## 2.2 Goal of the meeting

Per the Description of Work:

> These meetings will be organized as retreats in a somewhat private setting: **the main goal is to enable a candid conversation between STELLAR and relevant experts, so as to help steer the strategic direction of the work undertaken in STELLAR**. The intent of this Meeting of Minds is to promote an intense discussion to help clarify the relevance of the major research themes supported by STELLAR, with the overall purpose of working towards the Grand Challenge. The retreat will be organised around presentations by advisory panel members, dialogue between participants, synthesis, lessons learned and plans for the next Meeting of Minds.

## 2.3 Outcomes

The intended outcomes of the meeting were:

- Podcast recording:
  - The goal was to record one interview with each external participant at the meeting. This goal was achieved. The recordings are now being processed and will be disseminated through the STELLAR podcast infrastructure.

- The main substantive sections of this report are
  - Minutes of the meeting sessions: see section 3 for a global picture and the appendix in section 6.4 for more details;
  - Future scenarios developed at the meeting: see section 4 and the appendix in section 6.3;
  - Analysis of the outcomes: see section 4 and section 5
    - This section includes an analysis of how the scenarios relate to STELLAR Grand Challenge themes and Grand Challenge Problems: the group that defined the scenario on deep learning for schools (section 0) related their thinking to the original three STELLAR Grand Challenges and added an additional such challenge on “constructing knowledge”. The other break-out groups related their scenarios to the Grand Challenge Problems developed at the Alpine Rendez-Vous (see also section 6.1).
    - Reflections from the perspective of the STELLAR work packages on the relevance of the MoM2 outcomes are presented in section 5.

# 3 Minutes

## 3.1 Introduction

In this section, we document how the meeting actually took place. Details for some of the sessions can be found in appendix 6.3.

## 3.2 Before the meeting

All participants were asked to sketch a future learning scenario in 1 page before the meeting. Grand Challenge Problems prepared at the Alpine Rendez-Vous were sent out to all the participants beforehand so as to brief them about the current state of thinking in STELLAR.
The scenarios we received are included in section 6.3.

## 3.3 General Introduction

The goal of the first session was to establish a common understanding of whom the participants are and what we try to achieve in MoM2. Therefore, all participants introduced themselves briefly. Stefanie Lindstaedt presented a brief overview of the MoM2 goals and agenda.

## 3.4 Discussion of earlier STELLAR work

The goal of this session was to make all participants aware of relevant work already undertaken in STELLAR and in preparation of MoM2 by the participants themselves.
The following subsections cover what was presented in this part of the meeting.

### 3.4.1 The Stellar NoE

A short introduction by Peter Scott of the STELLAR NoE, its objectives and activities opened the floor for all participants. This information was especially important for external participants which had not participated in any STELLAR events before.

### 3.4.2 Alpine Rendez-Vous

In order to jump start the discussion, Lena Hofmann presented eight GCP's identified during the Alpine-Rendez-Vous 2011 workshops. A lively discussion ensued after Lena's presentation.
See section 6.4.1 for more details.

### 3.4.3 Stakeholder perspective

Stefania Aceto gave a short introduction on Stakeholder interests from a WP5 perspective. This presentation was again followed by an active discussion. See section 6.4.2 for more details

## 3.5 Future scenario development

The development of scenarios on future learning was the core of MoM2. After an initial recap of the idea and goal, we divided in four groups for most of Tuesday afternoon. Each group focused on one specific context:

- Group 1: lifelong learning
- Group 2: professional learning
- Group 3: formal education
- Group 4: higher education

On Wednesday morning, discussion focused on the development of Grand Challenge Problems, starting from the results of the Delphi study, using a group Delphi technique, where short "plenary" sessions alternate with work in small groups.
In the afternoon, the groups reconvened to develop in more detail the scenarios. Each group was asked to develop

- A slogan or tag line to describe the scenario
- The actual scenario, preferably as concrete as possible
- The research questions that would need to be addressed in order to make the envisioned scenario a reality
- Metrics that would help to assess whether progress is made towards actually making the scenario possible.

More details on the outcomes of the different groups are presented in section 4.

### 3.6 Consolidation, evaluation and follow-up

The goal of this session was to consolidate results from the meeting, plan concrete follow-up activities and evaluate the meeting itself.
Details of this session can be found in section 6.4.3.

# 4 Future scenarios

## 4.1 Introduction

The MoM2 meeting focused on the development of future learning scenarios. More specifically, the aim was to develop:

1. scenarios of how learning could take place in the future,
2. a caption or slogan to capture the essence of the scenario (like ‘one laptop per child’ or ‘no child left behind’ or ‘one tutor per learner’),
3. research questions that would need to be addressed in order to turn the scenario into reality,
4. means to assess progress addressing the research questions and realizing the scenarios.

The focus on these four aspects helps STELLAR in general and WP1 in particular, to make progress on the definition of Grand Challenge Problems: indeed, the slogan mentioned above could be the label of a GCP. The scenario illustrates the impact that solving a GCP could have on how people will learn in the future. The research questions elaborate the research work to be done in order to solve the GCP. In order to make the make scenarios and research challenges more concrete, we also discussed how progress on addressing the corresponding GCP can be assessed.

This focus took into account the feedback from the March 2011 project review, which asked us to “elaborate alternative futures scenarios focused on various areas of tensions and stakeholder concerns".

The following subsections present in some detail the progress achieved with the development of future learning scenarios in particular contexts. As such, they represent the main outcomes realized at the meeting.

## 4.2 Schools: Transforming Teachers and Students into Learners by 2020[1]

### 4.2.1 Scenario

The general objective in this scenario is to transform schools into an open and agile educational framework, focusing on the development of life skills and core knowledge through deep personal experience in networks in a transparent way, i.e. by making achievement public and by developing the culture of sharing resources and competences. The key terms are defined below:

- Core knowledge (to be a citizen, to function in society, to be able to make choices): Arts, Sciences and Humanities.
- Life skills:
    - *Personal*: self esteem, self management, self discipline, self evaluation, meta cognition, prioritization, critical thinking, etc.;
    - *Social*: Communication, teamwork, collective knowledge building, etc.;
    - *Informational*: ability to engage with resources, digital literacy, synthesize, information problem solving, exploit networks, etc.
- Deep experience: It is an experience that
    - can affect student self-esteem, perception of his/her own self-efficacy;
    - can influence student motivation and involvement, and
    - can influence student's learning quality perception.

  The belief is that if a student can develop a number of such experiences during his/her school life, these experiences can deeply influence his/her learning behavior (choices, self direction, learning to learn, learning to go deep, focus on processes, co-construction, building on the existing, agile role distribution, ...).
- Open system (networks, human resources and technological resources to support deep experience)

In such a framework, the roles and activities of the students and teachers have to be redefined. The following short scenario gives an example of the implementation of the above objective.

[1] This scenario builds on the scenarios by Lena Hofmann, Elisavet Linou, Denis Gillet, Rosy Bottino, and Florian Schultz-Pernice (see appendix 6.2)

A middle school classroom is learning history in Athens, Greece. Students are sitting either in groups, or alone, creating content to share with students around Athens and around the world on Greek history. They have used their individual iPads to download (or create) an app that will link stories and comments to GPS locations around Athens. [In a previous class, they walked around the city, selecting locations they wanted to learn more about.] Communities of students grow around individual locations that are most interesting to different students (foursquare style). Students can "like" a location and upload comments or historical references, record and upload oral history accounts from the community around the site. They can also develop videos and art to share with other students. Teachers can provide texts, or background reading, and students can "read along" with other students on texts that teachers upload. Teachers can use an open platform to crowdsource history questions or challenges for students that relate to a given historical site. The goal is to show overlapping periods of history in ways that put student experience and representation first. Students learn that various interpretations of history can co-exist. At the same time, teacher curricula are built around various perspectives, in many media forms. Material is shared between students, schools, and amongst teachers in open platforms.

### 4.2.2 Research Questions

- How to define life skills?
- How to select core knowledge?
- How to support management structures?
- How to assess outcomes of such deep learning experiences?
- How to explore and exploit diversity, complexity, etc?
- How to develop incentive schemes for teachers?
- How to evaluate the impact of networks on learning processes?
- How to develop a digital media literacy which is concept-based and not notion/skills-based?
- How to value and acknowledge the many activities related to learning and education that take place outside the walls of the classroom?
- How can technology modify our way of thinking and learning?

### 4.2.3 Success Criteria

- The definition of success criteria in such a new open and agile framework is a research question in itself. The focus should be on the acquisition of life skills.
- Map of core knowledge chosen
- Such an approach also includes new kinds of risks:
    - it may be difficult to scale up deep learning experiences;
    - such an approach requires a level of dedication that may be difficult to elicit and sustain;
    - there may be a lack of human resources to realize such a scenario.

### 4.2.4 Relationship with Grand Challenges

| Grand challenge | Rel. | Rationale |
|---|---|---|

| | | |
|---|---|---|
| *Connecting learners*: The scenario is about connecting learners, considering that teachers are also learners. It is about establishing learning groups and communities that spread outside the class and the school walls (as well as outside the traditional roles that can be seen as psychological walls) | Yes | Teachers are currently not connected enough and learners are not encouraged to exploit resources outside the class walls |
| *Orchestrating learning*: Because of the refocus in terms of learning objectives and roles in the proposed scenario, the entire school setting and processes have to be re-orchestrated | Yes | Enabling orchestration of learning relies on new regulation, processes and change management. |
| *Contextualizing learning*: This scenario focuses on better exploiting knowledge, competences and resources including people outside the schools' walls. As such, the learning context has to be redefined and integrates environments and platforms of various natures. Supporting new learning processes also relies on supporting continuity of interaction between contexts and environments (real and virtual). | Yes | The class cannot be considered anymore as the main learning context |
| This group added a fourth Grand Challenge aspect on *Constructing knowledge*: Deep experience is about defining his/her own objective, selecting the relevant artifacts and constructing personalized resources and networks. | Yes | The world becomes the school library and the office-hour room. |

### 4.2.5 Relationship with areas of tension

| Area of tension | Rel. | Rationale |
|---|---|---|
| Data tracking for personalized learning versus data privacy | Yes | The idea of sharing resources and competences is at the center of the proposed scenario |
| Digital divide despite technology spread | Yes | The schools as described in the proposed scenario should be THE place where digital divide should be tackled (and reduced) |
| Ubiquitous learning opportunities versus focused and critical processing of information | Yes | The interplay between core and life skills acquisition required a mix of ubiquitous learning opportunities and critical thinking. |
| Established practices versus continuous innovation in the classroom | Yes | The scenario is about supporting the necessary changes, not only to bring innovation in schools, but also to enforce learning for both learners and teachers. |
| Individual learning paths versus standardized learning paths | Yes | The scenario enforces personalization (resources, environments, and paths), not only for individuals (learners and teachers), but also for teams. |

### 4.2.6 Relationship with core research areas

| Core research areas | Rel. | Rationale |
|---|---|---|
| Computer-Supported Collaborative Learning | Yes | The scenario does involve collaborative activity and teamwork |
| Connection between formal and informal learning | Yes | The scenario does involve connection between formal and informal learning |
| Contextualized Learning | Yes | The scenario does involve virtual and real learning contexts and environments |
| Emotional and Motivational Aspects of TEL | Yes | In addition to enforcing life and core skills acquisition, the proposed scenario should have a positive impact on motivation (as the learners will have some control) |
| Improving Practices of Formal Education | Yes | Improving Practices of Formal Education is at the center of the propose scenario |

| | | |
|---|---|---|
| Informal learning | Yes | In the proposed scenario, external stakeholders play a key role, especially through informal interactions supporting learning (parents, peers, higher education students, …) |
| Interoperability | Yes | The scenario relies on resources from the cloud. Interoperability is required to make the usage of such resources effective. |
| Personalization of Learning | Yes | The scenario enforces personalization, not only for individuals (learners and teachers), but also for teams. |
| Reducing the Digital Divide | Yes | See the related area of tension |
| Ubiquitous and Mobile Technology and Learning | Yes | Learners and teachers are expected to use all the resources, environments and interaction devices available in the proposed scenario. |
| Workplace Learning | No | This scenario addresses schools |

## 4.3 Higher education

### 4.3.1 Assumptions

The Internet is 15 years old and has changed banking, travel, and communications, but has left 'The University' relatively unchanged. And yet, most of our world cannot afford higher education as it is framed in Universities; and even where the price is paid, 'education debt' is mounting unacceptably. The higher education Enriched Learning Landscape challenge focused upon the concept of a more 'disaggregated higher learning experience' in which institutions help to frame the pieces that allow you to "construct" higher education authentically for you and your context. This will entail reframing Higher Learning 'support' and the focus of the institution to genuinely encompass the learner. The challenge assumes an equal stress on the social changes in higher education as technical ones.

### 4.3.2 Perspectives

The 'Enriched Learning Landscapes' ELL challenge takes a disruptive view in which future learning is both *authentic* and *affordable*. Authentic learning should somehow be partly in the workplace and partly in the University, and this will also contribute to affordability. Another critical perspective is the *formal* and *informal* learning continuum bridging between learning in that University and the workplace world: understanding the idiosyncratic opportunities to "learn informally" in various contexts. How to effectively integrate formal and informal, with valuable long tail contributions?

The challenge faces the big switch fallacy...*there is no big switch that turns on learning*. Authentic learning is a gradual curve in which 'the creative, effortful work' of the learner is the real power behind the climb in that curve. Higher Learning is the critical and reflective ability to learn to ask questions, and know what makes a good answer. It should not be confused with having young people leave home and learn to do their own laundry. Somehow "the authentic" is not created in the classroom, so it needs to be connected to things that make sense to you as a learner. In this way, the role we call teacher is someone who can make learning connect to your personal experience.

This challenge aims to address the tension between 'the personal' and 'the standardized'. It requires us to rethink 'what are the basic skills for the 21st century'? And to ask the basic question of 'what is University for? Critical to the scenario is the idea of 'the 21st century independent learner'. In a world in which there are many more courses and modules to engage the learner and many excellent and already free resources, it is worth asking: what value do our institutions add beyond awarding status via credit? Finally, behind this challenge is a desire to imagine what can happen to make the university naturally change without destructive force that will damage the critical research and reflective spaces they offer. If we do not answer this challenge, we risk an education debt crash; and will be failing to take the valuable opportunity that technology now offers.

Critical Keywords: Disaggregated; Consumer-Producer; Self Directed; Mentored; Reflective; Open Access; Accessible.

### 4.3.3 Sample scenario

Molly is studying science at a University in 2021. Some semesters she is resident on the campus working full time; and some semesters she is away from campus working, and switched to a 'part time' remote model applying what she has learned. In learning processes, she is a producer/consumer learner, who offers and seeks assistance in flexible mentoring relationships with her peers and mentors. She does not meet people called teachers, who know what she needs and provide it to her whilst she listens or watches them. Instead, she works with a range of mentors who help her navigate the difficult topics – sometimes as peers who are working on the same issues.

