Evaluation System for Content And Language Integrated Learning in Architecture Using Immersive Environments

Matevz Juvancic[1], Tadeja Zupancic[2]
University of Ljubljana, Faculty of architecture, Slovenia
http://www.fa.uni-lj.si
[1]matevz.juvancic@fa.uni-lj.si, [2]tadeja.zupancic@fa.uni-lj.si

Abstract. *Based on the experience from EU project ARCHI21 (Hunter et al, 2011) and long-term commitment to research of architectural presentations and educational approaches to expert and non-expert public (i.e. Juvancic, Mullins & Zupancic, 2012), the paper aims to clarify the terms used in CLIL-architecture context, identify the variables that have, in practice so far, proven to influence the learning outcome and learning experience both in architectural and language sense, and systematize the findings into the useful system. The result can be envisioned as the potential 'ladder of the CLIL & architecture integration'. The system would be of help to anyone trying to integrate language learning at different stages of architectural education, pointing out the required fundamentals, predicting the possible learning outcomes or benchmarking them after the experience. The basic terms/variables divided into three major influencing groups - competence, work environment and course settings - are described first, proceeded with the scheme connecting them into the system and two actual examples 'run' through the matrix for illustrative purposes. The paper also looks specifically into the use of different immersive environments and digital communication tools for teaching the architecture/ design–other language combination and adapts the system to this segment, while also briefly comments on learners and teachers responses to CLIL-architecture integration.*
Keywords. *Architecture; immersive environments; CLIL; evaluation; teaching; Archi21.*

INTRODUCTION - BACKGROUND AND PROBLEM

While the Content and Language Integrated Learning (CLIL) has been tried out and implemented in the first and second level of education (Coyle, Hood and Marsh, 2010), the higher level education of CLIL approaches are yet to be developed and tested. The introduction of architecture as the content in this symbiosis and its special affinity to its own visual language can serve as an interesting counterbalancing act, enhancing and advancing the learning of spoken and written languages. Introducing the digital communication tools and immersive virtual

environments into the architecture-language equation offers additional opportunities for distance collaboration and language learning but also increases the number of variables influencing the learning outcomes adding to the uncertainty in results prediction.

In the paper we argue that some fundamental conditions need to be met to provide the minimal effective learning environment in which CLIL can take place as too much new learning experience threatens to overshadow either the learning of the
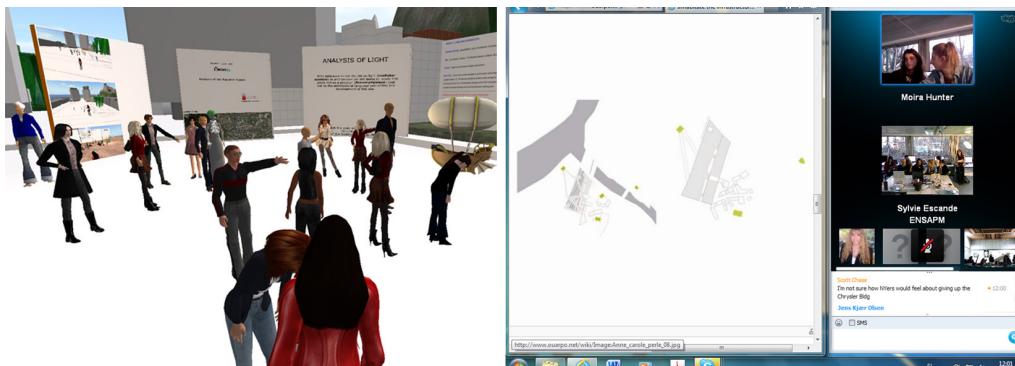
contents or the learning of the language, resulting in undesired poor learning outcomes on all fronts.

Architecture and urban design as subjects are very particular not only because they are concerned with complex matters such as buildings and towns but because they require the knowledge of special language – the visual language – that students need to learn and be proficient in it as well. On top of that we are describing and analysing situations in which the learners are dealing with the advanced communication tools, computer aided, practice specific tools and persistent digital worlds, all demanding and competing for the attention and burdening the learners with additional potential, sometimes steep, learning curves. On the other hand the visual language, if mastered, can be of help as a constructive mediator and translator between two different languages.

