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INTRODUCTION
This report is one part of the Deliverable 6.1 of IMAILE project D6.1 Recommendations of accommodating PLE in primary and secondary school.

The purpose of this report
This report is produced by 3 Technology enhanced Learning experts on global level in order to provide recommendations to IMAILE consortium regarding the IMAILE identified challenge – PLE (Personal learning Environment)

Personal Learning Environment (PLE) is quite a new concept. It was mentioned first time in a paper by Olivier and Liber (2001).

And therefore this guidance is needed as preparatory work to proceed with D2.1 (a complete need and market analysis) based upon a PCP methodology and according to the PCP instrument. According to lessons learned from previous PCP projects on EU level the key to success is a need-analysis and market-consultation stage performed in depth and with several aspects included. One important aspect is that the procurers from the Buyers group get recommendations from experts on a global level on the subject.

The objectives of this report is to

- provide information that support IMAILE buyers group to agree on a common definition of PLE
- provide recommendations out from Technology enhanced learning expertise perspective on PLE future work
- provide a global presentation highlighting Trends within Technology enhanced learning
- highlight Scenarios for Future Learning Processes
- provide analysis and recommendations out from an Technology enhanced learning expert perspective
- support the upcoming official delivery of D2.1 Commercial state of the Art with both existing PLE market as well as recommendations to work with the need analysis

This report includes in short recommendations both to IMAILE buyers group as well as IMAILE PCP expert support organizations within the consortium on how to proceed and work with the PLE concept throughout the different phases of the project.

Definitions PLE and PLEI
In this report we will use traditional PLE and PLEI which is the IMAILE PLE

IMAILE PCP and Education
The IMAILE (Innovative Methods for Award procedures of ICT Learning in Europe) project is the first unique project on a European level which addresses the area of the ICT in the field of Education and e-learning both from the demand side and the supply side.

The project takes an innovative grip on shifting research and innovation to become more customized and to be based on the actual needs from the end – users (our European schools, teachers and students)
**Situation and problem**

The field of Education in Europe confronts several major challenges such as early drop outs, financial issues, teachers spending less time with the students due to documentation, the shift into 21st century skills both for teachers and students, low interest in STEM subjects (Science, technology and Math) as well as an increased demand of personalized learning.

Apart from this we are facing a great shift within our Education systems and our teachers need support from technology to manage this shift from the traditional school to e-teaching and learning.

There exist a great amount of different ICT solutions on the market to be used in our classrooms but in spite of high investments and a market that offers such a variety of products we still confront a low use of technology to perform innovative teaching and creative learning in the European classrooms in order to meet the 21st century in full scale.

**User driven innovations – the solution?**

The IMAILE consortium believes that our actual situation and problems have one common origin – the lack of customized ICT products/services merging from the demand side (our European schools) and an effective dialogue between demand and supply side (procurers of ICT and ICT industry/research).

In order to change this scenario partners in Sweden, Finland, Germany, Hungary, Austria, Portugal and Spain together has developed the IMAILE project based on the PCP method (Pre – commercial – procurement) An instrument recommend by the Commission that stimulates a dialogue between public procurers representing the demand side and industry/SME as suppliers on the other side.

**The IMAILE challenge**

PCP requires one identified and common challenge and the IMAILE consortium has identified and decided to focus upon the challenge of an increased demand of personalized learning where new technology should support schools and teachers in an innovative and creative way.

The suppliers should provide innovative solutions of the next generation PLE (personal learning environment) that address students in primary and secondary school in the topics Science, Math and Technology (STEM) and that support different learning styles with the following personal content:

- Content and digital curricula of STEM topics, self-assessment
- Tools for collaboration, communication, cooperation with others
- Classroom management (interaction with teachers for planning and selecting the tools, assessment according to 21st century skills)
- Connectedness, parents, wider community, other students
Innovative PLE technology demand

The innovative PLE technology/solutions shall bring the following effects to meet or demands according to DOW:

- Support to teachers and students in primary/secondary education within Science, Math and Technology
- Reduce the planning hours for the teachers
- Support all students to reach their goals in a personalized way (gifted and with special needs)
- Create more 1 to 1 meetings between teacher and student in the classroom
- Increases the motivation to learn for our students using creative and collaborative learning methods in a personalized way
- Create a real shift from teacher centered learning to student centered learning (research shows that lessons in math and science still is mostly teacher-centered, with few opportunities for the students to have influence on their own learning and using digital tool).
- Be applicable to all devices (not fully BYOD concept) but our solution should be a tool that replicates the students’ personal devices and to all learning styles (tactile, visual, auditory)
- Positive effect and reduce the numbers of early drop outs

By introducing this already in primary school we also expect this PLE to follow the student into Upper Secondary school and Higher education as a long term identity collected in a European Digital Portfolio. In our project we choose to develop the PLE within STEM but the framework should be applicable on any other topic.

A more detailed Business Case with evaluation criteria will be developed and presented in August and September 2014.

IMAILE PCP methodology

This report is developed during the first phase of the IMAILE project. Phase I) Needs assessment and consists of recommendations from three Technology enhanced learning experts on global level on how to proceed with PLE definition, PLE need analysis and recommendations for the future and how to accommodate PLE in Primary and Secondary Education.
Table 1 – IMAILE phases of allocated work

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<th>Year and month</th>
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| I. Phase of needs assessment (incl. needs- and market analysis) | March – July 2014         | • State of the Art PLE  
|                          |                          | • E survey – end users               |
|                          |                          | • Workshops – end users              |
|                          |                          | • D 2.1                               |
| II. Market consultation  | August 2014 – February 2015 |                                      |
| III. PCP phase           | March 2015 – October 2016 |                                      |
| IV. Final purchasing phase| November 2016 – May 2017  |                                      |

The PCP work in stages

The European Commission has developed the PCP instrument to consist of several stages (for more PCP information) [http://cordis.europa.eu/fp7/ict/pcp/home_en.html](http://cordis.europa.eu/fp7/ict/pcp/home_en.html)

1) European public procurers identify one common mid- to long term challenge that requires new research and development

2) The challenge is presented to the industry / SME: s in a European call for tenders

3) Competition and award procedures of participating suppliers take place in order to provide the innovative solutions during 3 stages 1) Solution/ Design, 2) Prototype, 3) Test series.

4) In the end of the PCP process the supply - side (Industry, researchers and SME: s) have developed innovative solutions evaluated and with input from the end users and future customers. And the demand side (public procurers of ICT in Education) has reached a solution that matches their development needs.

Preparation of next D2.1 M 5

This delivery and recommendations will for all support the D2.1 which will provide the necessary incitement to our consortium to prepare the call for tenders with a in depth developed need –and market analysis according to a defined PCP approach and method.
1.1. Trends in Technology enhanced learning

Trends raised herein are selected from common trends in Technology enhanced learning, which should have an impact on the development of PLE in IMAILE project (PLEI) and on to utilization of it.

1.1.1. Cloud Computing

“Cloud computing is a marketing term referring to a model of network computing where a program or application runs on a connected server or servers rather than on a local computing device such as a PC, tablet or smartphone. The difference with cloud computing is that the computing process may run on one or many connected computers at the same time, which provides end user and operator benefits including on-demand self-service, broad access across multiple devices, resource pooling, rapid elasticity and service metering capability.”

Wikipedia

Potential impact of Cloud Computing

Cloud computing is commonly used for supporting collaboration, file storage, and access to computing cycles. Large number of available applications relies on cloud technologies. Cloud computing has become the unifying factor among content and applications on the many devices people use in everyday life. The ability to access services and files from any location and on any device offers considerable promise for extending learning beyond the boundaries of the school day.