Her first year credits were in science - just now in her second year she needs some credits on probability - she wants a better 'syllabus' than the simple examined model her institution offers - so she is currently working with a group on creating a "Let's go to Vegas" mathematic topic collection with her co-mentoring community – she works on campus for this credit-bearing creative production. She works to 'build and collate' learning materials with soft and human assistance for other learners and herself. Her University provides the infrastructure for this work, quality assures her mentoring relationships, and examines her work to award the credits.

However, in other formal work she is doing she does not choose to pay for or need credit or a formal exam, but instead learns in authentic and personally engaging pieces on music. She selects a mentor and uses entirely peer mentoring to support her work in this. She may convert this work later into products for credit, or take an assessment – but just now she does not need this.

### 4.3.4 Research questions

*What radical change does the scenario seek to encompass?* Most radically, the mindset of a *student* needs to change to include *Learning to Learn* at the core of their work. The truly creative learner must create learning artefacts that are personally meaningful for them to contribute back to a real community. This will require new cultures of contribution, moving past current open source ideals. This is in keeping with other examples such as in Wikipedia and youtube where you can add movies, knowledge, 3d models etc. But the best example is possibly in the energy domain – where 'smart grids' allow people to be part of solution, active participants in creating as well as consuming energy.

The scenario raises a number of questions:

- How to assess higher level understanding via credit management?
- Supporting higher education meta skills and soft skills?
- How to create and support economies of mentoring / support / content?
- How to support higher level questioning and reflection with tools and social systems?
- Balance of Breadth and Depth in learning; assessment, production, etc?
- Developing the effective supported producer consumer roles in social and software systems?
- Supporting Higher Education journeys for credit and not for credit?

- Redefining the role of mentor - redefining the profession of 'higher educator'?

### 4.3.5 Measurements

The success of the challenge can be measured via significant change to the formal institution, and similar change to the role of the teacher.

The challenge has progressed when:

- Students create as much as they consume;
- New disaggregated / alternative curricula emerge (past OER); and
- Campus Universities provide access to credit for students who move past their fixed syllabi.

### 4.3.6 Relationship with Grand Challenge Problems

| Grand challenge | Rel. | Rationale |
|---|---|---|
| Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development | No | This scenario deals with higher education. |
| Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully | Yes | The fundamental change discussed needs to be evaluated thoroughly. |
| Substantially improving motivation and learning of students in European schools by systematically using game based environments informed by our emerging understanding of the brain's reward system | No | This scenario deals with higher education. |
| Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning | Yes | The scenario proposes to move from teachers to mentors. |
| The million practices & million teachers challenge: ad hoc formation of large scale learning networks | Yes | The scenario builds on the formation of a co-mentoring community. |
| Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages) | Yes | The switch to a producer/consumer learner implies privacy issues. |
| A semiotic recommender system to decide which representation can fit learning needs at best | No | This scenario does not deal with this level of detail on implementation. |
| Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions | Yes | The scenario touches on smart grids as a way for people to be part of the process. |

### 4.3.7 Relationship with areas of tension

| Area of tension | Rel. | Rationale |
|---|---|---|
| Data tracking for personalised learning versus data privacy | Yes | The switch to a producer/consumer learner implies privacy issues. |
| Digital divide despite technology spread | No | The scenario does not deal with reducing the digital divide. |
| Ubiquitous learning opportunities versus focused and critical processing of information | Yes | The scenario describes ubiquitous learning opportunities. |
| Established practices versus continuous innovation in the classroom | Yes | The scenario questions many established practices. |
| Individual learning paths versus standardised learning paths | Yes | One of the core elements are individual/group learning paths. |

### 4.3.8 Relationship with core research areas

| Core research areas | Rel. | Rationale |
|---|---|---|
| Computer-Supported Collaborative Learning | Yes | CSCL is core to the scenario. |
| Connection between formal and informal learning | Yes | The scenario deals with the impact of informal learning on formal education. |
| Contextualized Learning | No | The scenario does not touch on contextualization. |
| Emotional and Motivational Aspects of TEL | Yes | The scenario encompasses authentic learning, which means learning with respect to things that make sense to the learner. |
| Improving Practices of Formal Education | Yes | This scenario deals with improving practices in higher education. |
| Informal learning | Yes | The scenario deals with the impact of informal learning on formal education. |
| Interoperability | No | The scenario does not touch on interoperability. |
| Personalisation of Learning | Yes | One of the core elements are individual/group learning paths. |
| Reducing the Digital Divide | No | The scenario does not deal with reducing the digital divide. |
| Ubiquitous and Mobile Technology and Learning | Yes | The scenario describes ubiquitous learning opportunities. |
| Workplace Learning | No | This scenario deals with higher education |

## 4.4 Horizontal Aspects: Deep Learning (Two dimensions of future learning – the balance between individual potential and social demands)

### 4.4.1 Background

As educational systems in cultures very generally serve the function of providing social coherence and continuity while at the same time preparing young people to one day take over and lead society into the future, increasing individualism in modern western societies confronts them with new challenges. This development is aggravated by new media technologies which open up the means of enhancing learning processes, albeit often at the cost of a reduction of face-to-face interaction in the traditional classroom. And although new technologies have over the last couple of years begun to provide us with the means of cooperation and collaboration, they are often perceived by teachers as failing to initiate learning processes which not only develop the student's cognitive abilities, but also help them to integrate within their social context.

Any future learning scenario has to take both sides into consideration. It has to make sure that, on the one hand, social cohesion is attained by initiating young people into their culture and its founding knowledge, myths, narratives, rituals, and values. This can be achieved by providing all students with what could be termed "core knowledge", comprising canonical declarative knowledge (e.g. about important historical events), skills deemed as indispensable in that culture (e.g. rules of behaviour and courtesy) and values (e.g. the personal conviction that women and men are equal). On the other hand, it goes without saying that modern western societies also value the individual and his ability of self-development highly, which then in turn leads to the challenge of providing young people with the best possible opportunity to develop their own full potential. This two dimensional task is an issue formal education has to cope with.

A learning scenario that takes both sides into account, therefore, must provide opportunities for both dimensions of learning.

It will help students to identify with their culture by teaching them the core knowledge which culture and society is built upon. Much of this core knowledge will be rather stable over time (e. g. human rights, the value of family, the great works of literature and art of the past), other areas of this core knowledge will transform more quickly (e. g. gender-role models). That is to say, what qualifies as "core knowledge" is a matter of permanent negotiation within a society in an ongoing discursive process.

However, a learning scenario of the future will also give students ample opportunity to develop their individual potential. This second demand will provide students with a totally different learning experience – a learning experience driven by individual choices, interests, preferences, talents, predilections, and thus intrinsic motivation. Consequently, it will transform the role of the teacher – and, indeed, his societal function. In such a learning experience, the teacher will not so much act as a powerful representative of society and culture, that is, somebody who personifies that society's knowledge, cultural memory and values, but as someone who accompanies, assists, advises and supports the students in their very personal learning processes and developments.

Thus, whereas the acquisition of core-knowledge will be a "consensual" learning experience in the sense that all students are eventually supposed to converge in their personal knowledge-constructions, the second learning experience is one where students are given the freedom to explore, to push their individual knowledge-constructions as far as they can, to dig deep, even to fail. Typically, this "deep learning" experience will and can be decidedly supported by the means new media technologies offer, because they are a gateway to all the informational and communicational resources that the students might need when exploring their individual fields of interest. Indeed, the rise of, especially, the internet has not only managed to provide us with access to information and communication to a degree unprecedented in history, it also initiated and now boosts and accelerates the societal development which made individual learning in an informational age so important in the first place.

However, the deep learning experience will of necessity also imply that the student at a certain point shares the results and experience of his learning process with others so that individual learning in the end comes to fruition and is negotiated within the community.

Thus, collective and individual, "consensual" and "deep" learning experiences might one day form a synthesis for the benefit of both individual and societal development.

### 4.4.2 Research Questions

- How far do "consensual" and "deep" learning experiences require different learning environments, different didactics and different types of technology if the former is aimed at producing shared knowledge, the other diversified and individual knowledge?
- What does this mean for TEL in general? Can we, in the light of the present learning scenario, assume that different types of technology are suitable and efficient for different types of learning experiences and how are these technologies related to different types of learning goals?
- An interesting research question for historians of the media would be in how far technological evolution in the field of the media have transformed and perhaps shaped the way modern societies think about and organize learning at all. It seems clear, for example, that the advent and development of the media (e. g. printing in the 16$^{th}$ century) has contributed decisively to the way people used to learn. Similarly, one could suppose that new media technology also nowadays has transformed and keeps on transforming what we expect learners to gain from their learning process. Thus it might well be that the necessity of the "deep"-learning experience as a very individual form of learning has only evolved in the wake of the development of new technologies.

### 4.4.3 Measurements / Success Criteria

- Tests should and could be developed which measure the way in which individual cognitive constructions are identical / similar or different to those of other people. By such an instrument, it could be assessed whether "consensual" and "deep" learning scenarios achieve their goal of providing

consensual realms and thus coherence within a society or culture or, respectively, open up to the individual the possibility of developing very individual sets of knowledge, skills and the ability to creatively develop new ideas and constructions. In how far both goals can be achieved at the same time and to what extent would then count as a success criterion.

- A success criterion would be the degree to which, after formal education, learners know about and adhere to the core set of cultural artefacts of their society.

### 4.4.4 Relationship with Grand Challenge Problems

| Grand challenge | Rel. | Rationale |
|---|---|---|
| Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development | Yes | Contribution to this challenge as the scenario poses the question as to whether there can be something like a general design for evaluating all kinds of digital technologies in the light of at least two fundamentally different types of learning experiences. |
| Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully | No | Scenario does not specifically address special types of evaluation |
| Substantially improving motivation and learning of students in European schools by systematically using game based environments informed by our emerging understanding of the brain's reward system | No | Challenge too specific for scenario – scenario leaves space for different realizations |
| Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning | Yes | In principle, the scenario addresses the challenge within the framework of "deep" experience learning which highly depends on the transformation of the role of the teacher, reflects the importance of cultural context, distinguishes between different technologies and – implicitly – also the relationship between formal and informal learning (the latter being especially relevant for the "deep" learning experience. |
| The million practices & million teachers challenge: ad hoc formation of large scale learning networks | Yes | Scenario does not specifically address the question as to how the two kinds of learning can be efficiently organized; however, in the "deep" learning experience, it rests upon the idea that individualized learning experiences are highly dependent on networks which |

| | | |
|---|---|---|
| | | enable learners to find specialist answers to their very specific and individual questions; thus, networking is a prerequisite to deep learning as sketched in the scenario. |
| Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages) | No | Challenge too specific |
| A semiotic recommender system to decide which representation can fit learning needs at best | No | This scenario does not deal with this level of detail on implementation. |
| Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions | No | Scenario does not specifically address research |

### 4.4.5 Relationship with areas of tension

| **Area of tension** | **Rel.** | **Rationale** |
|---|---|---|
| Data tracking for personalised learning versus data privacy | No | Scenario is on a more universal and abstract level |
| Digital divide despite technology spread | No | Scenario more fundamental |
| Ubiquitous learning opportunities versus focused and critical processing of information | Yes | "Consensual" learning covers focused learning experience, "deep" learning experience ubiquitous opportunities and resources |
| Established practices versus continuous innovation in the classroom | Yes | Relationship between "established" practices and "innovation" are at the core of the scenario – the former being addressed by "consensual" learning, the latter by "deep" learning experiences. |
| Individual learning paths versus standardised learning paths | Yes | The relationship between standardization (here called: "consensual") and individual learning are at the core of the scenario. |

### 4.4.6 Relationship with core research areas

| **Core research areas** | **Rel.** | **Rationale** |
|---|---|---|
| Computer-Supported Collaborative Learning | No / Yes | Scenario too abstract to address the research area directly, however high relevance in the realisation process as CSCSL seems to be a most convenient way of organizing "deep" learning which will often depend on communication and collaboration between individuals interested in certain specific areas of knowledge which are potentially physically far away from each other. |
| Connection between formal and informal learning | Yes | Highly relevant as "consensual" learning rests upon the idea of the necessity of formal education, "deep" |

| | | |
|---|---|---|
| | | learning, however, on the idea of personalised learning which will often be partly independent from formal education and in which formal and informal learning should eventually coincide and stimulate each other. |
| Contextualized Learning | Yes | "Consensual" learning experience is by definition contextualized as the integration into the cultural / societal context is the principal goal here; however, also "deep" learning experience will often be contextualized as students will, in their individual learning paths, have to communicate and collaborate with others in the same field of expertise within a given context. |
| Emotional and Motivational Aspects of TEL | Yes / No | Scenario too abstract to address the question directly; however, it is to be assumed, of course, that there is a strong correlation between intrinsic motivation and "deep" learning (which implies self-regulation, learners' autonomy etc.) |
| Improving Practices of Formal Education | Yes | The scenario redefines the role of the teacher radically – however, without devaluating his traditional role as a representative of societal demands, canonical knowledge and authority. This is done by defining different behavioral and role patterns for the teacher with respect to different learning experiences of the students. The distinction between different roles of the teacher in relation to the students' learning experience will hopefully contribute to the improvement of formal as well as informal learning. |
| Informal learning | Yes | Scenario mainly addresses the organisation of formal learning, however, informal learning is essential for the success of the "deep" learning experience. |
| Interoperability | No | Scenario on a more abstract level |
| Personalisation of Learning | Yes | Personalisation is at the core of the deep learning experience |
| Reducing the Digital Divide | No | Scenario on a more abstract level |
| Ubiquitous and Mobile Technology and Learning | No | Learning scenario more general |
| Workplace Learning | No | Scenario addresses the organisation of learning at schools |

## 4.5 Workplace learning: Learning Technology as a Workforce Multiplier

### 4.5.1 Assumptions

- Employees possess skills for self-directed learning (this is in contrast to education which is expected to build up these skills)
- Depending on work context (e.g. role) employees are expected to exhibit self-directedness on different levels of intensity
- Employees possess basic domain knowledge and skills (this is in contrast to education which is expected to build up these skills)
- Employers provide a working environment which contributes to motivation of employees (e.g. provide opportunities for professional development)

### 4.5.2 Perspectives

Personal versus company

### 4.5.3 Scenario: Paul's Job

Paul is a mechanic who just received a job to perform.

With the job, Paul's intelligent agent looked at all the content in the organization and provided a suggestion of what is relevant to perform it well. The agent uses what it knows about Paul and what it knows about the job to find and rank suggestions. Content includes "all" content, including video, training lessons, relevant discussion, etc.

Paul uses the content he likes to get prepared. The system uses his selections, his implicit as well as explicit feedback, the way he prepares, etc. in order to improve itself.

Paul has the ability to ask questions to prepare better. The agent responds interactively to the questions and provides more/other content.

Paul grabs his personal device and heads to the job. When he gets there, he realizes that there are some things that are not what he expected.

He uses the camera on his device to get additional help. This connects him to further relevant content and to people who may be able to help.

The device overlays some of the relevant information on the image to help, it removes information that is not needed, based on Paul's knowledge and skills.

