SMART LEARNING – AN EMERGING PEDAGOGICAL APPROACH

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Abstract
Smart learning is defined using the connectivist-inspired process-oriented pedagogical model [1] which considers dimensions and levels of interactions. In such technology-enhanced learning experiences interactions occur along dimensions determined by the nature and context of the activity. A Smart Learning experience is hybrid in nature, combining the physical with the digital environment, individual with collective learning, the local with the global (glocal), and knowledge acquisition with contribution. These activities provide the context for interactions with the Physical Environment, with the subject content (domain), with digital the technologies and tools used, with the data/knowledge networks accessed and used, together with the Community of other users and learners. The levels of interaction describe the modality of user engagement with the learning activity, that is, Operation interaction, Wayfinding, Sensemaking, and Innovation Interaction. Using these characteristics of this hybrid educational experience, Smart learning is then discussed as an emergent pedagogy characterised by widening access to information, opening up new ways of learning, providing opportunities for communication, collaboration, participation and the acquisition of skills. This multidimensional interactive learning experiences trigger further innovation and transformation of the learning experience by providing the opportunity to rethink the methods, content and structure of the learning process.

Using this theoretical framework Smart learning journeys are designed and developed integrating Augmented Reality. These journeys are carried out by students enrolled for the course in Technology-Enhanced Learning at the Faculty of Education, University of Malta. After going through these location-based, hands-on, networked, collaborative learning experiences, students are requested to apply the concept of Smart Learning in their areas of specialisation. This emerging pedagogy is evaluated through the feedback received from students after reflecting about the interactions categories proposed in the Connectivist, process-oriented model. The strengths and shortcomings of this pedagogical approach are identified. Suggestions are made how to capitalise on the strengths and how to address and improve the weaknesses.

Keywords: Smart Learning, Digital Pedagogies, Pedagogical models, Process-oriented methodologies, Augmented Reality.

1 INTRODUCTION
Defined from a Connectivist perspective [2], [3], [4], learning is a process of creating networks of connections with domains of knowledge, with co-learners and experts, and with technology. Downes [5] considers knowledge residing not only in the mind of an individual but is also distributed across an information network or multiple individuals and flows through a network of humans and non-humans (artefacts) comprising connections between nodes that can be individuals, groups, systems, fields, ideas, resources or communities. Smartness is an ‘emergent consequence of dynamic interactions between the environment’s constituent parts, including those of its human inhabitants and the artefacts and structures they wittingly or unwittingly create,’ [6]. So Smart Learning can be considered as location-related, networked, collaborative, technology-mediated, data-driven, customised learning.

Learners in places of particular historical, scientific, artistic or other significant characteristics can use their mobile devices to connect to on-line information sources, or interact with prescribed digital content available at points-of-interests (PoIs) using various trigger systems - blue tooth beacons, QR codes, geo-tagging and augmented reality. As part of this interactive and immersive activity learners share their experience or the digital content they generate with tutors or peers and interact with experts to ask questions or share their ideas. These learning activities are managed through dedicated on-line environments where all content and interpersonal interactions are organised. Customisation is made possible by presenting prescribed content in different digital formats and by providing interactive strategies through various options. Such smart learning experiences are normally organised into simple or complex learning journeys based on various pedagogical strategies – tour, game, mystery, self-directed. Being location-based, interactions occur with the hybrid physical
environment comprising buildings, objects and spaces together with the digital communication infrastructures - Wifi networks, mobile data and navigational data systems.

Digital technologies enable learners to create smart, interactive experiences about any relevant topic or theme. This paper discusses three Smart Learning Journeys (SLJs) carried in different locations - in a Botanical Garden about History and Botany; at a vantage point (Upper Barrakka) to augment a historical event that took place across the harbor), and along Republic Street in Valletta to explore the theme ‘Democracy in Malta’. Augmented reality and ad-hoc technologies are used to deliver context-aware content and for supporting creative, participative and collaborative pedagogies.