Cloud-based services include a wide range of increasingly powerful tools for almost any platform a user might choose, or any task a user might need to do. Examples of effective use of Cloud Computing:

- **LearnBoost** is a classroom management platform run through the cloud that enables K-12 teachers to track student grades and progress, create standards-aligned lesson plans, and generate analytics and reports, with Google App integration: http://www.learnboost.com.
- Schools in Brazil are collaborating on a blog for the **Global Curriculum Project**, where students participate in a virtual exchange program with schools across five different countries: http://curriculoglobal.colband.blog.br/
- A sixth grade class at Yokohama International School in Japan is using Google Apps to complete all of their assignments, including the creation of tutorials designed in Presentation and surveys created in Forms: http://blogs.yis.ac.jp/mstech/

(NMC. 2012)
1.1.2. Wearable Technology

“Wearable technology, wearable devices, tech togs, or fashion electronics are clothing and accessories incorporating computer and advanced electronic technologies. The designs often incorporate practical functions and features, but may also have a purely critical or aesthetic agenda.”

Wikipedia

Potential impact of Wearable Technology

Wearable technology may support learning at many levels, but it creates many challenges, including the privacy concerns that are already receiving abundant attention among those writing about Google Glass and concerns about how it might interfere with the learning process. As wearable technology consumes less space than current devices, it will have a big impact in HPLE designing.

Wearable Technology may also improve collaboration, allowing users to stay engaged in the same space, while accessing online content. Wearable Technology can also have an important role in Teachers User Interface Design of PLEI. For example Optical head-mounted display (OHMD) can help teacher in many way.

1.1.3. OER

“Open educational resources (OER) are freely accessible, openly licensed documents and media that are useful for teaching, learning, educational, assessment and research purposes. Although some people consider the use of an open format to be an essential characteristic of OER, this is not a universally acknowledged requirement.

The development and promotion of open educational resources is often motivated by a desire to curb the commodification of knowledge and provide an alternate or enhanced educational paradigm.”

Wikipedia
Potential impact of OER

With OER teacher can, for example, browse online photo galleries, select appropriately licensed images, and use them as a learning resource. The advantages of OER extend beyond remixing existing resources. PLE with interface for shared educational resources saves time, since educators do not need to generate components from scratch. Some OER, especially those which provide complete courses, can compensate for teacher shortages, provided learners are sufficiently self-directed and have enough prior knowledge about the subject. Learners also have the benefit of being able to customize their learning experiences with OER.

1.1.4. BYOD

"Bring your own device (BYOD)—also called bring your own technology (BYOT), bring your own phone (BYOP), and bring your own PC (BYOPC)—refers to the policy of permitting employees to bring personally owned mobile devices (laptops, tablets, and smart phones) to their workplace, and to use those devices to access privileged company information and applications. The term is also used to describe the same practice applied to students using personally owned devices in education settings."

Wikipedia

Potential impact of BYOD

The BYOD movement in education institutions is being driven by a major challenge that many institutions face — a lack of funds to support one-to-one learning, which is a systemic solution in which every student is provided a laptop or mobile device that can be used to support learning in and outside of the classroom. BYOD makes one-to-one more accessible and it is easier to put into use devices that students already have.

BYOD movement personalizes the learning environment automatically, because device includes usually also personal factors (virtual communities and networks). Next version of BYOD may be WYOD (wear your own device).
1.1.5 Blended Learning

“Blended learning is a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path or pace. While still attending a “brick-and-mortar” school structure, face-to-face classroom methods are combined with computer-mediated activities. Proponents of blending learning cite the opportunity for data collection and customization of instruction and assessment as two major benefits of this approach.”

Wikipedia

Potential impact of Blended Learning

Large scale data collection is now possible due to increasing number of technology-mediated activities. But this does not mean that the approach is restricted to purely on-line environments. On the contrary, until now, face-to-face interactions were the situations in which detailed information was collected (through assessment or conventional interaction) so that it could be later analysed. The virtual space for learning provided by PLEs, rather than being disjoint from the face-to-face context, it is a powerful enhancer. The possibility of students accessing resources about any topic, combined with the presence of a PLE guiding their activity towards the goal of learning, renders the face-to-face time as yet another highly valuable resource that needs to be effectively used.

Online activities and a PLE may serve as the ideal mediator to provide the right scaffolding so that activities of higher cognitive load can be addressed in face-to-face sessions. Online environments, rather than detracting from the overall experience they offer a springboard to reach activities that allow students to attain higher effectiveness in their learning (Pardo, A. 2014).

Blended learning is a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, path or pace. The engagement of students prior to the interactive sessions can now be formally included as part of their PLE. Learning analytics can provide a detailed account of the effectiveness of these preparatory activities. Requiring students to prepare for certain activities is not a new strategy; it has been used regularly by instructors. However, what is now new is the capacity to monitor the level of engagement and provide a personalized set of resources so that the effectiveness of in-class activities is maximized (Pardo, A. 2014).
Strategies such as the flipped classroom are an example of this combination. Flipped classroom is one of Rotation models in Blended Learning. Blended Learning with a high quality PLE can help:

- to personalize learning
- to extend the reach of effective teachers
- to improve the potential for individual progress
- in working conditions
- student engagement and motivation
- economy with decreased device costs
- in student and parent adoption
- in narrowing the digital divide

*Diagram 1 – Title Rotation model of Blended Learning*

(Staker, H. & Horn, M. 2012)
1.1.5. Gamification

Gamification is the use of game thinking and game mechanics in non-game contexts to engage users in solving problems. Gamification has been studied and applied in several domains, such as to improve user engagement, physical exercise, return on investment, data quality, timeliness, and learning. A review of research on gamification shows that most studies on gamification find positive effects from gamification."

Wikipedia

Potential impact of Gamification

Gamification in learning and Game-based learning are terms easy to mix up. Gamification includes the use of game mechanics not necessarily games. Game mechanics can be used in Learning Environments and they are for example:

- **Achievements** (are a virtual or physical representation of having accomplished something)
- **Appointments** (are game dynamics in which at a predetermined times/place a user must log-in or participate in game, for positive effect)
- **Behavioral Momentum** (is the tendency of players to keep doing what they have been doing)
- **Blissful Productivity** (is the idea that playing in a game makes you happier working hard)
- **Bonuses** (are a reward after having completed a series of challenges)
- **Combos** (are used often in games to reward skill through doing a combination of things)
- **Community Collaboration** (is game dynamic wherein an entire community is rallied to work together)
- **Countdown** (is the dynamic in which players are only given a certain amount of time to do something)
- **Discovery** (also called Exploration, players love to discover something, to be surprised)
- **Epic Meaning** (players will be highly motivated if they believe they are working to achieve something great)
- **Free Lunch** (a dynamic in which a player feels that they are getting something for free due to someone else having done work)
- **Infinite Gameplay** (games that do not have an explicit end)
- **Levels** (are a system, or "ramp", by which players are rewarded)
- **Lottery** (a game dynamic in which the winner is determined solely by chance)
- **Ownership** (is a powerful Game Dynamic that creates Loyalty)
● **Points** (are a running numerical value given for any single action or combination of actions)
● **Progression** (a dynamic in which success is granularly displayed)
● **Quests** (usually implies a time limit or competition)
● **Reward Schedules** (the timeframe and delivery mechanisms through which rewards)
● **Status** (the rank or level of a player)
● **Urgent Optimism** (extreme self-motivation)
● **Virality** (a game element that requires multiple people to play)

Gamification Wiki (http://badgeville.com/wiki/)

### 1.1.6. Learning Analytics

“Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs”

Wikipedia

**Potential impact of learning Analytics**

Learning analytics allows capturing a more detailed model of the students and their experience within a learning environment. However, data alone is not enough to enhance a pedagogical strategy. Data availability offers the possibility of re-thinking how experiences are approached and designed. New scenarios and strategies must now be considered based on the fact that designers and instructors will have detailed observations almost instantaneously (Pardo, A. 2014).