CLIL AND ARCHITECTURE

CLIL is a relatively unfamiliar term in architectural education circles. Whereas the notion itself might not be widely used in architectural context, its concept and idea are not new - namely, teaching architecture and urban design through the medium of a language other than normally used [1]. The expression *language other than normally used* is in text shortened to *the other language* and can be equally substituted with non-mother tongue language. The principles have been practiced in architecture and urban design on many occasions, especially in international learning settings that involve students and teachers of different country/language origin. We could argue that visual language used in architecture *is* the other language for students used to written language thus making the whole study a CLIL experience but in this paper we will stick to the notion of spoken and written language in a traditional sense. Beside the evident benefits of learning the other language *on the go* and being able to use it professionally, there are other beneficial factors as well [1]:

- Building of intercultural knowledge and understanding.
- Development of intercultural communication skills.
- Improvement of language competence and oral communication skills.
- Development of multilingual interests and attitudes.
- Provision of opportunities to study content through different perspectives.
- It allows learners more contact with the target language.
- Language learning does not require extra teaching hours.
- It complements other subjects rather than competes with them.
- Diversification of methods and forms of classroom practice.
- CLIL increases learners' motivation and confidence in both the language and the subject being taught.

The paper uses two terms that need further explanation: mode and level. Whereas levels denote settings where the subjects or notions can be followed through different inter-related stages, advancing or descending on the scale, the modes denote conditions that are independent and cannot be perceived or compared among themselves as higher-lower, more advanced-less advanced, etc.

THE MODES OF CLIL

In this paper we understand the mode of CLIL as the other language(s) of choice and the number of them. The ARCHI21 project includes several languages: Slovene, French and English, at least two of them representing the other languages to each partner and in some cases even all three of them (i.e. Erasmus students coming from abroad). As modes of CLIL we had combinations of Slovene-English, Slovene-English-French in our courses, and the school of Paris Malaquis had French-English, French-English-Slovene combinations, etc. The modes can be thus classified as:

- Mother tongue - first other language.
- Mother tongue - first other language - second other language.
- First other language - second other language.

The modes of CLIL are usually not uniform for participants involved, particularly in cases where there is a mix of regular and exchange students (i.e. native students in Slovenia speaking Slovene as a mother tongue and English as first other language, Erasmus students speaking English in Slovenia as first other language and Slovene as a second other language, while participating in the same course).

MODES AND LEVELS OF IMMERSION

When defining immersion of dislocated participants the ultimate immersion would be the face-to-face experience with other participants, being able to communicate, interact, work collaboratively and, in architecture also, experience the space and the surroundings as actually being there. Anything less is an approximation of this ultimate immersion through modes that associate the learners' presence, his in-teracting abilities and environment.

We can distinguish between the following modes of immersion where the presence of the user and his interaction possibilities play the part:

- *Mental presence* (third person observer, i.e. movie watcher in the cinema), limited to the passive role of the observing – cannot interfere with the action, but can mentally immerse himself into the virtual world.
- *Presence through the symbolic representation of oneself* - the user is transposed into the multidimensional pervasive digital worlds through the avatar, used as an interpreter of action between digital and physical world – the user can interact with the virtual world but needs to mentally immerse himself into his alter-ego (avatar) to be in-world.
- *Telepresence* – the presence in digital worlds with the help of VR technologies, that actuate and simulate the (total) in-world immersion and allow 'direct' interactions; one of the characteristics is also a first person point of view.

There are different levels of immersion, the presence representing only one of the aspects. Manovich (2002) distinguishes between illusionism, combining traditional techniques and technologies that aim to create a visual resemblance of reality, and simulation, recreating reality through other aspects, beyond visual appearance (i.e. freedom of movement). Not only that but being also able to use such environments through individual's experiential apparatus, use of logic and past experience. The notions which can be best summarized with the term *environment* or *medium* in which the learner is operating. By defining the levels of affordances that the viable 'classroom' media/environment supports in terms of recreating the experience of space and presence (and also having the currently available software/hardware in mind), we can derive the following levels of immersion regarding the learners:

- *Asynchronous audio-visual presentations* and posted replies (i.e. Knovio, VoiceForum, Wiki, etc.).

- *Synchronous audio-visual presentations* and discussions (i.e. Skype, GoToMeeting, shared whiteboards, etc.), usually limited to 2D presentations.
- *Synchronous audio-visual collaboration* in pervasive worlds not limited to planar presentations (i.e. Second Life - SL, TelePlace - currently known as 3DICC).
- *Face to face discussion* (f2f), allowing all types of presentations and the ultimate immersion.

Whether they are used to their full potential is another question, i.e. use of SL for presentations on boards in-world would suggest an advanced mode but is in fact not that different from audio-visual presentation mode.