The model proposed by Bonanno, Klichowski & Lister [7] was used to design and develop these SLJs. It proposes that learning interactions occur along five key dimensions – the physical environment, knowledge domain, technology, data / knowledge networks and the community. Along these dimensions, interactions occur within four levels of engagement – operation interaction, wayfinding, sensemaking and innovation interaction [8].

At the basic level of learning interactions, operational interactions are possible in all five dimensions to build interaction spaces or a Personal Learning Environment (PLE). This involves getting to know the interactional potential of each section / area of the place and linking these to ad hoc learning strategies; identifying resources, support structures involving peer learners, experienced persons or experts, together with the adoption of different pedagogical strategies. Operational interaction involves also learners connecting with different technologies through learner-interface interaction, connecting with different knowledge and opportunities, and bridging learning across multiple learning and living contexts. In data rich environments operational interactions enable smartphone (and tablet) users to connect with different data sources to obtain (and possibly contribute) data related to their learning initiatives. Along the Community dimension interpersonal interactional skills have to be developed within contiguous and on-line groups, and within networks accessed through communication or social networking tools for which operational competence has to be developed.

Wayfinding Interaction involves finding the right information and people and then connecting specialized nodes or information sources and people. Thus information about different sections of the physical environment are identified and made available. People or special interest groups related to the different areas of knowledge are identified, together with their means of contact. Information and knowledge related to the SLJ are identified and organized in activities designed to promote content-context-learner/s interactions, thus elaborating the relevant knowledge web, the learning community and the social networks. This organisational approach is applied to available or generated data through typical wayfinding interactions - imitate, communicate (chat, rate, comment, message) and share (send, upload, publish).

Sensemaking interaction is a pattern recognition, information (knowledge) seeking, and a collaborative process that includes information aggregation/sharing, discussion/negotiation, reflection, and decision making, [9]. During this participatory process, learners bring together concepts from different domains in a novel way (Siemens, 2009), and they achieve a coherent comprehension of information and make decisions quickly. Thus a detailed spatial plan and a global knowledge network are created for integrating the different PoIs of a SLJ. Knowledge organisation is carried out in domains related to different aspects of the SLJ which are linked to create a final interdisciplinary knowledge structure. With regards to technology sensemaking involves linking different digital tools used in various aspects of the SLJ, such as navigation tools, augmented reality, geo-tagging, communication, content sharing and management tools, into coherent functional system for promoting various modes of learning. Similar patterns are established with regards to data, by creating a bird’s eye view of data sources, data types and data capturing devices. Along the community dimension sensemaking interaction manifest itself in the formation, developing and sharing of knowledge networks, network identities and social presence in relation to groups and networks. Typical Sensemaking interactions involve different modes of facilitation such as recommend, channel, tag, subscribe, filter and mentor. The outcome of sensemaking interaction are organisational networked patterns connecting tightly together nodes in geophysical, technological, data, social and concept (neural) networks which will eventually form the basis for personal contributions in innovation interaction.

The most intense level of engagement is Innovation interaction comprising the deepest cognitive engagement of all four interaction levels. Learners show their knowledge and competence status through contribution, engaging in evaluative and creative activities [10], [11] by creating (digital) artefacts or elaborate existing ones and share this innovation with others. Thus learners may propose new designs or re-designs of existing SLJ or parts of it. Within a field of knowledge, innovation interaction occurs when new knowledge about a particular aspect of the targeted hybrid environment...
or the SLJ is added or modified. It can also involve the creation or modification of open educational resources relevant to a particular aspect or theme. New digital technologies or applications can be customised and used to interact in new or more elaborate ways within the hybrid environments including emerging Apps or location-sensitive digital tools. Besides utilising available networked data, learners engaged in SLJs generate new data such as digital or multimedia artefacts either as an ad hoc personal expression or to share significant experiences. New tools or elaboration of existing ones can be used to innovate and extend users’ social networks and digital footprint. Thus key innovation interactions include customise, design, produce, contribute, program, model and evaluate.