One of main consequences of collecting a detailed profile of how students behave in a learning environment is the possibility to provide a high degree of personalization. Thus, analytics can be considered as one of the main forces that shape a PLE. In such environment, the provision of specific functionality, resources, or suggestions can supported by the collected data. In a data-rich environment, a PLE can be considered as an entity that mediates between a comprehensive set of resources and actions and the needs of a student when trying to reach a specific goal. For example, consider the scenario of a collaborative activity in the area of chemistry in which a team of students selects a sequence of tests to identify an unknown substance. Data about their previous knowledge can help select an initial set of resources to explore (Pardo, A. 2014).

Students may choose to distribute the exploration among team members. Data about their level of engagement may support this distribution by offering personalized suggestions. Additionally, data may point to an unbalanced effort among team members, and the PLE may then include remediation.
actions. If the activity is supported in a context in which inter-team communication is allowed, data may support the detection and selection of other members of the cohort with which to exchange information. These are just some examples of the affordances within a learning experience that can be managed through a PLE and how learning analytics may support such management (Pardo, A.2014).

The combination of learning analytics and PLEs offer an ideal platform to observe and foster self-regulated learning. There are numerous psychological theories that have studied aspects such as motivation and self-determination. There are detailed descriptions of the possible stages through which an individual may transition from total disengagement to intrinsic motivation. This trajectory is of the utmost importance in the context of learning. A self-motivated student is capable of regulating the process and taking the experience in her own hands. Learning analytics and PLEs offer the possibility of a nuanced analysis of the current state of the student, her trajectory towards the goals, the reaction to different stimuli, and the level of autonomy included in the process. One of the key elements for the detection and fostering of self-regulated learning is the notion of trajectory. Students may approach an experience with an initial level of self-regulation. The provision of activities within the context of a PLE combined with an effective personalization layer based on observations may underpin the measures on the evolution inside a trajectory towards self-regulation. If data analysis is systematically included in the PLE, the trajectory of the student may be frequently assessed and the appropriate actions included as part of the environment (Pardo, A.2014).

Large scale data collection is now possible due to increasing number of technology-mediated activities. But this does not mean that the approach is restricted to purely on-line environments. On the contrary, until now, face-to-face interactions were the situations in which detailed information was collected (through assessment or conventional interaction) so that it could be later analyzed. The virtual space for learning provided by PLEs, rather than being disjoint from the face-to-face context, it is a powerful enhancer. The possibility of students accessing resources about any topic, combined with the presence of a PLE guiding their activity towards the goal of learning, renders the face-to-face time as yet another highly valuable resource that needs to be effectively used. Online activities and a PLE may serve as the ideal mediator to provide the right scaffolding so that activities of higher cognitive load can be addressed in face-to-face sessions. Online environments, rather than detracting from the overall experience they offer a springboard to reach activities that allow students to attain higher effectiveness in their learning (Pardo, A.2014).
1.1.7. Automated online assistant

"An automated online assistant (OA) is a program that uses artificial intelligence to provide customer service or other assistance on a website. Such an assistant may basically consist of a dialog system and an avatar. Automated online assistants have the ability to provide customer service during 24 hours a day and 7 days a week."

Wikipedia

Potential impact of automated online assistant

The dialog systems of many automated online assistants have integrated chatterbots, giving them more or less ability of engaging in small talk or casual conversations unrelated to the scope of their expert systems, or simply making the dialog feel more natural. Avatar of an automated online assistant may be called an interactive online character or automated character. It makes the automated online assistant a form of embodied agent.

If an virtual avatar (automated online assistant teacher) have a possibility to use learning analytics and e-mentoring tools, it can provide an ideal learning assistant service to observe and foster self-regulated learning.
2. PERSONAL LEARNING ENVIRONMENT (PLE) – DEFINITION

"Personal Learning Environments (PLE) are systems that help learners take control of and manage their own learning. This includes providing support for learners to:

- Set their own learning Goals
- Manage their learning, Both content and process
- communicate with others in the process of learning"

Wikipedia

Personal Learning Environment (PLE) has usually been described as a concept and not as a learning environment.

There is a shared understanding that the educational approach driving the development of Personal Learning Environments (PLEs) is one of learner empowerment and facilitation of the efforts of self-directed learners, also called autonomous or independent learners. (Van Harmelen, M. 2007). It allows the learner to self-control, and more control over their own learning. PLE provides support to the learner’s own learning targets, instruments, and the learning process and manage the contents and interaction with others during the learning process. At best, it supports a variety of learners and ways of learning, making visible the entire learning process and it allows the learner to better identify their learning and become aware of their own learning practices.

The difference between learning in a PLE and learning in a traditional manner is like the difference between simple and complex: simple is learning a fact; complex is learning a fact in the context of a network and learning not only the fact but all the associated information around that fact (Leone, S. 2014).

PLE develops, evolves and is shaped throughout life, depending on individual development and learning. The PLE ought to be supporting and controlling the whole Lifelong Learning process and give the individual to create specific portfolios out of the experiences, creations and curations of the learning process (Leone, S. 2014).

2.1. Personalising Learning: A Common Understanding

Personalised learning is more like a result of personalising learning (Hargreaves, D. 2004) and because PLE is a process oriented concept Personalising Learning needs a closer analysis.

Personalising learning is the process which empowers the learner to decide what, where, when and how to learn (National College, 2011), and to promote personal development through self-realisation, self-enhancement and self-development. Personalised learning is about increasing student participation and providing direction in the development of 21st century education. The
rationale for personalised learning is to meet learner’s needs, goals and preferences in order to ensure that every student achieves as high standard as possible. The emphasis in relation to personalising education is that learning is lifelong: people do not learn for the school, but for life (OECD, 2006).

In Personalising Learning process individuals are helped in identifying their needs in learning processes (Bentley & Miller, 2004). In Personalising Learning target is to know students well enough to make every learning experience motivating the students to learn more and lifelong (Littky & Allen, 1999).

2.2. PLE and Related Concepts

The first recorded use of the term “Personal Learning Environments” was for the Personal Learning Environments Session at JISC/CETIS Conference 2004 (Buchem, Attwell, & Torres, 2011). Since then, many researchers have explored and investigated the subject of Personal Learning Environment (PLE), and have presented many different understandings and descriptions.

Buchem et.al. (2011) describes that the concept of Personal Learning Environment can be viewed as complex activity system based on the Activity Theory framework to describe their key elements and the relationships between them. Activity Theory provides a framework of six interrelated components: subject, object, tools, rules, community and division of labour.

Diagram 2 - PLE elements

![Diagram 2 - PLE elements](image-url)
As the purpose of this report is to make recommendations for required PLE (PLEI) and its technical characteristics, so let’s focus shortly on the triangle of components with subject (learner), object and tools.

**SUBJECT (LEARNER)**

Conception of PLE includes that the subject (learner) can design his/her own learning, create a learning environment autonomously, orchestrate tools and services individually, negotiate learning goals and outcomes, personalise information sources and services, use technologically-mediated scaffolding and guidance, use scaffolding and guidance from teachers.