ARCHITECTURE, LANGUAGE AND TECHNOLOGICAL COMPETENCE LEVELS

There are three fundamental levels of competence that need to be addressed: the competence of developing architectural and urban design projects individually or in a team, the other (first or even second foreign) language competence level, and the competence of using particular digital and communication tools for professional purposes (an advanced notion of digital literacy). They can be further explained as:

1. *The competence of developing architectural and urban design projects* – the levels:
- Students proceeding to *bachelor's* degree (or equivalent in years).
- Students proceeding to *master's* degree (or equivalent in years).
- *Licensed architects* considered in the long-term view of lifelong learning process.

The first two are defined through curricula usually distinguishing between the ground level of achieving basic professional knowledge, later developed into the independent professional individual on the second level, while the third is more elusive of clear definitions and refers to the in-field working experience and specialization.

2. *Other language competence level* is easier to measure by common international standards, i.e. Common European Framework of Reference for Languages (CEFR) [2] – using levels such as A1, A2, etc. denoting the language competency

3. *Competence of using the particular communication and digital tools* for the professional purposes is harder to measure but can be described in terms of skills the learner is capable of doing on his own:

- *Rudimentary* – the learner is capable of using the common writing, visualization and publishing software tools along with the use of professional suites in 2D (of his choice); he/she is also able to use social and common digital communication tools; the student is capable of using and moving in the pervasive 3D environment; he/she is able to follow steps of instruction for achieving *intermediate* goals but is unable to do them on his/her own.

- *Intermediate* – the learners are capable of using different writing, visualization and publishing software tools and are able to use professional suites across platforms and across different providers (in 3D). On top of that they possess skills to construct and work collaboratively in 3D (pervasive) worlds; the learner is able to find and combine the social and digital communication tools to his advantage in pursuing professional purposes; the student grasps the logic behind the digital tools and is able to adapt to changing and fast developing conditions in the digital domain on his own.

- *Advanced* – the learners have the intermediate level of skills upgraded with the scripting and programming skills; they are able to modify and merge existing (open-source) applications into new ones or create their own if the ones available are not suited for the professional tasks they are faced with.

WORK MODES IN COURSE SETTINGS

The working objectives and type of work affect the learning outcomes, opportunities for the CLIL, suitability of digital tools used and required or desired immersion. Depending on the task and type of work there is a high possibility that learners will be bur-

dened with learning curves in several presented variables (i.e. language competency, communication tools' skills, etc.). The four envisioned types of work in courses cover the most frequent settings when architectural and urban design learning is in question, regardless of the type of learning (distance or f2f):

- *Lectures/discussion* – the usual setting for traditional ex-cathedra lessons or, more contemporary, teacher-students interactive lectures and ensuing discussions that happen either f2f or through distance learning (Mason and Rennie, 2006); they involve synchronous or asynchronous means of communication
- *Presentation/discussion/critique* – the prepared presentation of work in progress, work finished, historical material, description on topic, etc. done in any manner with the ad-hoc discussion and critique following the presentation in which either presentation itself or the subject of the presentation is discussed and criticized; on this level the learners can i.e. present their projects done collaboratively but without CLIL component
- *Collaboration on a project/workshop settings* – with envisioned CLIL component in all stages, including actual work on the project
- *Expert – non-expert public participation* – the collaboration of experts and non-experts (also a simulation of such situations) with all of the specifics of communication issues that ensue

ARCHITECTURAL DESIGN PROCESS LEVELS

The stages in architectural production and their characteristics differ greatly and span from initial first ideas, conceptual work on abstract levels proceeding towards detailed proposals and plans for the execution. The discussions about- and critique of- the projects accompany the process but can also span the part or the whole range when the main focus of the course is aimed towards analysis (devoid of designing), i.e. analysing the architecture historically, stylistically, functionally, etc:

- *Initial concepts* - defined by abstract, rough ideas and input data; (has or has not Project Based Learning - PBL - characteristics).
- *Intermediate level between concepts and details* – the ideas and concepts get more definitive form and dimensions; the functionality demands, tectonics, building and legislation constraints are taken into an account; the viable plan for execution is taking shape; (has PBL characteristics).
- *Detailed project or similar project-like exercise level* – all the factors are dealt with (or simulated) supported by thorough plans for the design to come into its existence; construction and execution are the logical next steps; (has PBL characteristics).