This connectivist, process-oriented pedagogical model provides the necessary framework to design and assess smart learning in targeted hybrid environments. It will be used to capture patterns of interactions characterising different learning instances within a SLJ, together with learner’s progression in extending one’s knowledge and social networks.

2 METHODOLOGY

Three SLJs have been developed for different locations as shown in the map below. These are briefly described and then evaluated using post-activity feedback from student-teachers at the Faculty of Education, University of Malta.

2.1 Argotti Botanical Gardens, Floriana

A SLJ was developed for these Gardens using the Android-based WAY-Cyberparks App to provide a smart learning experience in botany and about the history of the gardens. The SLJ comprised 10 PoIs starting at the entrance of the garden in pre-defined GNSS coordinates where the App notifies the visitor with a welcome message and provides a plan of the SLJ showing the location of the PoIs - Info Point, the Nymphheum, The Argotti Villa, the Endemic Tree section, the Cacti & Medicinal botanical collections, the underground Argotti irrigation system, View of Marsamxett Harbour at the inner end of Gardens. When arriving at a PoI the visitor opens the camera of the smartphone to frame a predetermined target object. The learner starts interacting with it through any of the four proposed options by selecting the relevant icon on the screen. Each of these options leads to an Augmented Reality-based interactive activity about the History, Structures, Processes in the location and also suggestions for follow-up activities as a ‘Reflect’ activity. On selecting any of these, the user will have different media options (text, images, audio, video) superimposed on the view window of the camera such as digital images of maps and models that are superimposed on the real background. The ‘Reflect’ option proposes activities to be carried out in other locations where user can continue his/her inquiry. The App provides access to different on-line media management tools and social networks to enable and record further user-generated interactions.
2.2 Smart Learning Activity at Barrakka Gardens – Augmenting a Historical event on Senglea Point

Using the WAY-Cyberparks App, a GSNN-activated SL activity was developed to be carried out at the Upper Barrakka about a historical event that took place at Senglea Point (on the opposite side of the Grand Harbour) during the Great Siege of 1565. When opening the App in the Smartphone a welcoming message appears describing Points of Interest through icons on a map. User selects any of the on-line content - Images with a short textual description or comment. The map below shows the identified PoIs: Point of View at the Upper Barrakka, Bastions, Windmills, Fallout position, Fort Saint Michael, Barricade in Sea at Senglea Point, Chain between Senglea Point and Fort St Angelo, Battery at St Angelo, Bastions of St Angelo where Grand Master stood.

2.3 SLJ in Republic Street Valletta – The development of Democracy in Malta

A SLJ about the evolution of Democracy in Malta was developed for the main street of the capital city – Republic Street. Starting from Valletta City gate to the Sette Giugno monument in St George Square it comprises 10 PoIs where tasks had to be performed. Using trigger images, location-related augmentations are activated giving a number of options to interact with relevant information in different media formats. Key questions are asked about the PoI and learners had to comment or share experience on-line (using Edmodo) through different media creations. The ten PoIs were City Gate, The Parliament, Palazzo Ferreria, the Law Courts, Great Siege monument, Piazza Regina, Grandmaster / President Palace, St George square - Independence Plaque, Republic Plaque, Sette Giugno monument.
3 RESULTS - EVALUATING LEARNER’S EXPERIENCE ABOUT SMART LEARNING

Evaluation was carried out with 8 groups of student-teachers (N=104) enrolled between 2017 – 2019 for either the Bachelor of Education (Hons) or the Master in Teaching and Learning. Smart Learning was discussed as an emerging pedagogy with 4 groups in the course unit (MSL4203 and LLI5003): Introduction to Technology-Enhanced Learning. It was also considered from a learning design perspective with 4 other groups in the course units (MSL4205 and LLI5004): Designing Technology-Enhanced Learning. (MSL refers to undergraduate level, while LLI to Master level).