**OBJECT**

In the concept of PLE objects should be focused in learning something new, producing something to be proud of, personal development, knowledge management and identity development. One object for the concept of PLE is to help to choose and use a suite of different tools to support users own learning.

PLE should also be focused on:

- maintaining the flow of learning activities and events,
- developing capabilities to become effective knowledge users and learners through participation
- achieving self-reliance through critical action across the boundaries of networks
- using tools to produce own content and resources
- using community management tools

**TOOLS**

In the concept of PLE, learners expect more control of their own learning. They want to determine own learning goals and outcomes and they want to keep track of personal progress. This puts requirements for tools, because learners expect more control of their learning resources and they want to select tools and structure of their own learning environment. In short, the learner would like to rationalise learning instruments.

**2.2.1. Hybrid Personal Learning Environment**

Education landscape has changed rapidly during the last few years. Formal learning institutions have recognised the benefits of blended (or hybrid) learning. Schools and universities increasingly provide digital platforms that complement their offline courses with supplementary learning materials, links to external resources, online communication channels between learners and teachers, etc.
Those tools are often controlled by the educational institution, and provided as integrated parts of the courses. However, communities of practice and informal learning evolve due to the nature of mobile devices and increasing possibilities to connect virtually outside of the physical classroom. Mobile learning by way of iPad, iPhones, smart phones, and other intelligent devices affects how and when students learn. Many students of today have embraced using technology to communicate, socialise and access information.

Ubique, hybrid and blended learning needs to find a cross platform solution for scaffolding learning processes. This can be categorized as a Hybrid Personal Learning Environment (HPLE).

**Table 2) PLE and HPLE**

<table>
<thead>
<tr>
<th>Informal Learning</th>
<th>Free-Choice Learning Environments</th>
<th>HPLE</th>
<th>PLE</th>
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<tr>
<td>Non-Formal Learning</td>
<td>Educational Programs</td>
<td>Non-Formal Blended Learning</td>
<td>Open Courseware</td>
</tr>
<tr>
<td>Formal Learning</td>
<td>Formal Educational Institutions</td>
<td>Formal Blended Learning</td>
<td>e-Learning</td>
</tr>
</tbody>
</table>

Physical Environments | Hybrid Environments | Digital Environments


### 2.2.2. Lifelong Learning

“During the last fifty years, constant scientific and technological innovation and change has had a profound effect on learning needs and styles. Learning can no longer be divided into a place and time to acquire knowledge (school) and a place and time to apply the knowledge acquired (the workplace). Instead, learning can be seen as something that takes place on an on-going basis from our daily interactions with others and with the world around us.”

Wikipedia

Lifelong Learning (LLL) is also a cultural term denoting a new paradigm. It is a shift away from the notion of provider-driven ‘education’ towards individualised learning” (UNESCO Institute for Education, 1999). It is all learning activities undertaken throughout life, with the aim of improving knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective” (European Commission, 2002 ).
The plans of the EU on LLL (EAEA, 2006; European Commission, 2000, 2006, 2007) are outlining the characters of the persons engaged in improving as professionals and as individuals. Lifelong learners (Leone, I., 2010):

- have a novice’s approach, rather than an expert’s attitude, that let them take advantage of all learning opportunities,
- relate and exploit the knowledge and the competences they have acquired in other contexts,
- are flexible and adaptable to favour learning,
- are always fond of learning something for the pleasure of acquiring and for personal empowerment,
- are curious and feed their curiosity,
- learn in many ways, both formal and informal settings and by different learning strategies for different situations,
- teach others to improve their competence.

Therefore LLL should be supported by a tool that offers time and space (anytime, anywhere), personalisation of paths, increase in interaction and tracking of the progress in individual competences and knowledge (Leone, 2010).

### 2.2.3 Learning Analytics and pedagogy

Learning analytics allows capturing a more detailed model of the students and their experience within a learning environment. However, data alone is not enough to enhance a pedagogical strategy. Data availability offers the possibility of re-thinking how experiences are approached and designed. New scenarios and strategies must now be considered based on the fact that designers and instructors will have detailed observations almost instantaneously. The effect of this new aspect can be divided into three categories.

The first one is the possibility of tackling the challenge of a truly personalized learning environment. The immediacy of data about how a student is reacting to an activity allows for an equally immediate reaction, if required, to improve or enhance the experience. For example, students may be monitored in aspects related to their trajectory to reach previously established goals. When this trajectory is detected to diverge, remediation actions can be immediately provided. Gifted and students with special needs are two groups that could benefit from this immediacy. Aspects such as the variation on the level of engagement in different activities can be used to identify patterns and either automatically deploy different activities, or notify the findings to the instructor.

The second category of the potential effect of learning analytics in pedagogy is to achieve a process of sustained improvement. Obtaining detailed observational data provides a more immediate insight on the effectiveness of the adopted strategy. This insight may then underpin a formal iterative process of refinement by which the strategy is constantly being reviewed and adapted with the support of the observed data. Instructors are already used to this mentality and they refine and adjust their strategy over the years. However, current technology allows this framework to be...
formally included in the process and the time to be greatly reduced. Designing a learning experience and obtaining data about its enactment may become one and the same thing. Data offers the possibility of estimating the effect of interventions, detecting which are more suitable depending on the profile of the students, and identifying highly successful elements of the pedagogical strategy.

The third category of effects derived from the use of data is to provide scaffolding for student-centred learning. The data collected is always about how students interact with the rest of entities in a learning environment. The creation of a detailed view of the student supports strategies in which student learning is the main focus. A learning designer may now be more inclined to take into account the effect of an activity on the student because there will be data supporting this assumption.

Although learning analytics has been shown effective to tackle issues such as student drop-out, its true potential can reach numerous additional aspects of a learning experience such as maximizing engagement, increasing self-reflection, supporting diversity; reduce the complexity of learning design, etc.

3. FUTURE SCENARIOS FOR LEARNING

When implementing digital technologies there is a need for schools and school leaders to identify which improvements they actually want to achieve and which tools and methods should be used. This can be a difficult task because the learning landscape is in a rapid transformation at the moment. That’s why we need a helicopter view of the situation and a perspective to near future including trends in technology and in education. With the help of these views we can create Future Scenarios for Learning.

Different scenarios are here not different alternatives. In the process of IMAILE project different scenarios (teachers, students and other stakeholders) are complementing each other so that the PCP process will have the broadest possible viewpoint and best information for making need analysis and requirement specification.

3.1. Scenario 1 (Students)

PLEI (Personal Learning Environment in IMAILE project) has proven to be a significant factor to that school is nowadays interesting, engaging and suitable way a challenging place. Teachers' work has become easier and learning processes have become more transparent. Co-design and PCP processes have enabled a rapid change in school culture because all stakeholders have been brought into these participatory design processes. Here is short scenario how PLEI has helped one student in primary school and in secondary school.
First impressions

I remember very well when PLEI was introduced to me for the first time. My teacher said that the PLEI will be my teaching assistant and my virtual mother from now on. First I had the chance to shape the personality and character of my teaching assistant (avatar). I named him Petri. Petri started to come out from time to time to ask questions and to give advices. Petri has guided me in when and how I should work. A lot of things I would certainly have forgotten, if Petri was not there reminding and guiding me.

My first task was to tell to Petri what kind of timetable I have. In this way Petri became aware of what and when I should study. I also told Petri also the hobby schedules of my own. In the beginning I chose my teachers from the list of our teachers. From this point I was able to show questions to them and to do tasks assigned to me.