With the design of objects for the digital worlds, the description of levels would differ slightly but would still follow the similar path. For example, the tectonics considerations are perhaps not necessary due to the different medium and the functionality can represent a different notion – behaviour of an object, but the detailed project remains a reasonable description of the design process level as the object can be produced in different levels of detail (textures, behaviour scripts, programming, etc.).

OUTCOME - THE LEVEL OF CLIL INTEGRATION INTO ARCHITECTURE EDUCATION

The level of CLIL integration into the architectural and urban design education is tightly connected with the language competence level of teachers and students participating but also with other variables discussed in this article. It spans the range from basic to advanced integration in the architectural courses and can be seen both as a variable and as an expected output of the presented system:

- *Basic* – expected learning outcome: fundamental, basic vocabulary and phrases not necessarily related to professional topic; students use single words and phrases interwoven with their main language of use in their work/presentations to illustrate/emphasize specific notions,

hear onomatopoetic sound of words, discuss the meaning of words used in different cultural and language contexts, etc.

- *Intermediate* – expected learning outcome: rudimentary professional architectural vocabulary on the specific topic, use of phrases, forming of elementary sentences; students can present their work and collaborate using the combination of main language of use and the other language, using the other language for the emphasis or demonstration of their language abilities; the amount of other language use is no less than one third.
- *Advanced* – expected learning outcome: using the other language for professional purposes during courses; students are able to argue, present, express opinion and collaborate in the foreign language, while also learning the language details and finesse.

THE SYSTEM AND THE MODEL IN USE - DISCUSSION

The system itself implies the variables that affect the learning outcome and learning experience when considering CLIL in architecture. Depending on the variable levels and modes the final integration can vary from basic to advanced. The model has not been designed to provide an exact number or percent of the integration, but it gives an overview of the complexity of interconnected factors. It does that on the basis of actual experience with known, but not lab-controlled, inputs and known outcomes. Being designed from deductive perspective, the CLIL integration can be best presented through the proposed scheme (see Fig. 2) on the basis of two actual examples from the Archi21 experience.

Two courses were introducing the CLIL – Space & media [3] and Workshop: Lighting guerrilla [4]. In Space & Media the students had to deal with and re-design the Square of the republic in Ljubljana, using pervasive worlds and integrate Slovene and
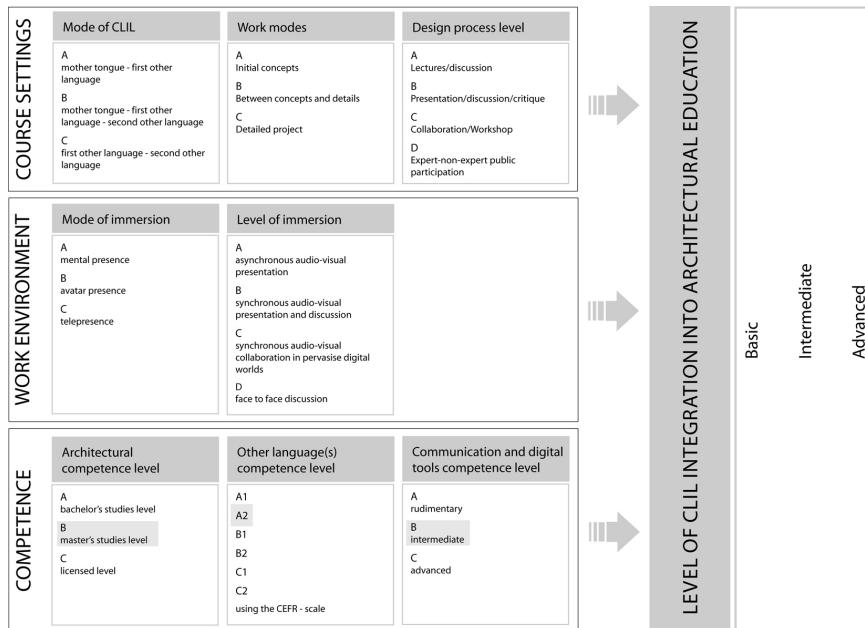
Figure 2
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English language. In the Workshop, the students had to design the light installation on the topic of movement and actually build it on site in the most physical sense, while also integrating the language of Slovene and English into their learning experience. The courses were fundamentally different in terms of variable levels and modes although they seem similar at first glance. The conditions are best represented by the mark-ups in the schemes (see Fig. 3 and 4) and they can also be compared. The final outcomes – the integration of CLIL and architecture – are different but following the variable settings the reader can have a better insight in why and where the differences stem from.