As Paul performs the job, his device captures how he does it. This will be used to "feed" the system, adding to the content available for use.

### 4.5.4 Influence of prior scenarios

This scenario was influenced by prior scenarios from John Alonso, Pascal Lardeux, and Peter van Rosmalen (see section 6.3). From Peter's scenario, we took the idea of the intelligent agent. John's scenario delivered the input for the use of personal device. From Pascal's scenario, we took the idea of a system that is filled by user interaction.

### 4.5.5 Research questions

- Horizontal topics
  - Expertise development
  - Learning behaviors / patterns
- Input into the system
  - User context detection
  - Knowledge capture and user traces
  - Image processing
  - Automatically maintaining user profiles
  - Personalization and contextualization
  - Privacy and security
- Output from the system
  - Knowledge analyzing for retrieval and inference
  - Augmented reality
- Human-computer interfaces
  - for recommenders
  - for visualizing and making accessible complex data

### 4.5.6 Measurements

- Company Perspective
  - Ultimate measurement is the performance of the job
  - Increased speed to perform
  - Reduced error rate
  - Number of accredited trainings (achieved without external training)
  - Proved compliance
- Personal perspective
  - Ultimate measure is the "flow" experience within professional life (right job for my competences with right level of challenges)
  - Increased awareness of own competences and competency gaps
  - Increased awareness of opportunities to develop new and improve existing competences (including career steps and chances)
  - Increased breadth of expertise (e.g. completion of tasks which are important for accreditation, increases employability)

### 4.5.7 Relationship with Grand Challenge Problems

| Grand challenge Problem | Rel. | Rationale |
|---|---|---|
| Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development | No | Challenge addresses early child development |
| Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully | No | Challenge does not involve industry |
| Substantially improving motivation and learning of students in European schools by systematically using game based environments informed by our emerging understanding of the brain's reward system | No | Challenge addresses schools |

| | | |
|---|---|---|
| Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning | No | The scenario does not involve collaborative activity |
| The million practices & million teachers challenge: ad hoc formation of large scale learning networks | No | The scenario does not involve networking activity |
| Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages) | Yes | In the scenario, all of Paul's actions are captured to give him feedback and to populate the system. This raises a lot of issues mentioned in the challenge. |
| A semiotic recommender system to decide which representation can fit learning needs at best | No | This scenario does not deal with this level of detail on implementation. |
| Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions | No | Challenge addresses research |

### 4.5.8 Relationship with areas of tension

| Area of tension | Rel. | Rationale |
|---|---|---|
| Data tracking for personalised learning versus data privacy | Yes | In the scenario, all of Paul's actions are captured to give him feedback and to populate the system. This raises a lot of issues with respect to data privacy. |
| Digital divide despite technology spread | No | Relates to societal issues |
| Ubiquitous learning opportunities versus focused and critical processing of information | Yes | The scenario describes ubiquitous learning opportunities, which raises the issue of focused and critical processing of information |
| Established practices versus continouos innovation in the classroom | No | Relates to formal education |
| Individual learning paths versus standardised learning paths | Yes | The scenario describes self-directed learning, which raises the issue of standardization and compliance. |

### 4.5.9 Relationship with core research areas

| Core research areas | Rel. | Rationale |
|---|---|---|
| Computer-Supported Collaborative Learning | Yes | The scenario incorporates collaborative learning activities such as help seeking from experts/other users via the personal device. |
| Connection between formal and informal learning | Yes | One of the assumptions is that employees possess skills for self-directed learning. These skills must be developed during formal education. |

| | | |
|---|---|---|
| Contextualized Learning | Yes | Learning in this scenario is leveraged through context detection. |
| Emotional and Motivational Aspects of TEL | Yes | One of the assumptions is that employers provide a working environment which contributes to motivation of employees. |
| Improving Practices of Formal Education | No | The scenario focuses on informal learning. |
| Informal learning | Yes | The scenario focuses on informal learning. |
| Interoperability | Yes | The scenario requires interoperability between Paul's intelligent agent and his personal device. |
| Personalisation of Learning | Yes | Learning in this scenario is personalized to Paul's knowledge and skills. |
| Reducing the Digital Divide | No | Relates to societal issues |
| Ubiquitous and Mobile Technology and Learning | Yes | Learning in the scenario is heavily supported by Paul's personal device. |
| Workplace Learning | Yes | The scenario itself is within this core research area. |

## 4.6 Horizontal & lifelong: Sweetskills

### 4.6.1 Assumptions

- Sweetware comprises critical thinking, an open mind, collaborative competencies, flexible problem solving, resilience in the case of setbacks and dead ends, creativity.
- Sweetware is about the mindset and competences you wish the others would have.
- Communication and the development of the solution (diagnosis and therapy plan) are monitored and compared to the standards of exemplary processes of collaborating and solving the case. Hints are given, prompts, in some cases also a presentation consisting of recorded dialogue and animated text clips that allow the participants to follow the development of a model solution. Capabilities to collaborate in a fruitful way and the understanding of what characterizes good collaboration are promoted. The same data are used to assess the quality of the sweetware of the students.
- At the end of the session, the system provides profile information of both students and their work as a group. This session and domain specific profile is compared and integrated in information from former sweetware learning, which might also include informal settings.

### 4.6.2 Perspectives

- Sweetware can be promoted and assessed at the individual and the group level. Sweetware requirements can be formulated for various settings of individual and collaborative problem solving, in real and virtual worlds, and on a higher level for different types of jobs, etc.
- A central feature of the new approach is that promoting and assessing a person's or a group's sweetware go hand in hand. Settings are realized in which the different facets could and should play a role. Behavioral indicators of the sweetware are recorded in such a supervised setting, and analyzed to provide feedback, hints, prompts, and help. On the other hand, the information is used to build up a profile of the sweetware to be mirrored to the person (group) and / or to the mentor (teacher).

### 4.6.3 Scenarios

- The hardware of Sweetware consists of a specially prepared meeting room with cameras and microphones and a number of data collectors attached to the people in non-intrusive ways. The software of sweetware includes an inference mechanism using hundreds of models coming from the most diverse areas such as psychology, sociology, and computer sciences or political sciences. Those models help to make sense of the large amount of data collected through facial recognition, voice analyzer, co-location measurements, gestures etc. Additionally, sweetware is integrated with academic databases offering the latest publications, anonymized patient records and conferencing links to a number of experts worldwide, who could be contacted from time to time.
- Lis and Eric, two health science students, are looking forward to her placement at the famous "CureAll Hospital". They know that the hospital has recently acquired Sweetware technology in order to boost

its training capabilities. Lis and Eric are known to have an implacable academic record, however they are also known to be impatient and hotheaded, if confronted with disagreement. Lis and Eric know that Sweetware can support their daily discussions of patient cases with an intelligent filtering mechanism offering sets of relevant publications as well as recommendations of relevant experts being members of the sweetware network. However, they have also been told that sweetware will monitor several of their physiological expressions and recommend strategies on how to resolve disagreement among them. Sweetware's social monitoring is soon to be tested when the first patient is discussed by Lis and Eric. The supervising doctor told them that they should have a recommendation within half an hour and that their responses would influence whether the hospital could keep Sweetware or not. As recent budget-cuts have revealed, licensing and maintaining Sweetware was too expensive. The only way out was to demonstrate that Sweetware was worth its money. At first Lis and Eric didn't understand but as soon as they saw the case they knew what this patient case would be about. The case contained much detailed information but didn't lead to a clear diagnosis. Rather, 3 or 4 interpretations seemed equally possible – however 30 min would allow them to investigate only 1 interpretation at most. Unfortunately, Lis and Eric's top two interpretations didn't overlap so somehow they had to agree quickly on which interpretation to pursue first.

- At this stage, they decided to use the sweetware meeting room to discuss the issue. In the room, they were monitored and on their tablets appeared warning messages as they were debating the pros and cons of each interpretation. The messages indicated that Lis interrupted Eric 3 times over the last 5 minutes; Eric could see that his voice was speaking with increasing volume while not looking at Lis because he seemed apparently busy to locate some patient data. Additionally, the dashboard analyzing their collaboration performance was far removed from the 'sweet spot' where it should be. After 10 minutes, Eric and Lis decided to switch into recommendation modus where they could get ideas about the general context of their situation, i.e. all the things that were at stake such as the development of their social skills, impressing the supervising doctor with a sound case analysis as well as keeping Sweetware, a system they had learned to appreciate. Based on its collection of negotiation models, Sweetware suggested a few generic strategies for how to deal with cases characterized by under-determination and lack of time. Among other things, Sweetware estimated the time needed to investigate each possible interpretation and suggested to prioritize the option that would take the least time. This was also the recommendation that seemed most logical to Lis and Eric. Additionally, Sweetware listed a few recommendations for Lis and Eric to keep in mind when under stress the next time. These recommendations were stored in a long term profile so that at the end of their placement, a clear development could be outlined tracing data across several discussions the two had to master. When they returned from their placement, their peers noticed a real change in the way Lis and Eric handled disagreements and their anonymized data served

Sweetware as a compelling example to demonstrate Sweetware's analytical as well as recommending powers.

Similar scenario:

As part of their sweetware curriculum, a medical student and a student of psychology collaborate via some type of a desktop video conferencing system. They work on hypothetic patient cases, which were carefully designed to require the combined application of both medical and psychological expertise to be solved correctly. In addition, the information on the cases is given step by step, simulating the dynamics of a treatment in real life. The system includes a shared workspace they can use to prepare a written joint solution as well as individual text editors. Communication and working on the solution are recorded.

Success in this task requires beside domain specific expertise in medicine and clinical psychology collaborative competencies, like sustaining mutual understanding, dialogue management, information pooling, reaching consensus, task division, and reciprocal interaction, but also critical thinking, flexible problem solving in the light of changing information, and resilience in the case of setbacks.

Another similar scenario:

- Lisa is a graduate student specializing in neurology. Hans is close to getting his psychology degree. And Christian is a 50-year-old general practitioner taking a refreshment course.
- Today, Christian will play the role of a patient who fears that he is losing fine control of his hands, in a role-playing scenario.
- In order to prepare the session, Christian goes through a bit of background about his supposed illness on his eyewear device, which projects on his physical body: he also uses the app that hospitals use to help patients prepare their visit. This app helps Christian to review public information and to prepare the questions that he wants to get answered during his hospital visit.
- The session itself takes place in the hospital where Lisa is working, with Hans conferenced in on a large screen display. The three of them have a conversation about Christian's reasons to seek treatment. Lisa asks Christian to carry out some fine motor movement tests - which are simulated to correspond with the symptoms that Christian supposedly suffers from. Lisa's wrist based device vibrates to warn her that she seems to behave in a rather condescending way, not allowing Christian to give her detailed information about his concerns in lay man terms.
- Hans occasionally intervenes from a distance. At the side of his video display, he can review some of the recent research about psychological problems that lead to motor disorders, typical for middle-aged professionals who suffer from anxieties related to what they perceive as undermined professional authority. His jargon indicator occasionally informs him that his is using terminology that neither Lisa nor Christian understands.
- Towards the end of the session, Christian is prompted to self assess

whether all his original questions were answered. It turns out that this is indeed the case and they wrap up their role-play. Afterwards, they all provide quick feedback to one another and reflect on their personal blog how the session went, what they learned, and how it will impact on their professional practice.

And one more alternative scenario:

- Todd is a bright 14-year-old boy who has been excluded from two schools. He has been offered a place at a new school but the offer is conditional on him successfully completing a course in sweet skills. He is introduced to Fred, a student with excellent sweet skills, who has agreed to act as his mentor.
  The new student and his mentor are first shown a clip of someone hitting a tennis ball. For some shots the racket only has strings going from the top to bottom (representing academic skills), for other shots the racket is strung from side to side (representing sweet skills) and then there are shots with a fully strung racket where the ball is hitting the sweet spot. It is clear that the effort of hitting the ball is always the same but the power of the shot varies. Nothing is said about the video and there are no spoken or written words to explain it.
- Todd and Fred are then invited to play a computer game together. They have to complete a number of challenges and make decisions about how to behave in certain circumstance. The challenges require a degree of academic intelligence and the decisions rely on emotional intelligence. The students go up a level for each challenge but are not offered the next challenge till they have escaped from a tough situation and the maze of emotional responses. It is not possible to make a choice till they have opened and viewed all the options.
  The purpose of the game is to heighten Todd's awareness of the power of sweet skills and the fact that we have choices about how we behave and react. The structure of a game and the fact that he can excel in some areas ensures that he does not feel humiliated or powerless. All schools value sweet skills as well as academic excellence. This is one way to encourage students to develop them for the benefit of the whole organization and for personal success.
- The tough situations in the games can be designed to focus on different sets of skills: For example
  - How to relate to people
  - How to manage situations
- At the end of the session, Fred is asked to feedback to Todd and Todd is asked to feedback about the support Fred gave him. They have both worn monitors while Todd played the game and Fred offered support. They discuss the readings that relate to levels of frustration and anxiety and consider if the feelings were useful. They agree on an area for further development of sweet skills (in the real world) and decide how Todd will be able to demonstrate to Fred that he has achieved it. Todd is asked if he has any comment or insight about the clip featuring the tennis racket and ball. They agree a time to continue with the game.

### 4.6.4 Research questions

- How can technology help learners to be more aware of their sweetskills abilities and performance?
- What kind of sensors can measure what kind of characteristics that are relevant to sweetskills?
- How can hardware be developed that includes the sensors mentioned above and that can be worn without interfering in the learning experience?
- What kind of learner interactions can be captured and how can the measurements be leveraged for assessing the sweetskills of learners?