Time travelling

One of the best things in PLEI has been the fact that I can travel in time. I have been able to look afterwards what, how and when I have been working with. I have also created many time capsules. Time capsule is a goal or a dream that is locked and can be opened on a specific date. I have written many goals for what I want to learn and achieve. I am now eighteen years old and last week I opened a time capsule which was locked and sent to the future when I was in the third grade. I was 10 years old then. I could read that at the age of eighteen I would like to play soccer in the best team of our city. It’s funny that I just made a contract with the best team of our city, but in ice hockey. Most of the time capsules I have sent to future have been locked for a considerably short time. Sometimes even just for a week.

Automatic time lining has helped me especially in preparing for exams. On a parallel timeline I have been able to see lessons, guidance of my teachers, comments and questions. This has helped me a great deal. I have e.g. looked at videos about difficult topics again and again. There are hundreds of video clips on my timeline because I remember things better from videos than images. Some of my friends have their timeline full of drawings and notes. I have also quite a lot of different mind maps there. I prefer to use digital pen for making mind maps and of course in mathematics, physics and chemistry. OCR has sometimes been a handy feature, but usually I use virtual keyboard on my tablet. Sometimes I have used speech recognition and sometimes I have been recording audio notes.

Levels

Working with PLEI gives you credits and points. I have got points from regularity, good planning, solving difficult problems, helping others, etc. When you have enough points you can get access from one level to next. I just achieved the next level of study physics. I got access to purple level. It is the best one.
Working together

I have also some common stuff with my friend in my PLEI. If we are having a team work, we can send a time capsule of our group or team. Usually we have used the recording feature of the PLEI so that we have recorded a short clip of what we did, if we had any difficulties and what we shall do next. This has been a handy feature and we have watched or listened to recordings before starting to work again.

As a senior student I have also been able to study courses in other schools and it’s all has all nicely been assembled to my timeline. I remember when I was teaching magic tricks to our group. I recorded some video guides and everyone made a small magician show in the end of the course. Some even asked other (really pro) magicians for good tips.

Portfolio

Last week I applied for a summer job and had a job interview. I used my PLEI and the employer saw that I have been working hard at school and that I can express myself in many ways and that I can speak foreign languages as well. I got the job!

PLEI can be opened and edited using any device that is online and has a web browser. It is good that I can also use it offline. Now I am finishing high school and I can have my PLEI with me. I will continue to use it in the future in my studies and also when I start to work.

3.2. Scenario 2 (Teachers)

Through the use of PLEI (Personal Learning Environment in IMAILE project) teachers have noticed that students are more active and engaged in designing their own learning strategies. PLEI has also been supporting the creation of better contact between student and teachers. Teaching and learning processes are also now less teacher-centred. PLEI has a surprising important role in the formation of learning landscape of the 21st century education.

First Impressions

I have a long time been waiting for a tool that would help me to support the learning processes of my students and which also facilitates my work to such an extent that I could focus more on my students. When PLEI was presented to our school for the first time, I understood that this might be the solution I had been longing for. It was indeed a good solution that we decided to bring PLEI into use for the whole school at same time.

Blended Learning

I am a physics teacher of our Secondary school and today just before the beginning of the lesson I had a quick look to the PLEI. I was interested, how my students had understood their own research of the concepts of absorbing and releasing energy. I opened their own physics timeline and I realized immediately that the concept of energy releasing was still little unclear - in some extent. I exported
with one click the questions my students had made about the topic to a video clip, and threw myself on the role as an external expert during the lesson. We had quite a lot of fun when I was trying to answer these questions. One question remained unanswered and we decided to make a shared mind map about this topic. We saved the mind map and every one made a time capsule of their own and added into it a reminder to their time line. We shall work with it in September, but from a different perspective.

**Personalized learning**

Tomorrow we are going to receive a new student here in our school. I watched today his learning processes in general, skills he has and I also looked at his student profile from PLEI. I noticed an interesting thing. He is a hard working student but surprisingly often underperforming in tests. After looking at the PLEI I think I now know why this has happened. I have a good feeling about the meeting tomorrow afternoon with him and his parents.

**Sharing**

I looked today at how our teachers are working nowadays. I am thrilled about the level of collaboration, co-planning and discussion. It's excellent, that teaching and design processes are happening today in teams. Developing teaching materials and sharing is so easy that it leaves more time for all of us.

**Content creation**

Next month I shall have an e-learning course to support the blended learning in my class. I shall create the learning path for my students in PLEI course builder. The readymade templates help me to create the path and I only drag and drop the files and other materials in the visualized learning path. I use e-books, OER materials and my own documents (assignments, tests etc.) to create the combination to support individual learners.

**Flipped classroom**

For the next mathematic lesson I shall create a short video as a teaser to the students. With PLEI's video/screen capture recorder I shall combine my power point slides with my voice and create SOOC (Short Open Online Course) on the topic. I will send the link to my students via PLEI as a quick message to the social media service, where he/she is active at the time. I will also give them a problem to think about for the next lesson combined with video recording. I also link the e-book chapter as flipped material for the students to prepare the lesson.

**Parent collaboration**

I send quick messages to parents to their e-mails and mobile phones with SMS. I also indicate the absence of students and get the explanation from the parents. In PLEI dashboard is always live schedule for everyone to see. Individual students and parents can see information about the tests, homework, exams and other information connected to their dependent.

Grant agreement number: 619231
Evaluation

For the term evaluation I just collect the progress information from each student in the PLEI. All the assignments, tests, exams and other work has been graded or evaluated in the system and can be used by the teacher. The self-evaluation tool of the system also let the students visualize on their development and this strengthen their self-esteem.

3.3. Scenario 3 (Other Stakeholders)

Use of PLEI has assisted parents to follow their children’s studying and schooling. Routine communication between home and school (events, absences, public notices, etc.) is still taking place using other communication tools, but PLEI gives a whole new perspective for monitoring the study-processes. PLEI makes it easier in several ways also for the municipal level management work, and may even drop annual costs of education.

First Impressions

"I do not know quite exactly if this is the result the use of PLEI, but last year the teachers’ days of sick leave started after a long time to fall. Because each student and teacher can now use their own device in their work, we are starting to get considerable savings in IT management revenues. Distribution of teaching and learning materials is also now with PLEI simplified and more straightforward."

Visualization

“The visualized path of learning processes has helped students and teachers to work more closely in direction of the objectives. While saving of significant time and resources PLEI has enabled to focus to the future competences. With the help of visualizations we have been able to focus on the semantic memory and the children as well as adults are now beginning to understand larger entities. Utilization of the semantic web, artificial intelligence, and gamification features have increased students’ motivation for studying, and teachers have had more time for supporting learning and for designing their teaching. ”

BYOD

Because PLE is using cleverly RSS feeds, we are aware better all the time of what is happening in schools right up to the individual level. Learning assistance and the differentiation upwards has become possible. In this way, each student is receiving appropriate education on their own level. We have also now been able to take full advantage of different mobile devices. BYOD (Bring your own device) - thinking is now realism which has become possible via use of HTML 5.

This technology has enabled video, audio, scalable vector graphics and MathML for mathematical formulas. PLEI is also supporting several short-range communication technologies (Bluetooth, NCF, iBeacon etc.) so PLEI can be used in collaboration and in project based work. Within short- range
communication technologies teachers and students can share documents, photos and videos and simultaneous processes (writing, mindmapping, drawing etc.)

3.4. Scenarios and design processes

When implementing digital technologies there is a need for schools and school leaders to identify which improvements they actually want to achieve and which tools and methods should be used. With help of these scenarios we can create needed features to PLEI.