Evaluation was carried out through class discussions after running a SLJ, written reflections as part of the unit final assignment, and comments / reflections / exchanges carried out in Edmodo as part of the activities in SLJs. The feedback from these sources was classified according to the four main categories proposed in the above model, i.e. Operation Interaction, Wayfinding, Sense-making, Innovation Interaction. An attempt will be made to identify emerging patterns of interactions and discuss the pedagogical and design implications for Smart learning.

3.1 Operation interaction

3.1.1 Determining interactional potential of different areas of the SLJ.

Participants evaluated the interactional potential of the SLJ PoIs considering the design, technical and organizational aspects. From a design perspective, most participants stated that the tasks were very well structured considering that locations were close within a reasonable walking distance. The icon representing the PoI on the map should provide an image with the key feature of the location for quicker recognition. When designing SLJ to be carried out within school premises, instead of GPS navigation, one can give orienteering instructions using geographical coordinates. However, if the SLJ is designed for outside the school premises an app such as google maps can be used to find the desired location by providing the address on the instructions page in AR App.

Students commented positively about the GPS function and use of Google maps to locate and navigate to the PoIs along the SLJ especially by someone who might be unfamiliar with the place. Many claimed that the interactional potential is directly related to the availability of the internet through which the Augmentations and Google Maps were accessed. Fortunately, most of the SLJ was within range of free wifi hotspots provided by one particular ISP. For PoIs not in range of wifi hotspots or if one was subscribed to a different ISP, the only solution was to pay for a roaming service, which could not be afforded by some students. Regarding the organizational aspect, participants showed concern about student security during such activities. If the SLJ was to be carried out with younger students, teachers would have an added responsibility leaving students to roam freely in public open spaces. This will definitely necessitate increased supervision by providing a teacher or LSE with each group at all times.

3.1.2 Defining a domain-related Personal Learning Environment (PLE).

A SLJ is described as a PLE by considering available resources, support structures and learning strategies. A D&T group identified a long list of workshop tools and equipment they planned to include in an AR-based tool familiarisation activity. They planned to use these tools in activities related to series and parallel circuits. They proposed a 3-step learning strategy: 1. Students learning to use HP reveal from their devices; 2. Perform the AR-based instructional activity; 3. Do related practical and theoretical activities. Various groups of students referred to the ‘situatedness’ of the SLJ – ‘learning about Maltese history on-site which made the learning more real and location-related’; ‘learn more about the history of politics of the Maltese islands in a wholly different environment.’ Some did not consider the SLJ as a PLE but more of structured activity extending beyond class for students when going on educational outings.

3.1.3 Promoting digital & information competencies.

Participants pointed out that such SLJ ‘do not only aid in the connection between the digital and real world but will also change students from being passive learners to active participants.’ Others emphasized the importance of integrating digital technologies and networking systems into the educational system while supporting teachers in developing relevant competences. Developing SL activities implies dedicating time to learn how to work with digital tools and resources, and by networking with each other. Collaboration amongst teachers from different subjects and the adoption
of interdisciplinary approaches was emphasized. SL provides the opportunity to teachers to update themselves with the latest digital content and resources, thus teach their students how to cope in a technological world.

SL can be used to develop creative competences by sharing on-line content and creations developed during or after doing a SLJ. Participants used their SLJ experience to identify relevant digital competences that have to be developed to carry out SL activities: install and get acquainted to the necessary apps that they need to use; Competence in using “Aurasma” and “My Google Maps”; Competence in uploading and sharing content in Edmodo. Some concluded that ‘Smart learning has a huge potential to enhance learning and engagement of students’ and thus demands pedagogical knowledge, digital skills and extensive preparation time from the teacher.’