### 4.6.5 Relationship with Grand Challenge Problems

| Grand challenge Problems | Rel. | Rationale |
|---|---|---|
| Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development | No | Challenge addresses early child development |
| Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully | Yes | Only indirectly – challenge does not focus on sweetskills as such. |
| Substantially improving motivation and learning of students in European schools by systematically using game based environments informed by our emerging understanding of the brain's reward system | Yes | Indirectly, as challenge addresses schools. Note however that we do envisage leveraging game approaches though. |
| Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning | Yes | Both motivation, affect and collaboration are important for this scenario. |
| The million practices & million teachers challenge: ad hoc formation of large scale learning networks | No | The scenario does not focus on large scale networking. |
| Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages) | Yes | In the scenario, all of the learner actions are captured, in order to give feedback. |
| A semiotic recommender system to decide which representation can fit learning needs at best | No | This scenario does not deal with this level of detail on implementation. |
| Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions | No | Challenge addresses research |

### 4.6.6 Relationship with areas of tension

| Area of tension | Rel. | Rationale |
|---|---|---|
| Data tracking for personalised learning versus data privacy | Yes | In the scenario, all of the learner actions are captured, in order to give feedback. |
| Digital divide despite technology | No | The scenario assumes availability of technology and |

| | | |
|---|---|---|
| spread | | basic technology skills. |
| Ubiquitous learning opportunities versus focused and critical processing of information | Yes | The scenario describes ubiquitous learning opportunities, which raises the issue of focused and critical processing of information |
| Established practices versus continuous innovation in the classroom | Yes | This scenario is quite innovative when compared with what currently happens in most classrooms. |
| Individual learning paths versus standardized learning paths | Yes | The scenario describes self-directed collaborative learning, which raises the issue of standardization and compliance. |

### 4.6.7 Relationship with core research areas

| **Core research areas** | **Rel.** | **Rationale** |
|---|---|---|
| Computer-Supported Collaborative Learning | Yes | Collaborative learning is central to the scenario, |
| Connection between formal and informal learning | Yes | One of the assumptions is that employees possess skills for self-directed and sweetskills learning. These skills must be developed during formal education. |
| Contextualized Learning | Yes | Learning in this scenario is leveraged through context detection. |
| Emotional and Motivational Aspects of TEL | Yes | Sweetskills focuses on emotional aspects of learning as well as more knowledge related aspects. |
| Improving Practices of Formal Education | Yes | The scenario is part of a formal learning program. |
| Informal learning | Yes | The scenario relates to informal learning. |
| Interoperability | Yes | The scenario requires interoperability between sensors and software components. |
| Personalisation of Learning | Yes | Learning in this scenario is personalized to the group characteristics. |
| Reducing the Digital Divide | No | Relates to societal issues |
| Ubiquitous and Mobile Technology and Learning | Yes | Learning in the scenario is supported by wearable, personal devices. |
| Workplace Learning | Yes | The scenario mimics a workplace setting in order to emphasize the realistic nature of the learning that takes place. |

# 5 Reflections from WP's on MoM2 outcomes

In this section, reflections are offered from the perspective of specific STELLAR work packages.

## 5.1 WP1

Whereas it is difficult to produce Grand Challenge Problems, the examples produced at ARV were a starting point for the work at MOM. We now need to evaluate Grand Challenge Problems produced at MoM. I view this is an ongoing process. If we can get at least one good Grand Challenge Problem from ARV and one good one from MoM we are making progress.

1. **The idea of crowd sourcing (see section 6.4.3) should be followed up**
   Formulation of problems on openideo.com are examples of how STELLAR problems could be formulated (e.g. How might we improve maternal health with mobile technologies for low-income countries? )
2. **We need a STELLAR Grand Challenge Problem task force**
   This small group of people would work on Grand Challenge Problems produced so far (ARV and MoM) and decide how to move forward, drawing on outputs from Delphi study and other WP 1 instruments (Autumn meeting?). Possible people in taskforce: Erik, Frank, Hans, Rosie, Ros, Nicolas.
3. **Linking Grand Challenge Problem to scenarios and research questions is a good idea.**
   We need to plan work on Grand Challenge Problems until end of STELLAR.
   I'm also wondering if we could move the Grand Challenge Problem idea forward by saying that STELLAR will sponsor a grand Challenge Problem on openideo. We then have an 'internal competition' in which we invite people to put forward a Grand Challenge and then we somehow decide which one to sponsor to go into openideo.

## 5.2 WP2

WP2 organized the MoM, and disseminates podcasts recorded at the MoM.

## 5.3 WP3

WP 3 is connected to the Meeting of Minds activity by their shared link to the overall scientific framework provided and aligned by Work Package 1. All 3 Instruments within WP3 - namely Alpine Rendez-Vous (ARV), Theme Teams (TT) and Mobility Fellowships (MF) – are selecting their workshops (ARV) and topics (TT, MF) by how they can add to and be aligned with the 3 Grand Challenges within the framework (Connecting Learners, Contextualisation and Orchestration). The Grand Challenge Problems have been introduced to add to the Grand Challenge Framework in a more concrete way by providing clearly defined problems in the field of TEL including a timeframe, measurable success indicators and benefits for the European education system and society.
During the 2nd STELLAR Alpine Rendez-Vous in March 2011 all 8 workshops have defined between one and seven Grand Challenge Problems. A selection of those definitions has been presented at the MoM2 in Semmering in May 2011 (see section 6.1).

The Theme Teams are more concerned with Grand Challenge research questions. That is, each TT has been asked to formulate some questions related to the topic at hand. For this reason, the discussion carried out in small groups during the MoM2 was more useful for WP3 than general discussions because they focused on scenarios and questions.

**Lessons learned:**

1. **The Grand Challenge Problems have shown to serve as a very effective starting point for discussions.** As those discussions following the presentation stayed on a more general level including the structure and approach of GCP, a next step would be to foster content-focused feedback and discussion.
2. As stated during the discussion, the GCPs and the scenarios that illustrate challenges could be brought together despite their different starting points.
3. **Also the number and level of input should be carefully considered** in the future. The Grand Challenge Problems are very diverse. Therefore attention should be paid to limiting the number of GCPs presented for discussion and rather go more into detail to encourage discussion.
4. Based on the feedback from the MoM 2 participants, the link of the Grand Challenge Problems to practical problems and goals from outside of academia should be further elaborated.
5. Content-wise, a general consensus seemed to be that GCPs should be memorable, understandable and measurable while of course the context always has to be considered as important.

**Next steps**

All aspects learned from the presentation of Grand Challenge Problems at MoM2 will be taken into account in the scope of the next activities scheduled.

1. Every GCP will be posted for feedback on TELEurope with a connected feedback form.
2. WP3 will provide the WP1 task force with all the necessary input from the Alpine Rendez-Vous (Grand Challenge Problems) and the Theme Teams (Grand Challenge research questions).
3. The upcoming publication on the Grand Challenge Problems from the Alpine Rendez-Vous 2011 will
    a. present more details for each GCP and allocate all to the Grand Challenge Framework to give more structure;
    b. link to practical problems and goals from outside of academia;
    c. be formulated in a memorable and understandable way and present measurable outcome criteria.

## 5.4 WP4

The STELLAR Grand Challenges concepts have been refined but somehow also complexified during the second year of the project and at the Alpine Rendez-vous (ARV).

PhD candidates have proposed a 4th **Grand challenge framework** to complete the STELLAR settings defined to consolidate the TEL research community and to enable interdisciplinary research in TEL: *Connecting Learners*, *Orchestrating Learning*, *Strengthening Contexts*, and *Constructing Knowledge*. The latter includes data mining, recommendation and analytics.

The outcome of the Delphi study presented at MoM2 has been successful exploited in doctoral events. **Areas of tension** have been introduced to help the participants of the Winter School 2012 to position their research with respect to societal challenges (similar activity is planned for the 2011 ED-MEDIA Graduate Track). The **Core research areas** have been exploited at the Summer School 2011 by the TELmap partners to classify the current research topics of the participants and has trigged requests for further collaboration in a workshop which will be held at ED-MEDIA 2011.

1. **The Grand Challenge Problems elicited during the ARV by the participants of the various workshops and presented at MoM2 are more difficult to exploit as such.**
   The TEL community and the various stakeholders have now to use them as a starting point for personalized editing and appropriation. The idea is that each stakeholder community takes the ones which are meaningful in its contexts and simplifies them to turn them into clear and compact objectives (limited to one sentence and three lines). They should somehow be turned into self-explanatory research mottos.
2. **The level of the Grand challenge problems is the most detailed one that we should considered in a network of excellence.**
   **TEL research questions** should be defined directly by PhD candidates and PhD advisors. It is part of their academic duties and freedom. Any attempt to predefine them will not be accepted by the community and may event limit innovation and creativity.
3. **The notion of TEL Scenarios introduced during MoM2 turned out to be a very successful instrument to initiate dialog between various TEL stakeholders and disciplines.**
   When created and refined collaboratively, scenarios are useful boundary objects to establish common vocabulary and shared visions. In such little stories or visionary statements, each stakeholder can project his or her concerns and expectations without impairing the projections of the others. Pieces and abstraction levels are just fitting together in scenarios like in multidimensional puzzles. They are also very effective communication means which can be exploited in different communities without translation.

➔ As a consequence, WP4 is replacing the quest for research questions illustrating the Grand Challenges problems by TEL Scenarios from which any PhD candidates and advisors can extract his or her own research questions. This idea was immediately applied at the Summer School 2011, which was held right after the MoM2. The participants were asked to write individually a vision scenario (see in annex) and reflect on them in team. Some scenarios proposed were very pragmatic and directly linked to the current research activities carried out by the participants. Some others were more visionary and can also be exploited to refine the Grand Challenge problems. Similar activities will be integrated in the Doctoral Consortium at EC-TEL 2011.

In MoM2, we started from about 20 individual scenarios to converge into 4 common ones. This was effective to elicit priorities in TEL. However, we also unexpectedly excluded some relevant topics. Future rounds should compensate for such omissions. Finally, because of the chosen scenarios and the profile of the external participants, the TEL dimension was not strongly taken into account. Some scenarios are mainly 2scenarios related to changing the educational paradigm, with or without technology. It is highly relevant, but maybe not directly related to the expected focus of the NoE.

## 5.5 WP5

The MoM provided significant input to the orientation of WP5 activities for the coming period, and of its strategy of stakeholders' engagement.

The presentation of the activities carried out by Stellar to engage stakeholders underlined the starting point of our approach, i.e. through engagement stakeholders have the chance to contribute to shaping the TEL research agenda of the future. Interestingly, the feedback of stakeholders attending the MoM gave evidence of the fact that:

1. **Stakeholders are more interested to know how ongoing research can contribute to their activities rather than to highlight specific needs and concerns that could affect the TEL research agenda of the future.**
   This is a quite critical aspect in a project like Stellar that does not produce research results but has the capacity to streamline current research results in the different areas of TEL. It also has a potential impact on the update of the stakeholder engagement strategy that is currently being revised by WP5.
2. **Agents of change**
   The suggestion to involve "agents of change" belonging to the different target groups of stakeholders in the activities of Stellar is also deemed very relevant.
   → Some of the ongoing activities and instruments of WP5 (such as the NoN and the StaB) are already working in this direction.
3. **Some of the recommendations and suggestions emerging from stakeholders in the MoM are in line with recommendations and suggestions coming from consultation activities carried out by WP5, particularly:**
   - The need to consider the full picture (not only endogenous, but also exogenous factors influencing learning),
   - The key role of assessment (reforms) in determining the future of learning,
   - the need for mainstreaming (uptake) strategies of good practice cases in the use of TEL. In this respect the suggestion to concentrate also on unsuccessful mainstreaming cases and analyse what did not work is deemed particularly useful.
   - the need to avoid the "reinvent the wheel" problem in research (i.e. start from what is already available in research and not from scratch).

Some informal conversations with stakeholders highlighted the following:

- the central role played by competences in the evolution (or revolution) of learning systems,
- the need to move out from the common (and outdated) prejudice about teacher resistance to change and to ICT use for learning.

The methodology adopted to actively involve researchers and stakeholders together in the envisioning of scenarios was particularly relevant to WP5 and will be taken into consideration in the organization of future events. The outcomes of such an exercise are also very relevant, as each scenario is featured by a metaphor, a keyword, an image that well represents the meeting point (in terms of "language") between research and stakeholders.

### 5.6 WP6

The MoM2 created the opportunity to look at the Science 2.0 infrastructure which we designed for STELLAR from a number of new perspectives.

1. **Privacy is a crucial concern when dealing with Web 2.0**
   When utilizing a Science 2.0 infrastructure and employing tools such as Twitter or Blogs in order to communicate and distribute the discussions and outcomes of a meeting such as MoM2, privacy questions arise. Is it OK to tweet statements of other people (not yourself) out of context? Are company/product related comments to be treated carefully? Etc.
2. **The availability of TEL datasets is an important topic**
   Researchers typically are subject to strong restrictions in the use of (evaluation) data. This puts them at a disadvantaged position in comparison to companies which can use the data internally (e.g. google, facebook, …). This fact underlines the need for TEL research to support and encourage the exchange of datasets by finding a way to share them in an anonymized way. Many scientific communities address the open access to datasets. In the case of physics for instance, this is less a problem, since the data is not about humans. However, in TEL the data is subject to privacy regulations and needs to be treated with respect. Open data is also a theme in education, not only OER, but also in learning analytics.
   ➔ This topic has already been taken up by the STELLAR Theme Team "DataTEL" which endeavors to propose formats in which TEL data can be made public. The discussion underlined the importance of this activity and suggests a continuation of it.
3. **Technology embodies ideas**
   While in many cases the original technologies/prototypes which introduced change and new ideas were lost relatively quickly, these ideas persist and are taken up in new developments.
   ➔ How can we develop technologies that convey the ideas effectively and in a reusable way?
4. **Communicate the idea not the tool**
   "When talking to teachers you cannot speak about Twitter and Mash-ups, you have to speak their language while showing them Twitter and Mash-ups." This comment by Florian and others was echoed throughout the meeting. These comments underline the importance of researching stakeholder practices and relating the developed tools to these practices (e.g. Science 2.0 practice map). We need to support stakeholders in needs around learning (not focus on learning alone). For instance, teachers need to stay in control of their class. TEL should take this into account and be designed for this.
   ➔ This discussion highlights the need to identify and analyze work practices (processes) of stakeholders and to tightly integrate tools within these practices (both technologically but also conceptually). This is common practice in

knowledge management and process improvement initiatives. Maybe these approaches could be applied here as well.

5. **Make learning use of tools visible**
   It would be interesting to make visible how many and which students already make use of educational software or use common Web 2.0 software to learn. This way we might be able to show that students already now bypass the traditional school system?
   ➔ For this we could for instance track usage of Twitter/Web2.0/Facebook/etc. for learning. So far we have only tracked use of our own software tools.
6. **Provide a central WebSite of learning tools and their purposes**
   John Alonso mentioned that teachers do not know all the great tools available to them.
   ➔ We could create a WebSite which brings all the tools together, explain how they can be utilized within teaching practice (see issue 4 above) and allows teachers to exchange experiences e.g. through a social software system. This way, also the student-teacher networks could feed into research networks and vice versa.
7. **TEL as a force multiplier and scalability agent**
   Professional Learning: TEL has the opportunity to scale learning at the workplace. Learning itself was there always.

## 5.7 WP7

The WP7 perspective will concentrate on MoM2's contribution to
(a) the strategic direction of Stellar work and
(b) the refinement or the creation of Grand Challenges.

**(a) Strategic direction**

There was an interesting discussion around the concept of GCs, where GCs originate from and why they are seen as such a good idea to thrive and direct research efforts.

- On the positive side, it was argued that GCs ensure that research contributes to solving societal rather than (merely) scientific problems. However, it was also critically remarked that unlike in Mathematics where GCs can be described quite clearly and tend to be stable over time, TEL is a more heterogeneous domain, with many normative elements of what good education looks like. Additionally, the normative elements tend to change over time, being more susceptible to political changes.
- A second interesting argument evolved around the need to consider past efforts. In short, do we know whether a certain GC had been addressed previously, how and why would we expect to be successful this time – if we were to address the same GC again.
- Thirdly, given the normative implications of GCs, many questions were generated that will certainly inform future discussions around GCs. Where should GCs come from – should they be derived from political agenda's (such as the 'no child left behind' campaign)? Should the process mainly be top down or bottom up? Do we need to clarify that education is a means to an end – happiness / self actualisation / innovative workforce?
- Another discussion evolved around the challenges of engaging stakeholders, other than researchers. Here the wide variety of MoM participants paid off nicely.