Here are some selected sentences from these three different scenarios in the previous text. Some words are marked in bold which indicates one feature of PLEI:

- Teachers' work has become easier and learning processes have become more transparent.
- My teacher said that the PLEI will be my teaching assistant and my virtual mother from now on.
- Petri has guided me in when and how I should work.
- A lot of things I would certainly have forgotten, if Petri was not there reminding and guiding me.
- My first task was to tell to Petri my timetable.
- One of the best things in PLEI has been the fact that I can travel in time.
- Automatic time lining has helped me especially in preparing for exams.
- On a parallel timeline I have been able to see lessons, guidance of my teachers, comments and questions.
- Working with PLEI gives you credits and points.
- If we are having a team work, we can send a time capsule of our group or team.
- As a senior student I have also been able to study courses in other schools.
- I used my PLEI and the employer saw that I have been working hard at school and that I can express myself in many ways.
- PLEI can be opened and edited using any device that is online and has a web browser.
- Through the use of PLEI teachers have noticed that students are more active and engaged in designing their own learning strategies.
- PLEI has also been supporting better contact between student and teachers.
- PLEI has a surprising important role in the formation of learning landscape of the 21st century education.
4. PERSONAL LEARNING ENVIRONMENT IN IMAILE PROJECT

4.1. Overview of current PLE technology solutions

The world of e-learning and using ICT in education is full of solutions and online environments. Most of them have a long history behind them and have had excellent user experiences reported. The dawn of the social age has driven more solutions, software and services to support learning processes and personalizing the learning. New pedagogies and working approaches have innovated teachers and researches to create their own solutions and vision of PLE.

The challenge of the existing solutions and software to support PLE is two-fold. Firstly the solutions focus on only some of the features that PLE needs and on the other hand they are mostly mended to university users (young adults) who can take the responsible of their own learning.

IMAILE project is creating a model for the K-12 (basic education) learners the “PLEI” and for the minors learning support and responsible of the process still lies on the shoulders of teachers and parents.

There are many great solutions already in the market and combining their features on can create a vision of the future PLEI, which needed to be defined.

Examples:

Gooru is a STEM education research, search, and curation portal that relies on crowd sourcing and collective intelligence. This service is a search engine and not applicable on our target groups Primary and Secondary schools. [http://go.nmc.org/gooru](http://go.nmc.org/gooru)

The Learning Hub At Yokohama International School in Japan, each student has their own blog that develops into their electronic portfolio and personal learning environment. This solution does not support teachers and students to assess and select tools according to their learning methods and personalized needs. [http://go.nmc.org/yokoh](http://go.nmc.org/yokoh)

LTISD Learning Portal In Texas, Lake Travis Independent School District students have 24/7 access to a webbased learning environment from school, home, and their mobile devices. This is a learning portal LMS and not specific a PLE. [http://go.nmc.org/ltisd](http://go.nmc.org/ltisd)

The PLAYground The PLAYground is an online platform for the curation, creation and circulation of user generated learning activities that encourages children and adults to learn and teach each other. From this project we would like to get inspiration of interactive collaboration tools for primary education to our PLE. Project is in USA. This solution does not support teachers and students to assess and select tools according to their learning methods and personalized needs. [http://go.nmc.org/thepl](http://go.nmc.org/thepl)
Shared Learning Collaborative This project is developing a common data layer and encouraging independent software vendors to build personalized learning applications for five pilot states in the US. The project is not a holistic approach. http://go.nmc.org/shared

Trail Shuttle Developed in Singapore, Trail Shuttle is a self-directed learning platform that uses technology to enable students to build their own learning programs. Not PLE but LMS. http://go.nmc.org/trail

Peda.Net Peda.net is a research and development project coordinated by the Finnish Institute for Educational Research, University of Jyväskylä, Finland. In contexts where information technology is drawn on during daily teaching activities, Peda.net web tools have found a hearty welcome in all parts of Finland. Our web tools are being used in basic education, upper secondary school and adult education. Peda.Net is user-based platform, which is building around the personal learning place. It is a PLE platform for students and teachers. The weakness of online tools, evaluation system and big data collecting still need development. http://peda.net

Mentorixx Developed in Denmark. Mentorixx offers a flexible, dynamic and interactive learning platform, facilitating the process of building internal or external training sessions! Mentorix Learning also includes social networking, where communication is central, to broaden the interaction and learning between staff and trainers. The platform has also connectivity with the social media tools, drag and drop course planning etc. The interaction with the parents and big data collection are the weak points of the platform. http://www.mentorix.eu

Overall conclusion of market analysis 2014 of existing PLE solutions

The overall conclusion from our scanning for PLE for the K-12 education is that the market doesn’t have yet fully functional PLE–platform to be recommended. The vide implementation of new pedagogies, equipment and methods challenge the market. The new needs from the primary and secondary education students, teachers and parents can’t be answered platform which have been created for universities in the first hand.

4.2. Future Trends in PLE technology solutions

The main feature of PLE is to support learning on lifelong basis. That means a challenge for the industry to serve a platform, which doesn’t drop the users out during the lifelong learning process. It means different kind of business models connected to one platform.

In Primary and Secondary education the learning process can be described as a triangle with learners, school and parents in the tips and teacher in the middle.
On the other hand the whole process of PLEI should take in account also the free time of the student so the student can control his/her tasks through one interface.

### Diagram 3) PLE platform

**Community Service**
- Content sharing and public management
- Community and learning networks
- Identification of the roles of the learner, the teacher and parent

**Own space**
- The lifespan of orientation, school autonomy, formal and informal learning reunion, free installation, follow-up to ensure the development
- Personalized learning platform and profile, their own tools, their own learning networks
- Their own learning goals, manage their own learning processes of their own learning identification, evaluation and visualization of
- The extension of the learning environment, mobihuus and Playfulness

**The school's learning platform**
- Web pages, information and communication
- Work of subjects, classes and categories, projects
- Online courses
- School councils, parents' associations
- Home-school co-operation

**E-learning materials**
- E-book learning environment, community and customization of learning materials
- Publishers, learning materials, learning games, e-books
- Open Educational Resources
- Teachers sharing their materials

**Leisure facilities**
- Clubs
- Associations
- Or similar

**The interfaces**
- Login interfaces
- Study Material interfaces
- Interfaces to other e-learning platforms and gaming environments
- The interfaces of social media services
In the technology this means several new features for the platform. The signing up process needs to flow. For single sign on in any service should open access to the PLE.

The user profile should have personalizing features like social media tools and add or edit profile information including social media login data like: Skype, Facebook, Twitter Page, Google+, Tumbir, Blogger, Printesest, Youtube, Vimeo Flickr etc.

The dashboard should have at least information and tools like, calendar overview module that shows next events, new activities from groups, overview of all user activities, list of all courses for a student, block for broadcasting news for all, social score (the more active the higher social score), full calendar overview, access to Course Builder tools (only Teachers)

The teachers ought to build courses from templates and from any media or files. Building should be drag and drop based. The score data collection from the tests, assignments and other work need to be collected, analysed and performed easily to teachers, students and parents.

The teachers and the students also need tools for recording the live lessons or other events for later use. This challenges the profile of the cloud storage space. The best option for the lifelong learner is unlimited storage space.

One main feature for the primary and secondary PLE is the interaction with the parents. The parents need to access the platform to follow their children work and achievements. Also from the parents point of view the school need to bring messages, their children schedule, grades and credits, tests, attendance, support, and other basic information. The need for daily questions like contact information, printouts, surveys, other announcements, study guidance and annual planning is also needed. The parents also need to know about the attendances of their children and for example notify their absence.