3.1.4 Developing effective Human – Digital Device Interactional strategies.

Participants reported various ad hoc and planned interactional strategies to overcome problems arising from the operation of their device or connection to wifi / data systems. Some described the learning curve for getting acquainted with Google Maps, Edmodo and HP Reveal involving downloading of Apps, signing up for an account, exploring App’s features, and activating on site augmentations using trigger images. ‘Some users had problems interacting with HP Reveal and the dedicated on-line site. ‘The website where you identify trigger images and link content to the Auras seems to be working very clumsily and the instructions on how to create content are not clear. I found the website working completely different on a laptop than on a desktop computer’.

When encountering problems with the activation of triggering images, participants took the following precautions: using different brands of smartphones, using 3 or 4 smart phones several times to trigger an augmentation, moving to another PoI, visiting all the Pols at different time of the day to control for different light intensity on the trigger image.

The internet was needed to use the apps but this was not available for everyone in the groups. A constant connection with 3G data was required because free Wi-Fi along the journey was not available all the time. Participants considered both the discriminate triggering of augmentations and the demand for a roaming data service which was not affordable by all, as serious inequality problems resulting in an unfair experience.

Smartphone resources had a direct impact on interaction. To complete the task, users had to switch from one app to the other, as it was inconvenient to view both the map and HP reveal at the same time. Further on, the experience became more complicated as to read the information about each site the app redirected users to the on board web browser. This slowed down the mobile phone and some apps, HP Reveal in particular, had to be closed and re-opened. Using both apps, with HP reveal continually using the camera on the phone, drained the battery fast. So smartphones had to be fully charged and power banks readily available when smartphone battery get drained.

Many participants had positive comments for this interactive experience. They were successful in triggering augmentations, and interacting with links, media and tasks provided. The HP Reveal app was very enjoyable and useful in learning about the identified locations. Some expressed their determination not to be deterred by operational problems and continue getting engaged with technology as this keeps improving.

3.1.5 Nurturing interpersonal interactional skills within groups and networks.

Participants discussed mostly the facilitating role of technology in interpersonal interaction. Students without access to the apps should work with other classmates so that they can still have the opportunity to learn from such a novel way of learning. Edmodo served as a very good sharing tool where students can upload generated content after the activity. Students might be more motivated to add their comments through Edmodo than discussing them face to face as they might feel more comfortable and confident in communicating through their personal social media.

3.2 Wayfinding

3.2.1 Connecting specialized nodes or information sources related to SLJ

While answering key questions for each PoI, participants created content in the form of location-related digital photos taken while doing activity and also by providing detailed historical accounts from on-line sources about the buildings and related historical events relevant to that location.
3.2.2 Connecting key domain info and knowledge nodes to the different aspects of the SLJ

Tasks were assigned at each PoI encouraging participants to take photos or any necessary notes based on what they observe. In the Argotti SLJ, plants being augmented were analysed for physiological adaptations as a means of survival in its native environment. At Pols in the SLJ about democracy in Republic Street, participants took photos of features related to the theme or questions for each PoI, linked these photos to information from on-line sources and organised this in the relevant section in Edmodo.

3.2.3 Using digital tools that mediate learner connection with info, knowledge, resources and relevant people

Most of the participants used the Google My Maps app to determine which points of the journey had to be visited. They found the app and the information about the triggering image of each PoI very accurate. The Edmodo online sharing facility was easy to use and posed no problems to upload content and post the images. Others commented about the ease of use and customisability of Google maps enabling them to write the information straight to the map when planning a SLJ. Some also claimed that even lack of technology can connect people such as when students without a smartphone pairing up with someone owning a suitable device, thus sharing the learning experience.

3.3 Sense-making

3.3.1 Negotiation and Argumentation of domain related knowledge; development of an interdisciplinary knowledge structure

Participants commented that the SLJ was an excellent example of how subject knowledge can be learned on site outside of the class and on the move. When designing SL activities, a multi-disciplinary approach should be adopted having teachers teaming up with others from different subjects. Discussions and knowledge sharing should be structured and managed through on-line facilities.