- **Government**: if you want to ensure uptake be aware of "other needs", unrelated to TEL, e.g. Governments need results within 6 month.
- Some government initiatives don't show any impact of TEL research.
- Create an imploding revolution, kids will bypass the system, kids having the iPad use it in new ways – thing is this step might prefer privileged kids only.
- Create sensitivity for change and creativity.
- **Teachers**: fundamental shift from teacher as person with answers to person indicating directions, Can we include non-electronic professional networks?
- **Industry**: engagement needs to be very specific (ROI driven).
- Engagement needs clear value proposition.
- Everybody thinks next big thing is mobile learning but we cannot mention two successful cases where they have implemented.
- TEL needs change management – we are not paying enough attention to this.

**(b) Refinement or the creation of Grand Challenges**

ARV GCs have been given to the MoM2 participants in order to build on previous events. However, fully grasping what was implied in the written statements was seen challenging, also due to the limited level of details in some cases. Too little details presented GCs as desirable agendas but less as actionable GCs that could inform research.

A main activity during the MoM was the production of Grand Challenge scenarios, involving four outcomes: a label, the scenario, relevant research questions, measurements that indicate progress. I think that was a very constructive approach though I couldn't tell to what extent the ARV GCs still played a role or not. The scenarios were developed in groups and it became also clear that first some common ground had to be created before the group could plunge into the scenario production.

Also, the discussion of each group's scenario had to be relatively short, but it is hard to say whether other agenda points could have been omitted.

**Follow up possibilities – what to do with the scenario**

One of WP7's tasks is to support the measurement of impact. In that sense it's critical to follow up on the work started during the MoM2. Participants suggested an OEB workshop, production of a concept video (sun, Microsoft, common craft, diy), a bar camp and discussions with policy makers (and send them video upfront). Crowd sourcing (general user inclusion) through a game like environment was also mention, though that's probably beyond our resources.

# 6 Appendices

## 6.1 Appendix - Grand Challenge Problems from the Alpine Rendez-Vous '11 presented at MoM2

1. Workshop – Early Years and Technology (Organiser: Andrew Manches)

   > Grand Challenge Problem: 'Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development'

   - Problem: Proliferation of digital technologies missing guidelines on design & evaluation
   - European Education System: no equal opportunties for children at this significant stage in their learning. Now: provide those in Education with the information needed to maximize, and thereby provide equal opportunities for Children's learning
   - Activities to address:
     a. summarizing understanding of how digital technology can shape children's development
     b. tailoring this information to specific user groups.
   - Timeframe: 2 years (1st: examination of opportunities, 2nd developing guidelines)
   - Progress and success indicators: peer-reviewed documentation -> guidelines -> take up of those guidelines
   - Funding: European (*e.g. Marie Curie*) and National Research Councils (*e.g. Economic Research Council, UK*)
2. Workshop - Methods and Models of Next Generation Technology Enhanced Learning (Organiser: Daisy Mwanza Simwami)

   > 'Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully'

3. Workshop - Neurosciences, Technology & Learning (Organiser: Paul Howard-Jones)

   > 'Substantially improving motivation and learning of students in European schools by systematically using game based environments informed by our emerging understanding of the brain's reward system'

4. Workshop - Structuring online collaboration though 3 Ts (Organiser: Francesca Pozzi)

   > 'Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning'

5. Workshop - Exploring The Fitness and Evolvability of Personal Learning Environments (Organiser: Effie Law)

   > 'The million practices & million teachers challenge: ad hoc formation

of large scale learning networks'

6. Workshop – data TEL (Organiser: Hendrik Drachsler)

,Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages)'

7. Workshop - Leveraging Researcher Multivocality for Insights on Collaborative Learning (Organiser: Kris Lund & Carolyn Rosé)

'Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions'

## 6.2 Appendix - Scenarios written by the PhD candidates at the Summer School 2011

**The question asked was:** If you would be a magician, how would you change education with or without technology (max 12 lines scenario)?

The scenarios have not been edited; they are given as written by the PhD candidates (only misspellings have been removed)

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There is no doubt; I appreciate in power of technology. However, human as a part of nature must be with nature. I would like to see technology enhance leaning in the way most concern about environment. We use technology but we not trying to get away from nature by not destroy the environment.

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Every student would have a personal laptop at school. I would like students to collaborate on learning tasks with students from other countries, for instance American students with Indian students. (Obviously, if I was a magician, I would also abolish time differences.) Teachers would have an easy way of collecting pre-analyzed data on their students' progress, and get a diagnosis on where students require specific extra scaffolding. Students would do their homework on smart phones. Their homework would often be to go out into the world and relate what they learned in school to real-world things; for instance, by finding examples of what they learned applied to real problems.

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Since teachers find a lot of obstacles when they try to integrate different ICT tools in their practice, I'd delete these problems, turning the use of ICT tools as easy as using a board, a chalk, a paper or a pen.

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If I was an omnipotent magician and a billionaire I would create classrooms in which all the walls were interactive. Instead of students putting their work to display on the wall and it get taken down regularly, if the walls were massive interactive screens good work could be emblazoned all over the classroom on a day to day basis. Also, demonstrating old / ancient / foreign environments could be even more engaging by situating students within four walls which emulate the original settings. I think this would improve the problem which occurs with 'seams' of technology. One interactive board at the front is only a window for students to view, instead of a fully interactive environment.

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In short - pedagogical people would study more technology and visa versa. Relevant critical minding might be obligatory. Technology divide might disappear. Without technology: more group activities, developing interaction between professionals and students in the field. In addition, introduction to "soft skills" could start from education in school. With enormous amount of information field of education would be more specific, but not more than necessary, not only concentrated to the professional field, but to fields nearby. With technology: support of major systems might be implied from the beginning of development. Introduction of technology to people might be as easy as possible, following guidelines for usability. Digital division might be weaker, and all involved personal in the process might be able to speak the same "language" regarding the technology.

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I would solve two major issues in the wink of an eye: (1) school, including summer schools, need to start later in the morning. (2) learning should be supported whenever

and wherever it happens, not necessarily with technology and not bound to a classroom.

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If I was a magician, I would change education so that all of the students were motivated and wanted to learn, that they were eager to learn more and more and more about everything, that they were life long curious. The education would have more of a hands-on approach where the teacher mediated the inner meaning of the subject. It would be more about exploration than explanation. There would be no tests or home works, the test would be more in their will to learn and in their reflections about what they have learnt. There wouldn't be one way only for the students to approach a topic; they would be able to choose from a range of tools (both online and offline) to find the one that they (as individuals) find to be the best for their learning. I don't want to change education only; I want to change the ways that people think and to challenge the institutional view on learning.

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Make it more adaptable, according with students' needs, skills, and motivations. Provide or integrate more simulations, modelling and immersive scenarios in order for students to live the experiences in a more close and accurate way. Make use of game based learning for students' acquire knowledge and to assess them. Make sure teachers have the proper profile. Maybe schools should be less formal.

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Stick to the process; see what teachers, students and academic administration want. Target the weaknesses of existing way of doing things. Focus how to save teachers time, increase student motivation, reduce stress of administrative overhead communications. Change the activity, curricula, and assessment, even the existing technology practice to improve process performance. Culture is the greatest support or barrier, will study the culture of organization, family, society and individual practice. I shall use the approach in which culture like it. Catchy top technology with high brand for some and very low cost usable for another.

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If a had a magic wand, I would make employers and bosses realize that learning is not what happens in seminar rooms when they bring a high-priced speaker to "motivate" their people to do what they want them to do. Learning is something that you must allow time for, and it's a conscious effort that does not happen automatically. I would create spaces in offices that are conducive for learning, not just work. As far as HE is concerned, I would do at least half of it in real workplace settings and from an interdisciplinary perspective.

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I would like to go a step beyond recommender systems. Even in the case that a recommender system recommends the best resource to the user, it does not mean that this is the best resource that can be obtained. My point is that with the existing resources it could be possible to generate new resources which can be more suitable to the learner. There can be several operations to obtain a new resource from existing ones. A post-recommender system could be able to apply operations to resources, obtain a new resource and provide it to the learner. Maybe there should be several steps before reaching such a tool. But it is possible that integrating existing technologies it could be possible to obtain a first approach.

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I would focus more on the concept of the creation of informal learning environments either supported by technology or not.

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Big classes with many different corners where different things can be done. We should have different teachers running them and moments for listening and moments

for working in groups. Guaranteeing a balanced diet is important to focus attention. I think this is an important problem in countries where we have late lunches, like Spain.

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Future education could be more personalized so that it could help students to learn on their own way. So, students could be in class and attend to all subjects, given the opportunity to focus in the subjects that that fit their own interest (and intelligence). Students will be able to proceed in the next level or class when they finish and not when the educational system imposes (one student can finish school in 8 years and someone in 12 years). In addition, personal online tutor, exercises and feedback should be provided to students. Finally, education could move from the traditional class to the real authentic environment. Students should learn language or mathematics in the real context that is used, so education (teaching, learning and assessment) should be as authentic as possible. Future education in two words: personalized and authentic.

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I would like that children could learn in a more funny way. They should learn in a more open situation, where is not mandatory to stay seated five or six hours each day. They should have more opportunities to learn from practice, explore (in the real life and on the web) and then reflect on what they learn with their classmates in short dedicated sessions. It is not a so innovative scenario but it is quite far from reality (unfortunately).

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I would teach others how to do magic. We discuss together what do we need to learn other subjects, where I would suggest to: exclude politics from education; allow students to have own opinions; train teachers how to learn from students; test prospective teachers how much humanity they have with all the technology we use, emphasize the real-life experience no matter how expensive and difficult it is provide learners with free time; let the young choose what they wish to learn without stressing them with possible difficulties in a certain profession; keep everything open and free to use (we are all still magicians). Do it.

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I am developing new strategies right now in my school - management, teaching, learning and environment, I like classrooms what are different and equipped with the different tools to use when they are needed. technology is there to support us but there are still papers and markers etc that is missing right now because of the budget. Every class has movable furniture, 4-5 computers to groupwork, different gadgets GPS, cameras to do videos, pictures. Projectors, TV, podcasting is average tool. We have different supporting learning systems what is easily changed into PLE or VLE when needed, the systems are more intuitive and widget like but they all communicate if needed or share same database. There are more tools to analyze what everybody is doing like measurements of interaction and thinking. There are no room for competitions and "I must be the best" its very individual because its learning not running. Feedback for everything is not needed, exams are not needed, you would be evaluated as your life goes along anyway. And every teacher knows that technology is not the object (goal). The process, globalization, real life problems etc is important. In our schools there should be lots of game consoles and staff you can move with your hand or see thru your "glasses". Teacher can be a wizard who shows us the "world". Also there is more communities. With parents, other adults, teachers. They speak (innovate, manage) more, do less themselves, asks to participate more and learn more from the students. But telling a story is the most powerful tool of all times, you cannot beat that.

I'd suppress the anxiety out of the whole educational environment, specially during assessments. In this way, assessments would be "fun" to have, instead of a bad experience. For this, I'd create a complete assessment solution (methodology and tools) that enables the evaluation of the students in a way that they enjoy and probably without even knowing that they are being assessed. This would enable that students wouldn't have the issue of getting nervous during answering an assessment and the teacher would be sure that the student isn't failing because of that reason.

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I do not change education; I change the people view of the money, benevolent, nature, the usage of recourses of our planet. So, in such case people will find the optimal way for learning by themselves. Maybe it can be with or not the technology. Maybe they will need some more powerful things than technologies.

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While we waist our days a lot of time in setting up learning situations, a more intimate support (for example "on the fly" support with resources for educators) would be great. I would like to have tools which support me with my learning needs instantaneously. One example. If I want to use a resource, which is not planned in from the beginning of an interaction (lesson). Without magic it would interrupt the interaction, because it is time consuming to retrieve it. In time support with technology (quick access, finding relevant things, and instant sharing, and manipulation), and a mindset of leaving pre-structured lectures to be more flexible for the moment would be magic.

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I would return the old standards - teaching kids to read, write and count in the 1st grade (age 6-7). Kids have to know the difference between school and kindergarten so I would make sure that they concentrate on learning for at least some hours a day. A computer is one of the most basic instruments that is used in everyday life and should be therefore used in schools and education on regular basis, but reasonably - not every activity is more effective on the computer than in classroom. The kids need to be aware of the things they do on the Internet - they should be educated about the safe use of Internet, and good practice. They should still have some privacy in their own life, go out and explore things in nature. People have to be digitally literate so the computer science in elementary schools should be compulsory and not voluntary as it is now. ACM K-12 curricula for computer science should be followed. Kids should learn by example, through different activities that would be interdisciplinary. Learning through serious learning games and in virtual environments should be complemented with interdisciplinary learning activities in nature and in real world.

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If I will be a magician, I will every month for a few days turn off the mobile connection, internet connection, bring the students in to nature and then will take technologies of nature for their learning. They must be do different task that will be given to them. After that the students must be come in the classroom and share they experience doing given tasks. Left time of month they can work with needed technologies according the subject.

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I would like to be able to learn anywhere, any time (even while sleeping), without any device and technology. Just by thinking and discussing with other people. May be find the answer by only thinking or just by touching to objects. It should be personalized learning so you should feel necessary to share and discuss your findings with other people.

I am passionate of technology and I'd like more to change education with technology rather than without it. My very wishing vision is that to have education freely accessible and affordable for everyone everywhere and anytime. One solution is, as mentioned in the lecture, OER, which can bring education at everybody's disposal. The role of technology in envisioning this is very important by providing the required infrastructure and adaptive systems which meet the needs and preferences of learners.

I hope that in future all people can find answers to their questions just by thinking about them. Instead of teachers there should be exist one figure to do the right questions according to the person's age. The education would disappear to give place to learning that should happened everywhere at every time. All knowledge would be available to all people simply because they think.

I would create multidisciplinary communities of practice for every topic. People around the world could collaborate to build their learning. The concept of course would disappear and people could choose to study just about the things you are interested (but you could be guided by a mentor). Also, summative assessment would disappear just remaining the formative part.

The scenario is give by activities where the students can keep a real touch with their classmate and teacher. So, they continuously publish information in tools as twitter, create and share information in social networks about of topics of class. The teacher promotes a real participation of the students who propose the topics and tasks. So, the activities are attractive to students and they are done from the contextualized scenario. Also the teacher help to the students to realize of the importance of the responsibility, but like a competence they have kept in any subject. They will understand that if wish to reach a knowledge building they have to do participations of high quality. Besides, they will think in the learning like a team where if somebody win it's a benefit for all.