A student ought to collect all his/her activities under the same platform. The school work, free time activities and hobbies can be used as a platform for both formal and informal learning.

The PLEI is a mobile and flexible interface to support the students, teachers and parents cloud based lifelong learning.
4.3. How PLE solutions should be evaluated

According to several reports on global level the demand for personalized learning is not adequately supported by current technology or practices yet and the supposed time to adoption is additionally two to three years. Our consortium has reached to a conclusion that PLEI is at the first signs of development and has great potential both for the demand and the supply side.

PLE is a learner-centred learning environment, which is based on the concept of new learning and competence building methods in accordance with the ideas of learning. Primary user group are the learners of different ages (for Lifelong Learning (LLL) in formal, non-formal and informal learning situations). The platform for LLL model requires that service should be appropriate for the students, as well as the smallest ones and adult students.

PCP requires evaluation of solution during 3 stages from IMAILE Evaluation panel (consisting of Buyers group) but also from test and reference groups (consisting of students and teachers in Primary and Secondary Education)

There are several aspects to take into consideration to confront the evaluation work of the innovative solutions.

Here follow some recommendations from this report to IMAILE consortium and the evaluation of innovative solutions.

Evaluating depends on which perspective (Personal, Learning or Environment) we choose and what kind of requirements we have prescribed to it.

Table 3) Evaluation of PLE

<table>
<thead>
<tr>
<th>Unified elements</th>
<th>Variations of elements</th>
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<tbody>
<tr>
<td>Personal perspective</td>
<td>Learners have ownership and control of their learning</td>
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<tr>
<td>Learning perspective</td>
<td>Learners find and share information, collaborate with and teach each other, to pursue educational goals</td>
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<tr>
<td>Environment perspective</td>
<td>Web-based, digital tools, various resources</td>
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</table>

From D1.2 Quality assurance plan there are 5 different areas that should be evaluated. (Technology, Pedagogy, Usability, Cost and Continuity). These descriptions and features are here on a quite general level. After this we present a more detailed input / recommendation of possible questions from learners, teachers, parents and schools view. This work is developed out from the first outline in D1.2 Appendix or Appendix 1 of this SOTA report)
<table>
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<tr>
<th>Technology</th>
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<td>Collaboration, communication and cooperation tools</td>
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<td>Classroom management and assessment</td>
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<td>Digital Content and curricula</td>
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<td>Be applicable to any device (BYOD, Bring Your Own Device)</td>
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<td>Personalisation</td>
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<td>Scaling Teaching Innovations</td>
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<td>Connectivity with parents, wider community, other students</td>
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<td>Support within Science, Math and Technology</td>
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<td>The use of creative and collaborative learning methods in a personalized way</td>
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<td>Support all students to reach their goals in a personalized way</td>
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<td>Teacher centered learning to student centered learning</td>
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<td>Reduce the numbers of early dropouts</td>
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<td>Self-regulation and self-assessment</td>
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<td>Managing Knowledge Obsolescence</td>
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<td>Reduce the planning hours for the teachers</td>
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<td>Connectedness with wider society</td>
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<td>Personalized selection of working areas in (tactile, visual and auditory)</td>
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<td>Digital Fluency of Teachers</td>
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<td>European Digital Portfolio</td>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
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<td>The cost of purchasing</td>
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<td>Maintenance expenses</td>
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4.3.1 Learner’s questions about PLE

- How do I create the essay that contains pictures and other media elements?
- How do I save my images, video and sound in the platform?
- Who owns the stored data? Who can delete it, and under what circumstances?
- What will happen to the tasks, writings, etc. when I switch to school, graduate, or stop studying?
- Where can I publish the content in the service? Can I publish my writings, pictures, etc. to the open network (Internet)? Do I need a license for publication? How is it done in the practice?
- Can I choose the tools myself to make learning tasks or the production of content?
- Who can see the outputs and tasks I have made? Do I decide when the case is finish, or does decision be made by someone for me?
- Can I obtain and use the service of e-learning materials such as e-textbooks? What type of electronic content one can get in the platform and how they are used?
- With whom I can communicate in the service? How is it done?
- Can I use the service to non-school and personal issues?
- What do I do if I see something that I feel doesn’t belong in the platform?
- Where and how can I get user ID?
- If I lose my password, how do I get it renewed?
- What is the age limit for service?
- Do I understand the significance of the terms of use of the service for me? What is stated in the terms?
- Is the service easy enough to use?
- Can the service be used on equipment that I am using?
- Can the service be used in those places where I want to use it?
4.3.2 Teachers questions about PLE

- How can I create learning tasks for my students? How is it controlled, how is it assessed? How does the basic functionalities of the service take place, for example, submitted work, guidance and assessment? What about the return of teamwork, guidance and assessment?
- How can I generate students own content service? How can you share with students and other teachers?
- What type of electronic content and the service can be used? How can, for example, different publishers be incorporated into the contents for the learning process? Can the combination of different publishers’ materials, transparent materials, Open educational materials and students own materials/instructions/assignments used to build your own learning package? How does it actually happen?
- Who will be able to publish the contents of the platform in the open network, under what circumstances and under what conditions?
- How does the service works to expand the learning environment? With whom and under what conditions one may co-operate in the service?
- How does the service take place in the learning process, can it be reached by a so-called third party, even if an external company or union representative?
- How can parents participate in the activities taking place in the service? Can a guardian act in the service role of the guardian?
- How does the school’s non-formal learning reflect in the service? What other things can the students use from the service apart from school assignments? How and in what condition will I see what else the students will use according to their additional tasks?
- Is the service easy enough to use?
- With whom can the students communicate and share content in the service? Who will decide? A student, a teacher or someone else?
- How do students communicate with each other in the service? How do they communicate with the teacher? How do they communicate with a parent or guardian?
- What is the teacher and student relationship between the service?
- What is the teacher and parent relationship between the service?
- Who chooses what tools to use such as student assignments, a student or a teacher?

(Questions from the Oppijat –project 2013, The Education Research Institute of the Jyväskylä University)
4.3.3 Parent’s (Guardian’s) questions about PLE

• How do I get services offered username?
• How do I find my area from the platform with the school tasks and other things?
• Who owns the data recorded by my child in the service? Who can delete it, and under what circumstances?
• To whom will my child be able to publish his/ her content and tasks? With whom will my child be able to communicate in the service?
• Who do I contact if there are problems with the service? How can I tackle a problem that may occur in the service situations?
• Can I get access to the e-learning materials for my child?
• Can I use the service for non-school issues?
• What is the age limit for service?
• What are the terms of service? What do they mean in terms of my child?
• Can the service be used on any device that my child is using?
4.3.4 The aspect of the institution (school)

- How do pupils and teachers get the service accounts? Who can make the service user accounts? Under what conditions?
- Who is responsible for the published content?
- Who is responsible for students' IDs?
- Who will be able to publish the contents of the service on an open network, under what circumstances and under what conditions?
- What happens to the stored outputs, signalling in networks, friend links etc. when a student ends his/her studies? What happens to them when the students change schools or municipalities? What's will student; teacher and administrator do when the student changes classroom, the school or municipal?
- Who is managing the platform? What resource is maintained? Does one need the specific support of a school administrator? What are his duties and the amount of time spent by them? What is the local information management role?
- In what operating systems, and what terminals does the platform work? How can materials can be shared and sent via Internet?
- How does it work as educational environment? Does the start-up require renewal for used software or hardware?
- Who owns the data recorded by the student’s in the service? Who can delete it, and under what circumstances?
- What are the real costs using the platform? What are the maintenance costs (support, the local maintenance)? What platform introduction costs (e.g. training costs)?
- Are there some platform parts that are not covered by the platforms' "basic price"? What are these and how much do they cost?
- What are the terms of the service, for example, age limits, and content ownership?
- What is the service development in the future? Who maintains it? Where do the servers locate and from which country the service is provided? What happens if the service is sold to a third party?
- Terms and Conditions, age limits, and the guardian permits
5. RECOMMENDED KEY ELEMENTS FOR PLEI

Trends in Technology enhanced learning (Cloud Computing, MOOC, OER, BYOD, Blended Learning, Gamification, Learning Analytics, E-mentoring, Lifelong Learning) and usability and the user interface for PLEI are the key elements for requirement specification for PLEI.