3.3.2 Linking technological affordances to learning modes

One participant who used Google Maps for navigation, HP Reveal for augmentations at the various Pols and Edmodo to share the generated content complained that participants need devices with good functionality and internet connection to use all of the applications at the same time. Thus before making learning journeys, teachers have to be sure that the students have enough working devices with particular specs. Combining all the elements in a single application would encourage and simplify these activities tremendously, eliminating switching from one application to another all the time while doing the journey. Participants also complained that those who had a sim card from a particular service provider that provides a number of hotspots along the SLJ had continuous connection to the internet and could access each augmentation and Google Maps with no problems. Those using other service providers either had no access or had to pay for a roaming service which was interpreted as a form of educational inequity. Some considered the possibility of adopting a learner-determined random approach in executing the SLJ as a customization possibility which enhances engagement and motivation.

Some participants claimed that smart learning activities provide students with an authentic context to learn subject content in an informal but effective way by providing modes of learning and multimedia resources that serve the learners much better than classroom approaches based on notes and verbal presentations. Using the proposed apps helped them think further about how they can integrate smart learning within subjects that are taught in a traditional, instructional approach, and thus promote learning experiences that appeal more to young people who are so much engaged with technology.

Various participants commented on their experience with augmented reality during the SLJ. The AR apps enabled them to interact with the environment turning everyday objects, images and locations into engaging reality experiences. The tasks proposed by the augmentations enabled them to learn beyond the usual classroom setting.

Participants linked the SL activity to the following aspects of learning: involved 21st century digital skills and innovative methods to engage with tasks; helped them retain more information; motivated them and developed an intrinsic interest to learn more; discovery approach increases students’ ability to learn; compared to current teaching these are innovative, engaging approaches that appeal more with today’s generation who maybe apprehensive to teacher-centred approaches.
3.4 Innovation Interaction

3.4.1 Re-design of SLJ to address Learner evolving needs

One group of participants adapted the Democracy SLJ to Orienteering for PE students, while D&T students created a SL experience about tools and equipment found in a workshop. Another group re-designed the SLJ at Argotti to familiarize Biology students with the history of the botanical gardens, to explore the different botanical collections and the key features of plant in these collections.

3.4.2 Renovation of domain knowledge relevant to SLJ

Various participants pointed out that the SLJs could be extended beyond politics and History and thus applied this methodology in their areas of specialization. Drama students developed a SLJ about different theatre spaces in Valletta providing hybrid experiences for each theatre space category. Graphical Communication students developed a SLJ about Ideograms – to learn different categories of signs used in workplaces and construction sites (Warning, Prohibition, Mandatory, Safe-condition and General information signs). They developed augmentations for locations where such signs are found for students to learn about the content of the sign, its category, rules being communicated and where sign should be applied. Using a Digital Compass app, HP reveal and an on-line guide, PE students applied the SLJ to an Orienteering activity in Gozo utilizing key landmarks as triggering images. The SLJ at the Argotti Botanical Gardens inspired a group of Biology students to develop one about Sexual Reproduction in the Flowering Plants found in these gardens. Students of Home Economics developed a SLJ for one of the local supermarkets and used AR to navigate through the store and get information about different food commodities including ingredients, nutritional value, function, and modes of production. A group of Mathematics students developed a SLJ in the form of a trail in which students move around the school premises and outside to revise in a practical way topics covered in class and to explore use of mathematics in real life as shapes, lines of symmetry, rotational symmetry, scales, elevation, and other.

Two chemistry students developed a SLJ about air pollution where students had to travel to identified landmarks and through AR learn about different sources of air pollution, their effect and how these could be controlled thus make themselves more aware of how their behaviours are impacting the environment and ultimately their health.