## 6.3 Appendix: Future scenarios received before MoM2

### 6.3.1 From Gerhard Fischer

Two Future Learning Scenarios — Inspired by a Long Tail Framework for Future Learning

**Vignette1: Costume Play**

Shea is a young adult who has developed a deep interest in “Cosplay” (short for "costume play," a type of performance art in which participants don costumes and accessories to represent a specific character or idea. Characters are often drawn from popular fiction in Japan, but recent trends have included American cartoons and sci-fi as well as other pop culture and role play). Shea spends a large amount of her free time working with a group of friends on designing and sewing their own costumes. Much of their effort is focused on preparation for special events such as Nan Desu Kan (NDK), an annual anime convention (which has grown from 200 attendees in 1997 to 21,000 in 2010; see http://ndkdenver.org/info), and more recently, the NDK New Year’s Eve 2010 Costume Ball. These events provide an opportunity to show off participants’ work and creativity as well as to socialize with and gain inspiration from other Cosplayers, ranging from those who purchase their costumes to others who also design and create their own garb.

Shea’s interest began when she was a pre-teen—her social group became interested in anime, viewing Sailor Moon videos and subsequently role-playing Sailor Moon characters. This led to other activities such as drawing new characters and costumes and writing their own stories. Shea’s own interest in writing grew through these activities, with the additional impact that her interest in history expanded as she strove to place some of her fictional stories in specific historical contexts and wanted to provide as much historical accuracy as possible.

During college, Shea and her friends decided to put together her sewing skills and their design/sketching skills to create their own costumes, beginning with simple attempts for their first NDK. In subsequent years, much more elaborate efforts evolved into a year-round activity with a weekly sewing night. To avoid being the critical path and becoming overworked with sewing, Shea worked with her friends to teach them how to sew their own costumes, especially as additional members joined the group and Shea migrated to more of an advisor on many of the individual projects.

In addition to sharing what happens at the events, there are resources for Cosplay activities such as the forums at http://cosplay.com and extensive information on sewing techniques at numerous Web locations. Much information was learned and shared at the peer level as well as with local resources, such as sewing and hobby stores.

**Vignette2: Long-Term Learning in the Energy Domain Supported**

Finding Relevant Knowledge: When Joe creates a profile in SPELE (=A Social and Personal Energy Learning Environment), as an optional step he is asked to enter his account information for the social web applications he uses, one of which is Foursquare. Next, Footprint, a module within SPELE, retrieves the places Joe has visited by utilizing the Foursquare API. Footprint compares these data with information from the Google Maps API to determine whether there are modes of travel other than a car that Joe can utilize. SPELE combines these data with the local bus schedule and shows Joe that there is a bus stop only three blocks from his apartment. He notices that there are several reviews by other SPELE users regarding

a bus route that will take him to work. Exploring these reviews, which all have a high relevancy score, Joe sees that each one rates the bus as being reliable and comfortable. He decides that he'll try taking the bus the next time he heads into work.
Knowledge Creation and Sharing: Joe recently joined the RASEI lab at the University of Colorado, which utilizes the SPELE system. Since he used SPELE to help reduce his carbon footprint by finding alternative modes of transportation (Scenario-1), Joe is looking forward to also using the system in the workplace to reduce his impact on the environment. Logging into SPELE and viewing his lab's energy profile, Joe notices that the energy consumption per person in his lab is a lot higher than that in other labs in the same building of similar age and construction. He runs an analysis of the lab's energy usage and sees that its baseline consumption is a lot higher than that of the other labs.
SPELE offers several explanations for this and supports Joe in the investigation of outdated appliances (such as refrigerators, computer servers, or air conditioning units) and extreme thermostat settings. Joe can eliminate the thermostat settings and air conditioning units from the list of things that he can adjust because those are centrally controlled in the building. Joe uses SPELE to look for the lab's servers in the built-in energy database to compare them to servers used by other labs of similar size. He finds that most of the similarly sized labs do not run local servers but use integrated online services to store and back up their data. Looking up the lab's refrigerator in SPELE, he learns that it uses 50% more electricity than newer, more efficient models.
Joe accesses SPELE's energy simulator to determine what impact replacing the refrigerator and switching to cloud-based services would have on his lab's energy usage. The simulator shows that if Joe were to exchange the refrigerator with a more efficient model and replace the servers with a cloud-based system, the lab would be using less energy than most labs of similar size. Joe saves the simulation and makes the findings public so that his coworkers and other SPELE users can learn about his findings.

**Analysis of the Two Scenarios**
With the support of SPELE, Joe, as evidenced by Scenario-1, is able to see, understand, and judge the options he has to reduce his energy consumption when traveling by making educated decisions instead of relying on guesses or feelings. The integration of external information sources such as Foursquare or Google Maps allows him to go beyond simply reading numbers and statistics and get personally meaningful information. In Scenario-2, the collaborative body of information provided by other users, enables Joe to investigate and explore how to become active in using energy more efficiently. The open architecture allows him to go beyond being a consumer and to contribute to SPELE.

***Some Theoretical Background***
Human Learning and New Media. Exploring the opportunities and the challenges of a Long Tail framework for human learning with new media learning and discovery [Collins et al., 2009] is a fundamental and large-scale undertaking. Associated with this topic are numerous questions, which are explored by researchers in different contexts, including:

- rethinking education and schools in the age of technology [Collins & Halverson, 2009] including the *integration of formal and informal learning environments* so they successfully complement each other [Bransford et al., 2006; National-Research-Council, 2009];

- analyzing the numerous ways in which old and new media collide and offering the potential for new *synergistic possibilities* [Jenkins, 2006; Slotta, 2008]; and
- exploring how people come together and learn from each other in a world where tools for collaboration *are not solely in the hands of institutions and professionals* [Benkler, 2006; Shirky, 2008].

Inspirations for these approaches:

- Illich's vision of *"Learning Webs"* [Illich, 1971], which anticipated the possibilities of cyberlearning (including: reference services to educational objects, skill exchange, peer-matching, and reference services to educators-at-large) 40 years ago and outlined some of the unique possibilities;
- Rogoff's concept of *"Communities of Learners"* [Rogoff et al., 1998], which transcended one-sided frameworks (such as "adult- and child-driven learning");
- Resnick's *"Computer Clubhouses"* [Resnick, 1998], which are out-of-school learning environments that encourage young people to become designers, inventors, and creators as they work on projects based upon their own interests, supported by adult mentors and other youth (these have evolved into the Intel Computer Clubhouse Network (http://www.computerclubhouse.org/);
- Gee and Hayse's research on *public pedagogy* and *affinity spaces* [Gee & Hayes, 2009], which illustrate the possibility of learning outside of school in areas learners choose and for which they are motivated; and
- Engeström and Sannino's framework for *expansive learning* [Engeström & Sannino, 2010], which focused on helping practitioners to generate learning that grasps pressing issues humankind is facing thereby creating the challenge for learners to learn something that is not yet there.

### 6.3.2 From Michelle Selinger

Jay is studying at a local university and has selected a vocational avenue. Part of his time is on campus but much more of it is in the community. He works part time and is mentored by a senior co-worker, who in turn liaises with his university mentor. His programme of study is defined by Jay's interests, supported by both internal and external experts, and often goes beyond or outside the core curriculum which has become minimal to allow for knowledge creation and authentic learning opportunities.

He is mainly taking modules, from his local university towards a degree whose title is yet to be defined. He will take between three and five years to complete it, and will use some of the modules towards an M-level program. Other modules are taken virtually with other providers whose courses are accredited towards his final qualification. His studies are directly related to his are work, which is supported by his employer, but go much wider so his life chances are not reduced. A considerable amount of Jay's time is spent time working on developing ideas with peers who are either work colleagues, on his university courses and others who are people he has met online and who have similar interests. He has a number of communities from which he has his thinking challenged and understanding enhanced. Amongst a subset of his peers, meetings are rarely in person since they are located around the world. All his online encounters are recorded *when* he chooses them to be and his contributions are analysed automatically and count towards his final assessment.

His work experience also counts towards his assessment. Assignments are multimodal and there is a mix of collaborative work and working on his own. Some are undertaken in the workplace and others in an academic setting. The balance between collaborative and individual assessment is attributed accordingly and is dependent on the relevance of collaboration on the area of work or study and students' learning preferences.

Lecturers are perceived as co-learners, albeit experts in their domain, and they help students to make sense of, and help validate, the rich array of digital based resources available across the Web.

The virtual learning that Jay undertakes has considerable amounts of synchronous activity over video, IM and audio. On campus a number of experts are beamed in via video, often together so students can observe debate amongst these experts, and also take part. Asynchronous tools are still used, but the use of social media makes them highly engaging and reaches far beyond the institution's firewalls. Lecture capture has changed: it is much more interactive and used as the organising framework for accessing resources, eliciting questions and critique, and soliciting feedback.

### 6.3.3 From Ayleen Driver

In this scenario the educators have realised that they are preparing young people for life, therefore in addition to academic and practical skills, they will want to teach the following abilities:

- The ability to build rapport, empathise and connect with others

They might **build rapport** by explicitly teaching some basic strategies, for example: *If someone tells you some personal detail about themselves and you want to build rapport with them, you should try and disclose something similar about yourself.* This sort of information could be delivered and tested (with a simple multiple choice exercise) using an application on a smart phone or similar. When the basic skills were learned the students could practice, possibly as an avatar in Second Life. **Empathy** might be encouraged by getting students to examine situations from different perspectives. They could be shown a short video clip featuring a number of stakeholders and then be asked to role play one of the characters and feedback about how they feel. With headphones and a microphone students could watch the scenarios on any device and then when they feedback they could speak in their own words but an animated character would deliver them and their voices would be altered to fit the character they were representing. The students could retain total anonymity if they preferred and all those involved could peer review at the end of the session. **Connecting** with others and collaboration will be second nature for most young people in the future. Those prevented by a lack of technology, or prerequisite skills needed to exploit it, will be even more seriously disadvantaged than they are now.

- The ability to work in a team, be creative and research

In the future I hope we will empower learners to take a greater role in their own learning. I feel that the style of learning offered by 'Personalisation by Pieces' (a suite of online tools) for accurately assessing learners' competencies will become more widespread. www.pbyp.co.uk
Any competency can be added to the PbyP. A license provides each learner with their own Profile, e-portfolio and secure login to access these from home and school. Each

learner sets their own targets and submits their own evidence.There is a focus on **Development of skills and competencies** for learners of all ages through gathering and recording of evidence from life in and out of school. **Peer assessment**: evidence is peer assessed by learners from other schools all over the world who are developing the same skills. This is anonymous and moderated. All users become learners and assessors. **Mentoring:** all learners are given a mentoring role for another learner with structured mentoring meetings and resources on the website. Every user is a mentor and a mentee. The program works on mobile phones.

### 6.3.4 From Pascal Lardeux

**A Training and Learning scenario within Mr. Joe's LEAN Company.**

Mr. Joe arrives on a new job without any of the specific skills required by the job except his willingness to learn.
His boss, very busy, has only the time to say welcome and send him a link on the Company intranet.
This link is leading to the Key Success Factors Profile which has been specifically assembled for his job.
In each skills area, a set of assessment tools will help Mr. Joe to identify a personalized training plan.
The assessment tools are made both of knowledge tests and simulation tasks.
According to the level of mastering required by the job, the deepness of the assessment system is automatically adjusted and the output as well.
Modeling of the assessment system is built on knowledge mapping and standards which are periodically revised on feed-back evaluation reports.
As an output of the assessments, training plan is designed to respond to the objective: facilitate, optimize and speed up learning on the job.
The core of the training plan is about standards to apply in order to play roles and perform tasks accordingly.
Mr. Joe is also invited to identify and record his current skills in a nominative data basis. This data basis is a resource to get tutoring on know-how, available from a training sequence.
Areas of skills are indexed into an "informal learning" resources environment made of training material but also documents, links, forums etc … This learning environment, highly available, is maintained by Knowledge Managers with the experts on these areas.
Everywhere standards are not playing or not operating to the expected results, Mr. Joe is invited to share and report the gaps within the appropriate on line network. Under the supervision of the owner, research, discussions, proposals are done to close the gap, create or improve the standard as a reference. Documentation and training supports are updated. Communication is pushed toward the users.
Mr. Joe is curious and active, each time he is confronted to different situations which need modifications, adaptations, improvements, he is contributing actively by his learning's to the common standards and becomes an expert in some areas.
Then, as an expert, Mr. Joe is asked to formalize and teach his knowledge through the knowledge mapping reviewing and the assessment tools revision. Perhaps will he be also sought to build some new training programs.

### 6.3.5 From John Alonso

It's been 3 weeks since Paul was hired and he is getting ready to visit the main company campus in Germany. He's been impressed by the entire process of getting acquainted with the company and everything that he is being exposed to. He knew that it was going to be different to work for such a large global company, but he didn't think it would be this easy for him to understand how the company worked.

He was very surprised that on the first day, he was given a laptop … asked if he wanted a new smartphone or if he preferred to use his. He was also surprised to be asked if he had an eBook reader, a tablet and what type of gaming system (if any) he had at home. It was explained to him, that the company had a "learn the way you want" mentality and that in the end, as long as he was comfortable and could perform the job functions … any way was possible, and ok.

The first orientation showed him the application to install on his smartphone. This app Paul would come to realize would become a "gateway" to communicating with the knowledge of the company. He was also very surprised to find out that anything he needed to read was available in his favorite tools. The company history was something that he downloaded to his Kindle. He liked that he could read it as he wanted, using any of the kindle apps … this let him take advantage of the commute by reading sections on his phone. He was also very happy that there was a personal YouTube channel for him … not a channel for the company … but one for him.

Paul's channel had all his welcome videos, plus several others. He could access them from any device … including from his TV at the house, the computer in his kitchen and the laptop he was given. Paul loved that the channel would sort the videos based on what he was working on and learning at the time. He liked that the company wasn't telling him how, when or with what to learn, but giving him many options for him to choose from.

Paul very much liked the companies communication system … which he always thought was email … he came to realize, that it was much more than just that … it allowed him to communicate by SMS, voice, email, twitter, etc. He could define how he wanted to get information, restrict times, approach and devices based on his preferences. He very much started to understand that as he communicated with his coworkers and colleagues, the system would provide a list of suggested content that could help him. This was just like his personal Gmail account … but rather than ads appearing, he would get links to content, videos, twitter feeds and other items … solely based on the conversation in email.

This was great … when he received the email explaining the trip … the content links included a map of the company campus, a quick lesson on basic German, several links to "things to do" in the area … Paul's favorite was probably the "what to expect" video and "getting the most out of the trip."

He enjoyed the virtual walkthrough of the campus on his computer. He liked that the sim asked him to use his phone and point it's camera at picture of a building. It was very cool that the phone then provided details of the building, what departments where there and pictures of the people in the building. He liked that when pointed his phone at a picture of the map of the campus, the building would light be highlighted to show where his meeting would be and have text showing what the meeting times where.

After playing for a while with this, he wondered if this would work without the sim. He pointed his phone out the window at one of the local buildings; excellent … it showed the details for that building, who worked there and so on, just like in the sim.