After analysing Trends and Scenarios we found elements or features the IMAILE PLEI should have.

1. PLEI has a Cloud Computing supporting interface.

Cloud-based services include a wide range of increasingly powerful tools for almost any platform a user might choose, or any task a user might need to do. There are examples that with Cloud Computing teachers can track student grades and progress, create standards-aligned lesson plans, and generate analytics and reports.

PLEI shall take advantages of Cloud Computing with having interface to different cloud services.

2. PLEI makes it faster to create learning materials and easier to tailor the learner environment.

MOOCs provide innovative pedagogical approaches which rely strongly on collaboration and cooperation between stakeholders. Security, identity protection and contents personalization for end users are becoming more and more important when using powerful technological platforms. When developing PLE it’s important to design an open interface to providers of MOOC courses.

It should be also as easy to use as MOOC platforms.

3. PLEI supports usage of resources with different standards.

With OER teacher can, for example, browse online photo galleries, select appropriately licensed images, and use them as a learning resource. The advantages of OER extend beyond remixing existing resources. PLE with interface for shared educational resources saves time, since educators do not need to generate components from scratch.

Learners also have the benefit of being able to customize their learning experiences with OER.
4. PLEI is independent of the operating systems and can be used with different devices.

BYOD makes one-to-one more accessible and it is easier to put into use devices that students already have. PLEI should personalize learning environment automatically with the use of common identity. Perhaps easiest way to make PLEI as a cross platform service is to use technique which supports all devices (tablets, smartphones, desktops and laptops). HTML5 is recommendation mark-up language at the moment and by the end of 2016 HTML5.1 will be the recommendation for services in Internet.

5. PLEI supports different models of Blended Learning.

The virtual space for learning provided by PLEI is a powerful enhancer. The possibility of students accessing resources about any topic, combined with the presence of PLEI guiding their activity towards the goal of learning, renders the face-to-face time as yet another highly valuable resource that needs to be effectively used. PLEI may serve as the ideal mediator to provide the right scaffolding so that activities of higher cognitive load can be addressed in face-to-face sessions.

6. PLEI uses innovatively different game mechanics.

Gamification includes the use of game mechanics. Game mechanics can be effectively used in Learning Environments. With gamification PLEI is giving an positive effect, rewarding, supporting collaboration, dynamic, surprising, motivating, supporting ownership and showing learners progression, time frame and level.

7. PLEI uses effectively learning analytics.

Learning analytics allows capturing a more detailed model of the students and their experience within a learning environment. Data availability offers the possibility of re-thinking how experiences are approached and designed. New scenarios and strategies must now be considered based on the fact that designers and instructors will have detailed observations almost instantaneously.

One of main consequences of collecting a detailed profile of how students behave in a learning environment is the possibility to provide a high degree of personalization. Thus, analytics can be considered as one of the main forces that shape PLEI. In a data-rich environment, PLEI can be considered as an entity that mediates between a comprehensive set of resources and actions and the needs of a student when trying to reach a specific goal.
8. PLEI takes automated online assistance to the next level.

If an virtual avatar (online assistant virtual teacher) have a possibility to use learning analytics and e-mentoring tools, it can provide a ideal learning assistant service to observe and foster self-regulated learning.

9. PLEI is also a tool for Lifelong learning.

PLEI is not only for the formal education in primary and secondary schools. PLEI can be used in Informal Learning and in Non-Formal Learning as well and usage of PLEI has no time limits, so LLL (Lifelong learning) should also taking into consideration.

10. PLEI has an innovative UID for visualizing and helping processes in learning and in teaching.

User interface design (UID) is the design with the focus on the usability, user’s experience and interaction. The goal of user interface design is to make the user’s interaction as simple and efficient as possible, in terms of accomplishing user goals—what is often called user-centered design. Good user interface design facilitates finishing the task at hand without drawing unnecessary attention to it. Graphic design may be utilized to support its usability, influencing how the user performs certain interactions and improving the aesthetic appeal of the design.

5.2 Final words

These 10 key elements are the result of this report and recommendations from 3 Technology Enhanced Learning experts for IMAILE consortium to proceed with need analysis and IMAILE iterative process described in D1.2 Quality Assurance plan and the Iterations of the project.

Image 2) Basic pattern of iteration
The iterations that will be managed in IMAILE are:

1. Phase of needs assessment (the customer needs is always in priority)
2. Market consultation (our information, communication and dialogue with suppliers)
3. Launch PCP call for tenders
4. PCP phase (3 stages) IMAILE PLE solutions assessment strategy and scores

1) Phase of needs assessment

This phase is based on the concept “Think inside the box” where the IMAILE consortium analyses and expresses the needs in detail. This box should not be too small nor to open in order to keep the needs of the customers in focus. It is important to manage a trade-off between market pre-information and the State of the art in order to enable effective RTD answers. Where one key aspect/focal point during the preparation phase is to verify the existence of innovation/market gap for a specific (not already technically specified) need from buyers group.

Allocated work that will be supported by these 10 key elements of Iteration 1)

- PLE definition (workshop Budapest)
- PLE common need agreement (workshop Budapest)
- D2.1 Need analysis and complete market analysis global level

Key to PCP success

In order to develop a qualitative PCP process the preparatory work before launching the call for tenders is of major importance. Therefore it should also be developed, presented and used as an iteration to which the consortium can go back and find its fundament over and over again throughout the project period.

These 10 key elements are crucial to support this work as recommendations of implementing PLE in primary and secondary school. And they will be used for a well-defined need analysis as well as for a complete market state of the art on a global level that will be done in WP2 and D 2.1 (MS 2)
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Appendix 1) Template of content - Score sheet for suppliers PCP (D1.2)

Tender assessments/ scores

The tenders of 3 PCP stages will be evaluated and scored out from several areas with minimum of up to maximum. The following areas will be evaluated in IMAILE and a detailed score sheet will be prepared in WP 3.

Impact on challenge

- The extent of how well the proposed idea / solution / technology meets the challenge as detailed in the Brief and whether it will have the desired impact
- Potential of proposal to address future/ wider challenges in an innovative manner
- The extent to which the approach demonstrates commercial feasibility and whether it is a realistic commercialisation plan / route to the market

Technical approach (with support from external ICT experts)

- Validity of technical approach that will be adopted

Quality of the Tender (with support from Contract manager)

- The extent to which the tenders shows a clear plan for the development of a working solution, and whether it is a reasonable plan to finish phase 3 in time
- Effectiveness of project management
- The extent to which the tenderer and/or subcontractor of PLE solutions appear to have dedicated its resources (human capital, equipment etc) necessary to perform the scope of the tender
- The extent to which crucial risks (technical, commercial) to project success appear to be identified and how effectively these will be managed

Price

- To insert an IMAILE price model