Another group of PE students developed SLJs to have students explore the impact of diet and exercise on the cardio-vascular system. Using HP Reveal they created a SLJ for a particular supermarket designing augmentations for different food and drink products, giving information about the nutritional value and how these products affect the cardio-vascular system with regards to fat and cholesterol build up in blood vessels. In conjunction with an App (Runtastic) they could check physiological parameters at different PoIs in a SLJ developed for a park equipped with physical training facilities. Augmentations at different PoIs propose relevant training activities. Links to on-line charts are provided to compare one’s performance with that of others when doing the same activity.

3.4.3 Customise tools to interact in new ways with the hybrid environment

A group of D&T students explained in detail how they have to control ambient conditions to address the problems with image triggering they experienced outside. The objects to be augmented have to be in a fixed position with even and strong illumination. The augmentation will include the name, description of use, safety precautions, and a link to a demonstration video for the different tools and equipment.

3.4.4 Generating data through creation of digital artefacts

Varies participants discussed data generation activities after carrying out the SLJ by sharing their photos and notes about the activity in the relevant Edmodo page created by the teacher. Through online discussions with their peers, they build up presentations which they will use in class to share their experience.

3.4.5 Renovate and extend users’ social networks and digital footprint

Participants specializing in PE pointed out that ‘The Democracy SLJ was a very good example of connection between technology-enhanced learning, the social aspect of learning and physical education. Working in groups to complete the tasks promoted cooperative learning and communication skills to enhance the bond between students. Collaboration was also evident while
doing the activities in Edmodo, connecting with other colleagues and sharing the created digital content that enhances the digital footprint of the individual members of the group, of the whole group and of the class as a whole.

4 CONCLUSIONS - EVALUATING SMART LEARNING AND THE PROPOSED CONNECTIVIST MODEL

The feedback from student-teachers through the different evaluation activities after experiencing the SLJs, reveals a pattern how participants evaluate their experience. This innovative connectivist experience was first rationalized and subsequently evaluated through established instructional frameworks often comparing and linking it to class activities. Through conceptual clarification about the epistemological underpinnings of these different activities (student-)teachers will be supported in their professional development as this pattern is typical of the initial stages of conceptual change and the adoption of a connectivist epistemology. Yet students appreciated various strengths of SL, such as:

- The beneficial use of digital technologies to learn in authentic real-life contexts
- Negotiating meaning and knowledge building through an approach that resonates with learning modes in the digital era.
- The nurturing of a wide range of 21st Century skills by interacting with these hybrid environments including information, media and digital literacies, inquiry/problem-solving, creativity, collaborative and communicative competences, the ability to be innovative in using the surrounding habitat in culturally sensitive, globally aware and ethically responsible ways.
- The nurturing of life-long and life-wide autonomous learning self-management, self-monitoring and extension of their own learning (Tan et al., 2011).
- Promoting seamless learning merging authentic context with formal learning, local with the global, physical with the virtual, the now with the past and future.

Participants pointed out the following limitation of SL:

- Very time consuming with regards to time dedicated for the design, development and testing of prescribed components of the activities.
- Can involve steep learning curves to develop working competence with proposed Apps.
- Problems related to connectivity involving both location-related connectivity – disconnection or shaded zones but also mobile data subscription plans.
- Apps incompatibility with mobile platforms.

Regarding the proposed Connectivist model, categorizing the feedback according to interactions typologies arising from the intersection of dimensions of interaction with levels of engagement, gives a valid and reliable evaluation methodology. Besides qualitative analysis of manifested interactions one can also use the interactions typologies proposed by this model to quantify the categories of interactions. For example, after analyzing all the categories of feedback received about these SLJs, one could note the relative frequency of interactions with the physical environment, with subject knowledge, with the digital tools and with colleague participants. Yet there were no occurrences of the following interactions: Identify data sources relevant to PLE; Negotiation understanding and Argumentation about the different aspects of SLJ; Connecting with key people; Identification of key features of mature identity; Identity development; dialogic space analysis and expansion. Considering both the type and frequency of interactions proposed by this model can help researchers understand participant conceptualisations of smart learning – which dimensions and levels of engagement are evident in a participant’s interactions profile.

REFERENCES