He started to appreciate that whenever he needed to prepare for something, he would be provided with a list of suggestions; he could also always just type in a search criteria and look for what he needed. He liked that the company didn't force him to just go through stuff, like in previous companies he had worked at … he very much liked that they would explain the goals and objectives that he needed to meet … and it was up to him to choose the best way to do it. He appreciated the tools made available that would help him figure out his areas of need and present him with suggestions. It was nice to be able to take a quick quiz, figure out that most of the stuff he knew and just be pointed to the area he needed help with.
He was pleasantly surprised that the company was helping him make friends as well … when he received the schedule of meetings and objectives for each … he also got the list of people attending … as he was going through the sim on the campus in Germany, he noticed that there where many people online doing similar things. He noticed that a couple of these where highlighted … then noticed that these where the people in his upcoming meetings. When he watched a video or read content, the people doing the same thing where always identified … As he hovered over the icons of the people, he noticed he could chat with them …
It's now 3 days until his trip … and Paul has an email explaining an option that called "Pack and Go". Apparently, it will download all the content that he is in progress with to his laptop, his phone and even his tablet. He was impressed that it included the interactive lesson, a couple of video and several documents and blog posts. This way he could finish going through them during his trip.

### 6.3.6 From Lisa Petrides

**How a Person Can Learn in the Future**

Without going too far into the future, that is, where verbalized and articulated knowledge that we have is fed into a chip that resides within our brain, while a computer analyzes that data as well as data in related environs (perhaps in those we friend in BrainBook) so as to recommend improvements on what we know on a regular or scheduled basis, I can say that I feel fairly certain that learning will become more interest-driven in the future. Today our formal learning is fairly structured and may be based on what a certain desired curriculum is for a given grade. A learner in the future is more likely to be guided by the likes of Wikipedia and even more sophisticated aggregations of information and knowledge than we have today. They will be taught or guided by those who have deeper knowledge about a particular area of interest, as well as by those who simply have had prior experience in that area. They will also acquire new learning by doing everyday things such as riding on a subway and figuring out, for example, problems that have to do with distance traveled and energy consumed (these "learning occurrence opportunities" will be scattered throughout cities and generated regularly).

A learner with a self-interest in a subject matter will find (or be matched via AI) a just-in-time mentor or guide. It may be a (a)synchronous mentorship, or simply a video that the guide has left on the Internet for anyone to use, that helps push you to that next level of learning.

Also, as a potential learner, you will be able to easily find others like you who have the desire to learn them same subject, and you will collectively work to learn that together. It will be important to track and remember what you have learned, and you

will be motivated to take ongoing assessments as a way to register that knowledge. Once you have taught others that subject, you will receive additional learning points. Experiential learning will be a big part of learning, both on the part of the teacher as well as the learner. A learner will be encouraged to spread that learning over a lifetime, as certain social services will be able to be bought with your learning points each year. This is a mechanism to ensure that people in fact continue to learn every year, not just within the confines of a traditional formal education or vocation.

Also, actually applying the learning you have acquired will be seen as a higher level of learning than simply having learned something. And the ultimate learning level (equivalent to a doctorate now, for example) will be when you have successfully unlearned something due to failure of its application, and then demonstrated how you have improved or adapted it moving forward.

Oh, and did I mention this is all freely available and open? ☺

### 6.3.7 From Elisavet Linou

A middle school classroom is learning history in Athens, Greece. Students are sitting either in groups, or alone, creating content to share with students around Athens and around the world on Greek history. They have used their individual ipads to download (or create) an app that will link stories and comments to GPS locations around Athens. [In a previous class, they walked around the city, selecting locations they wanted to learn more about.] Communities of students grow around individual locations that are most interesting to different students (foursquare style). Students can "like" a location and upload comments or historical references, record and upload oral history accounts from the community around the site. They can also develop videos and art to share with other students, teachers can provide texts, or background reading, and students can "read along" with other students on texts that teachers upload. Teachers can use an open platform to crowdsource history questions or challenges for students that relate to a given historical site.
The goal is to show overlapping periods of history in ways that put student experience and representation first. Students learn that various interpretations of history can co-exist. At the same time, teacher curricula are built around various perspectives, in many media forms. Material is shared between students, schools, and amongst teachers in open platforms.

### 6.3.8 From Florian Schultz-Pernice

Learning is generally defined as the acquisition of a stable behavioural potential in an organism on the basis of experience. If we take this for granted, the acquisition of what is most commonly referred to as "knowledge", i. e. declarative knowledge relevant to the educational and economic system of a society, is only a minute part of what learning in its full scope is really about.

The educational system of any society, however, as the result of a specific social and cultural evolution, is only partly concerned with this kind of knowledge. To be sure, qualifications such as fundamental cultural techniques rank high among educational goals, at least when it comes to intended goals. However, the function of educational institutions and of the activities undertaken by societies seems to be concerned with a much more general goal, and that is the production of social coherence, cultural identity and continuity. This is achieved by educational activities in the field of

qualification and professional knowledge just as well as in the field of, e. g., the passing down of cultural narratives, culture-specific behavioural patterns, shared schemas and scripts, values, rituals, emotional patterns etc. Thus, the learning processes organised by societal institutions are invariably highly complex and often somewhat diffuse, especially and most conspicuously in schools, probably less so in the field of vocational training or college education.

Learning scenarios of the future have to take this into account if they want to have an impact on educational practices – namely the fact that they are part of a culture whose main goal is not primarily or at least not only the advancement of learning.

As a consequence, there will be no one learning scenario of the future. There will be many learning scenarios of the future which have to be highly diversified, first of all as to the educational goals they aim at – whether they be declarative knowledge about the world, basic cultural techniques such as reading, highly complex integrative competencies such as essay writing, the reflection and eventually compliance with core values of our society, the ability to decode, cherish and value outstanding works of our cultural tradition etc.

Secondly, learning environments will have to be diversified with regard to their respective addressees, the learners – in the context of vocational or professional training the conditions of learning are naturally much different from the context of, e. g., schooling, where the "educational" function is often predominant. Accordingly, also the learning scenarios and in which ways and to which amount they might be enhanced by technology, will have to vary greatly.

Thirdly, learning scenarios will have to be diversified as to the reference system which is supposed to learn. In a traditional learning environment this would typically be the individual, as it is the individual pupil, student or staff member who will be addressed in learning scenarios and who will in the end be tested and, if successful, benefit from his learning process. However, as concepts like collaborative knowledge construction gain ground, learning could also be conceptualized as the learning not of individuals, but of social systems (e. g. a learning group or an institution).

Thus, a possible concrete learning scenario of the future might look like this. I will take as an example the traditional cultural prototype of learning – that of a child or an adolescent at school –, because here we have probably the most complex interplay and entanglement of societal goals, cognitive, emotional, motivational factors, political influences etc.

There might be various fundamentally different learning scenarios and learning environments a typical child of the future might be confronted with on a regular basis. They might vary greatly according to their respective learning task. Imagine a 12-year-old student and a day of his learning biography.

His (or, indeed, her) day will typically be divided into different learning periods with some of them involving work on one's own, some of them involving group discussions, some of them involving that the learner be coached or supervised by a trainer or teacher. Knowledge acquisition periods will alternate with periods in which social, creative-artistic; sports or practical activities – and thus other types of learning

processes – prevail. Whether the learning goal is individual knowledge, insight and understanding, the knowledge of a group (social system), skills, or personal convictions, the learning environment will be specifically designed to meet the respective needs of the learner and the task at hand.

Thus, the student will probably often learn by himself to acquire basic knowledge, he will use elaboration tools (either computerized or paper and pencil) to account for his knowledge structures, he will take notes, visualize structural relationships or write an essay. These learning periods will be much more individualised than was possible in a traditional classroom. And they will be supervised by a learning specialist who is always accessible when needed. Assisted by relevant software, the teacher or supervisor will be able to check and analyse the student's results and will be able to give individual feedback on complex matters (whereas in less complex cases, feedback will be provided by technology-driven systems). Knowledge-acquisition periods will often make use of multimedia and online-resources, typically varying between closed and open learning environments, according to the stage of knowledge-acquisition, subject-matter, learning attitudes and preferences of the individual learner. This also means that the learning environment offers the student and his supervisor a multiplicity of methodological approaches and media resources.

When it comes to other types of learning processes such as, e. g. the acquisition of analytical, hermeneutic and aesthetic categories and competencies with regard to language and literature, the fine arts or music, the learning environment will be different. Such learning processes would probably generally rather take place in a social environment where the main goal is the negotiation of e. g. individual interpretations, readings of literary or philosophical texts etc. Here, traditional approaches of teaching, such as the "Socratic" method consisting in dialogue, face-to-face interaction and personal communication, will predominate. This means that dialogic periods of cooperative knowledge construction will play an important role in the learning scenario of the future – that is, whenever there is need for negotiation and consensual knowledge construction.

A third type of learning scenario might be one in which neither the acquisition nor construction of individual knowledge is predominant, nor the construction and negotiation of social meaning and culturally shared consensual areas, but the acquisition and training of personal or social skills. Also here, direct social interaction seems inevitable or at least most conducive as a medium of learning.

Even if there are much more learning scenarios which could and should be specified, it seems clear by that all learning takes place in a cultural context and that the organisation of learning is always influenced by a specific cultural heritage. If we take this into consideration, it seems quite plausible to ask ourselves whether any vision of future learning scenario can indeed be relevant if it does not systematically take into account the traditions and institutions the pertinent culture rests upon. To take such a seemingly culturalistic stance on the question of learning scenarios which indeed make sense to a culture is not to deny the necessity of change in the educational system. On the contrary, such a view only raises the question as to the kinds of changes which are possible at a given moment in a society and what has to be done and can be done if you want to contribute to a future of learning that really makes a difference.

### 6.3.9 From Denis Gillet

**Dissolved Learning: The Augmented Little Humans**

Between 0 and 6 year-old, little humans learn from any interaction opportunities and activities without even noticing and driven by their instinct to explore and exploit their environment and its population in order to get food, heat, and safety. Later, when they go to school, one tell them that learning is a serious business that can only happen under supervision, and they start to loose their innate learning abilities. Thank to social media and the large variety of interaction devices, the little humans have now an opportunity to reappropriate learning and to bring it back as part of their social life.

Her dad brings Little Girl for her first day at school, on September 1st, 2020. When all the little humans enter the class, mobile and embedded devices (communication units and body sensors embedded in their clothes, glasses, fashion accessories) are recognized, clustered and display anonymously on one of the class transparent wall, including their owner's localization in the class and in online social media platforms.

The first activity is a workshop on identity and privacy. The teacher uses the information from the wall to discuss opportunities and risks of sharing identities and information with others. The little humans then choose the pseudo they want to use at school and they introduce themselves (their real and virtual identities). They can decide which info they share with whom and in which context. Little Girl decides to share her emotional state with the teacher only when she is in the classroom (with a few gestures on the wall). She also decides to share her drawings and notes from her digital paper only with her two best friends (their faces appear on the top of her notepad). She can tag notes with her dad's name when they are related to iCraft (the new name of homework introduced by Apple to promote its iPen technology, which is called iPain by some kids). Obviously, little humans have the opportunity to change their sharing preferences at anytime from any place and with any device.

As the digital paper is a great aid to train handwriting thanks to its built-in recognition and recommendation feature, the handwriting lessons have been replaced by communication workshops where Little Girl practices discourses with her peers. Her preferred subject is the Sustainable Planet. Her science teacher is digging in the online discussions of the class to select the subjects he will discuss with them the next day. The science teacher is a student at the nearby university. Since the suppression of the military service in all European regions (formally known as countries), each student dedicates two weeks per year to train pupils in his/her domains of competences online and at school. Just 4 years after the introduction of science students for teaching math in primary schools, the proportion of kids choosing to study science and technology has increased by 50%.

Two years later, after the four traditional daily contact hours in the class, Little Girl decides to stay at school to do her homework (i.e. her iCraft). She tags her math exercise as challenging and folds the help corner of her notepad. She automatically gets on her digital paper the geo-localization of all her friends from every study degrees located in the neighborhood and with good competences in multiplication techniques. After a short chat with her elder brother best friend (pseudo Math Doc) which is located in the building, they meet face-to-face and they practice together with a game available in Mindville (the social platform which took over Facebook in 2015 after the child abuse scandal which confirmed the low privacy enforcement policy of the latter). Thanks to this action, Math Doc will get 5 ECU (the newly

established Educational Currency Unit used for knowledge and competence bartering) that he will use later to get accepted in the advanced science modules offered by MIT −Everywhere. The completion of these modules will be recognized to get ECTS credits in his part-time curricula at EPFL. His other part-time job is with a NGO recycling digital paper in developing counties to enable underprivileged children to get distant support.

### 6.3.10 From Lena Hofmann

Early in the morning the people get up – but not all of them as people now follow the principle of starting the day according to their own rhythm (early bird vs. night owl). Once the early birds have arrived at school they start by doing some morning exercise together with their teachers.
After having a little healthy snack (provided by the school's kitchen) together in the relaxing food area the children process to their classrooms and see the night owls arriving for their morning exercise.
In the classroom the pupils are joined by their teachers. It is always two teachers who are going to team teach the groups of up to 22 children. By following this approach the picture of the teacher in general has changed and people of this occupational group are no longer perceived as the slightly disliked know-it-alls but as experts that share their knowledge while being open for discussion at the same time. Furthermore pupils get more one-on-one attention by a teacher as both of the team have more capacities.
Besides this fun start to the school day there are still guidelines to follow for the pupils to follow and acquire general rules like 'always finish a task before you start with the next one'. During math education the teacher's first goal is to make the rules clear. Therefore they work with worked-examples and try to foster self-explanations by comparing different examples and adding gaps to the explanations. After repeating this procedure with several short examples the pupils are all provided with different mathematical problems / examples on their tablet computer which saves paper and at the same time makes it possible to adapt the difficulty of task to the learner's state of knowledge. Those who are already more skilled get examples that include mistakes and must be detected.
Following this course the children proceed to their art class. Today on the schedule: building a chair and afterwards colour it. Those chairs will then be used in the classroom if the pupils like to. First, the teacher shows how to start working with the material. Those of the pupils who already feel well prepared start with their own work. The others have the possibility to watch further models working on chairs in one corner of the room where some screens are offered.
During lunchtime all pupils meet in the food area including the night owls who join in for a healthy lunch followed by the afternoon classes.

### 6.3.11 From Peter van Rosmalen

**Scenario**
From: Ramaekers, P.P.J. & Van Rosmalen, P.M. (2002) Mining and Personal Knowledge Management in J. Meij 'Dealing with the data flood', STT Publication 65.

"March 2012: Ann recently started her new job at the microelectronics department.
For the first two months her task was to get acquainted with the company and to become aware of all the issues and knowledge involved in running the company. Her first task today was to instruct her personal knowledge agent to merge her personal

knowledge profile with the company's knowledge tree and her function requirements. Next she had to negotiate the access rights to the various parts of her knowledge profile. After this she left for a break. At this time her personal knowledge agent invoked a knowledge transfer process. Her personal knowledge agent entered into a dialogue with the user model agent, the domain model agent and the knowledge transfer model agent to prepare her personal internet with items of interest she could browse through and select for study, if she so decided. When Ann returned, her computer showed a map of items of interest to study, of people she could contact and a visualization tool pad to structure her thoughts as she goes through her knowledge space. In line with her background and her role some of the items cover topics in detail, other give just a superficial overview. Also in line with Ann's cognitive style her information space contains a large number of documents and an abundant list of topics. So she can really explore. Stepwise as she explores, her user model is updated and as a result of the continuous interaction between her personal knowledge agent and the three other agents her personal knowledge web extends and renews."

**Motivation**

This scenario was originally written in 2002. The reason I selected it for this event is the recent attention for the topic 'learner analytics'. As it was written in 2002 the scenario did not mention social or mobile applications, however, they can be easily included. The importance of the scenario (and the challenges it addresses) is the ease of use and the apparently seamless support given. The *user is in control,* however, concisely supported to assure that they make effective use of their precious time. In the example we see a lifelong learner. The user could as well be a student at a university or in primary or secondary education. Equally, the support given could also be to more concrete activities e.g., question-answering, feedback to written assignments, assistance in using a serious game etc..

The most important challenge met in this scenario is the (immediate) support the user receives to all its actions be it an essay they write, a question they have, a serious game they play, learning material they need, a competence plan to be developed or personalised etc.

There is a continuous stream of new applications and devices and an unlimited amount of learning materials. Users (students, teachers, institutes/companies) are constantly challenged to keep up to date. However, many of the possible offerings do require additional expertise to be able to use and appreciate them or too much additional work to use them to make them really competitive with regard to the enhancements they offer. At the same time, there are many educational activities that are in use but only limited supported and therefore are only of limited effect. Therefore the following challenges are of high importance:

- tools to support the learner / teacher (more and more effective with the same amount of time)
- research & innovation tightly coupled to Open Educational Scenarios (e.g., broaden OER to OES). This means research & innovation well explained and easy to embed.

## 6.4 Appendix: Detailed session minutes

### 6.4.1 Alpine Rendez-Vous

In order to jump start the discussion, Lena Hofmann presented the eight GCP's identified during the Alpine-Rendez-Vous 2011 workshops (see section 6.1):

- WS1: Develop an agreed set of principles for designing and evaluating digital technologies for the early years that are informed by an understanding of early child development
- WS2: Construct evaluations of TEL that allow complexities of interaction between policy, strategic leadership, teacher and student to be negotiated successfully
- WS3: Substantially improving motivation and learning of students in European schools by systematically using game-based environments informed by our emerging understanding of the brain's reward system
- WS4: Develop & validate approaches to empowering teachers & learners to take advantage of the potential of online tools for sustained and engaged collaborative activity aimed at improving or transforming learning, taking into account teacher and learner agency and motivation, the role of affect, the influence of the cultural context, the potential and limitations of different technologies, and the increasingly blurred boundaries between informal and formal learning
- WS5: The million practices & million teachers challenge: ad hoc formation of large scale learning networks
- WS6: Privacy, Data Protection, Surveillance in DataTEL: The DataTEL research must address issues with respect to data protection (or other relevant) legislation compliance, concerns with respect to individual privacy, as well as problems arising from surveillance (social sorting, cumulative disadvantages)
- WS7: A semiotic recommender system to decide which representation can fit learning needs at best
- WS8: Building a comprehensive framework for exchanging research data from different research teams in order to deepen the discourse, coming to a convergent interpretation and identifying further research questions

A lively discussion ensued after Lena's presentation. The most prominent discussion topics were:

- Learn from History?
    - Gerhard Fischer argued that we should take previous experiences with "non-uptake" of educational technology into account when defining new GCPs.
    - For example: LOGO project (Seymour Papert & Piaget): The impact of LOGO on the educational system at large is negligible (although it was perceived to be ground-breaking). We should study such "success stories" in order to understand what we can learn/do differently? Why did we have such high expectations and why did they not materialize? In addition Gerhard argued that we should look into the financing models: early childhood education versus higher education for free? Where do we draw the boundaries?
    - Ros said that we should take out complexity, by not worrying too much about earlier results.

    - Peter van Rosmalen argued that two years timeframe is too short for a grand challenge (as for some of those shown) and leads to oversimplification.
    - Michelle argued that the Internet was a big disruptor, and stopped a lot of research in its tracks. Peter van Rosmalen countered that we kept a lot of the ideas, even though the tools were lost. Michelle said that early years are poorly served.
- Where is the big picture?
    - Peter van Rosmalen argued that the GCs are at a too detailed level, very academic, with little impact on societal problems. Fridolin countered with "One tutor per learner" as a very understandable grand challenge.
- Is TEL different from other disciplines?
    - Gerhard Fischer said that "defining GCs" is very fashionable; they had their origin in mathematics. Grand Challenges on High Performance Computing are clearly measurable. He argued that TEL cannot be pinpointed down like other fields. Which measures should be applied?
- How to bring TEL into schools?
    - Allison Littlejohn said that looking at benefit models to stakeholders could help.
    - John Alonso replied that TEL also needs to go the last mile. Elisaveth asked how to get teachers to know about technology; maybe a GC is how to build take-up?

### 6.4.2 WP5 stakeholder engagement

Stefania presented the identified stakeholder needs and interests.

A lively discussion ensued after Stefania's presentation which touched on the following topics:

- Change on Company Level
    - Michelle said that industry needs to be segmented further as the needs of an IT company are different from a food producer. Our news messages should be tailored to the specific branches.
- Change on Policy Maker & Schools Level
    - Elisavet argued that other needs have to be taken into account, e.g. in policy, only a 6 months timeframe counts. She said that it would help most to find agents of change within the stakeholder groups. The trick might be to target needs of stakeholders beyond learning (e.g. for teachers: how to keep control of the class). Find "Power users" who speak the language of the stakeholders and work with them.
- Change on Teacher Level
    - Gerhard Fischer proposed to see role of teacher and learner in context. Sometimes the learner is the teacher and the other way round.
    - John Alonso asked how you turn a teacher into a facilitator? Is there research on this?
    - Ros argued that teachers are only interested in reaching their students' evaluation scores (what about their personal ones?). In the UK, schools with low scores are closed down.
    - It was discussed whether exams scores improvements indicate real change, and whether quantitative indicators make any sense.

    - Michelle added that we tend to measure stuff that is easy to assess instead of assessing the "right" things. How can we change this?
    - Peter van Rosmalen added that we should promote sensitivity for change and creativity.
- Change on Organizational Level
    - Peter van Rosmalen said that people don't think in abstractions, therefore STELLAR has to also address organizations and not only individuals.
    - John Alonso suggested working with pessimistic people, because what works with them will work with everybody else.
    - Michelle said that there are existing networks of teachers that could be leveraged.
    - Ayleen said TEL should not be about a shopping list of technology, but rather focus on what makes sense in a given scenario.
- Change on Learning Eco-System Level
    - Allison argued that what we need to change is the entire learning eco-system and that TEL is just a tiny microcosm within that. She said that she doesn't see real change.
    - Stefanie added that maybe we need a revolution instead of evolution (as said in the book "Learning in the digital age", the revolution will come when all students bypass the educational system).
    - Lisa Petrides said that students already bypass the educational system; as an example she mentioned the Granny Cloud. How can we make this trend visible? Because showing this might wake up decision makers!

### 6.4.3 Consolidation, evaluation and follow-up

The goal of this session was to consolidate results from the meeting, plan concrete follow-up activities and evaluate the meeting itself.
The meeting results are presented in more detail in section 4. At the end of the session, the groups raised issues and discussed ways forward:

- Group 1 – sweet skills: This group has agreed to write short scenarios (6/12 lines) from 6 different viewpoints based on an agreed structure. The result is reported in section 4.6.
- Group 2 – professional learning: This group has produced 3 power point slides and a catch phrase – learning technologies: a workplace multiplier. See section 4.5 for details.
- Group 3 – formal education: 4 slides have been produced and shared – they agreed to write redraft scenarios and turn slides into a short report. The result is section 0.
- Group 4 – higher education: 4 slides were produced; the next iteration was on track. The result of that iteration is section 4.3.

A general discussion ensued on how to take the outcomes of this meeting further. The most important issues discussed were:

- Production of an animation video to represent a scenario – interest in this idea and some experience/expertise in the group – concern about cost in time and money.
- Outputs from MoM could be used in:
    - STELLAR workshop at Eden Conference – June 21st

    - Workshop at EC- TEL Sep 2011
    - STELLAR workshop at On-Line Educa Berlin - Dec 2011
- How can we communicate with stakeholders?
- Suggestions for alternative ways for visioning:
    - involve more direct users – children – teachers;
    - crowd source – openideo.com – develop crowd sourcing scenarios – inspirations – evaluate other ideas – neurovation.at;
    - Barcamp- (Peter Kraker has experience of this ) openspace meeting – unconference – truly generative;
    - balance between top-drown structure and bottom–up generative.

Finally, we discussed how the meeting worked out.

- Lisa:
    - would have loved a list of everyone's names – maybe URLs
        - In the mean time, this report has been circulated to all participants, so that issue has been addressed.
    - don't under-estimate power of connections
    - marvelous opportunity to sit with people for two days
    - more direction and less structure: for instance, why doing the Delphi study – were we coding data?
- Pascale
    - sometimes lost in discussion
    - sometimes would have appreciated some reformulation: facilitation through reformulation within whole group
    - Delphi study worked well
- Florian
    - more structure about scenarios
    - structure emerged through work together
- Peter
    - introduction too detailed on grand challenge problems from ARV
- Elisavet
    - group worked well
    - first day possibly not orientating enough
    - hike, lunch and dinner very good idea (informal discussions)
- Michele
    - more about what expected from meeting
    - Delphi study not useful
    - would have been more valuable if aims of the session were clearer
    - small group work very valuable
    - keeping same small groups very valuable
    - but switching would have been helpful
- Ayleen
    - important to be in one group that reconvened throughout the meeting
    - extremely positive experience
    - lovely group
    - mix of people
    - openness
    - nice manners
- Gerhard

- how is STELLAR making progress
- how could that be better facilitated
- what could be better reward structures
- building community
- would put more efforts in because more rewards
- It requires a substantial effort
- synthesis
- curators to sort through information space
- ask Advisory Board to get feedback
- positive Delphi study
- challenge  is Delphi study in core agenda of STELLAR
- Reward: space for deep conversation for which don't have time to do at home

We discussed other kind of instruments (in addition to face-to-face meetings) that could be used to develop GCs and future scenarios?

- Crowdsourcing
  - use game-like environments such as OpenIdeo.com or Neurovation.at in order to distribute challenges and get the ideas of a large crowd
  - BarCamp "Unconference", open format, open participation, bottom-up, local (typically in languages other than English), high-risk

The main positive feedback about the meeting includes:

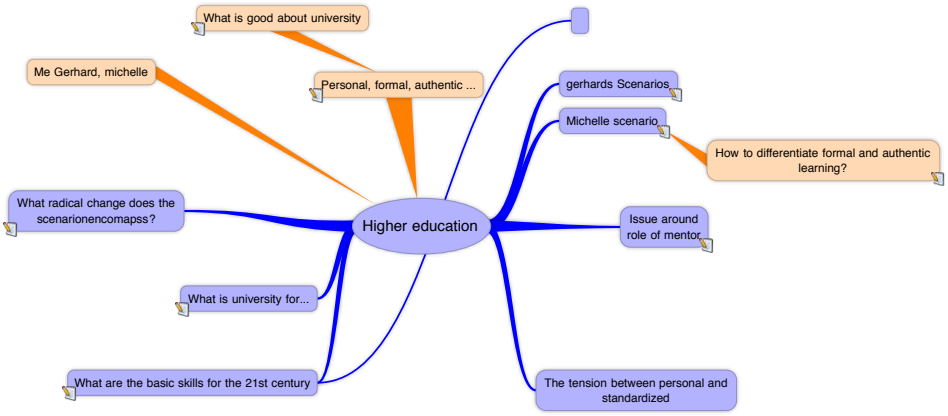
- good opportunity to share
- group work was really valuable, it is important to have same participants in groups over a longer period of time
- Delphi study was valuable in order to understand breadth of endeavour: it raised the question: What is the focus of STELLAR?
- lots of good discussions during "free time"
- extremely positive experience for people personally
- good mix of people made meeting a success

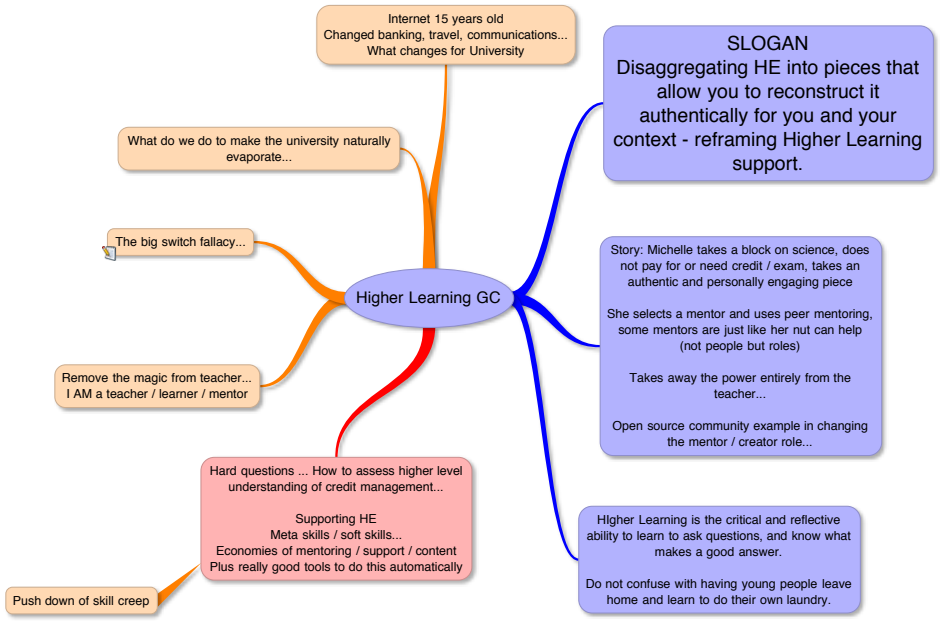
Suggestions for further improvement include:

- more direction, less structure (don't worry about influencing participants)
- assess progress and refocus during meeting (when in plenary)
- more direction in the beginning (e.g. how to write scenarios)
- do not overload with content (e.g. 8 Grand Challenges – which ones can we remember now?)
- distribute preparation, directions, goals, tasks before the meeting
- the purpose of the Delphi Study session was unclear
- how can progress of STELLAR be shown (e.g. how does ARV relate to the MoM2 event?)
- what could be a better reward structure for the external participants? This could be used to increase commitment.
- how to do synthesis on meeting outcomes?
- list of participants, URLs to their websites and e-mail addresses should be available at the meeting
- progress statements from time to time – so everyone gets a sense of where we are at

- scope of Stellar is very broad:  what is our core agenda (see tension between breadth and depth)

## 6.5 Appendix: concept maps used in Higher Education scenario discussion



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