Discussing the hierarchic order of variables and their significance for the final integration of CLIL in architecture, we can establish that competence levels are the unavoidable base on which the CLIL can be developed. Certain levels of technological, architectural and language competency are necessary in order to have any integration expectancies.

For example, the CLIL-architecture integration is very limited without sufficient command of other language, particularly when the other language is not widely used, is unfamiliar to the learner, or the learner has just began learning it. The same is valid for the learners coming from general education, only starting to get the knowledge and expertise in the field of architecture – the lack of sufficient competency in the field hinders CLIL attempts, which become unwanted and unnecessary distractions, drawing the much needed attention away from the contents. The argument from the beginning of the paper still applies - fundamental conditions, especially in terms of competencies, need to be met to provide the minimal effective learning environment in which CLIL can take place. The course settings and work environment also affect the learning experience and outcomes but can be seen as modifying rather than restraining factors of CLIL-architecture integration.

The responses of learners and their teachers to CLIL-architecture integration have been positive.

Figure 3

The integration of CLIL in the course of Space & media [3] is shown as an illustration of the input variables and final outcomes. The course was part of Archi21 project and done in collaboration with partner institutions in WS 2011/12.
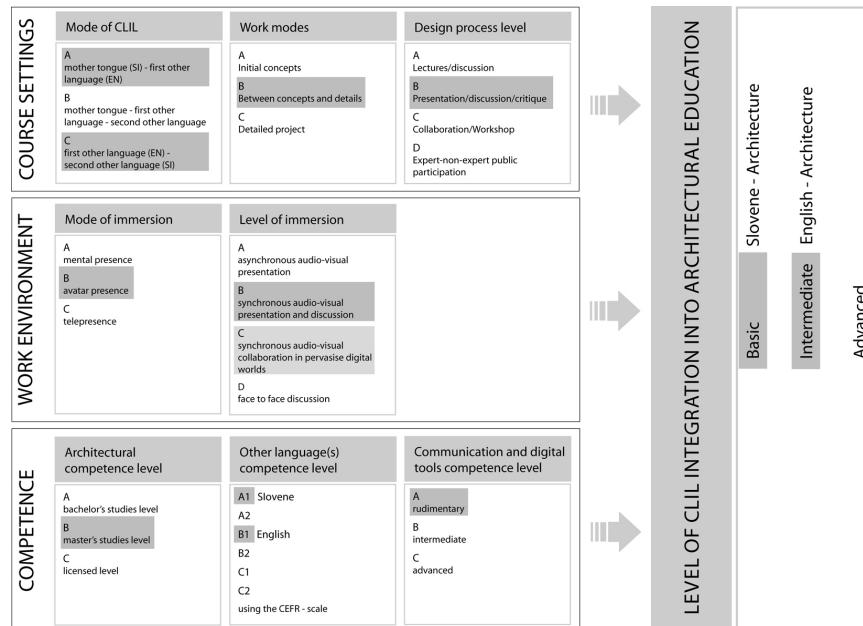
While not surveyed statistically, the qualitative responses from teachers emphasized benefits of spicing up the topics, widening the architectural vocabulary and adding cultural richness through the use of other languages and expressions. They also stated the disadvantages: the additional burden and learning for the teachers themselves, allocating the time and attention from contents to language and taking care of their interplay add the complexity to- and demand on- their job. While students did not talk about disadvantages, during their work, they un/intentionally focused to the contents – architecture – more, sometimes forgetting or ignoring the language aspect and they had to be reminded by the teachers to bring some of their attention back to the language. Based on the experience described above it can be said, the integration does not happen naturally or effortlessly on this (higher) level of education. It has to be nurtured and focused upon constantly. With specialized tools, developed for CLIL-architecture purposes, such as *learning objects* (Watson, 2010), the

integration can be helped and can happen on multiple levels from the start; however the hindrance of such tools is the very same specialization, the need to prepare them on case to case basis and time they take to prepare.

It seems that architecture and urban design as visually oriented fields are in a better position to bridge the *language - in-field expertise* divide, occasionally resorting to the different, visual language when faced with an obstacle in communication. In this way they can be beneficial to learning English and wide variety of other languages *on the go* and in parallel while learning and gaining expertise for the profession (learning by doing or learning while doing). The comparison of the expressions and notions in different languages also brings new meaning, new insights and fresh discussions into the architectural (dis-) courses.
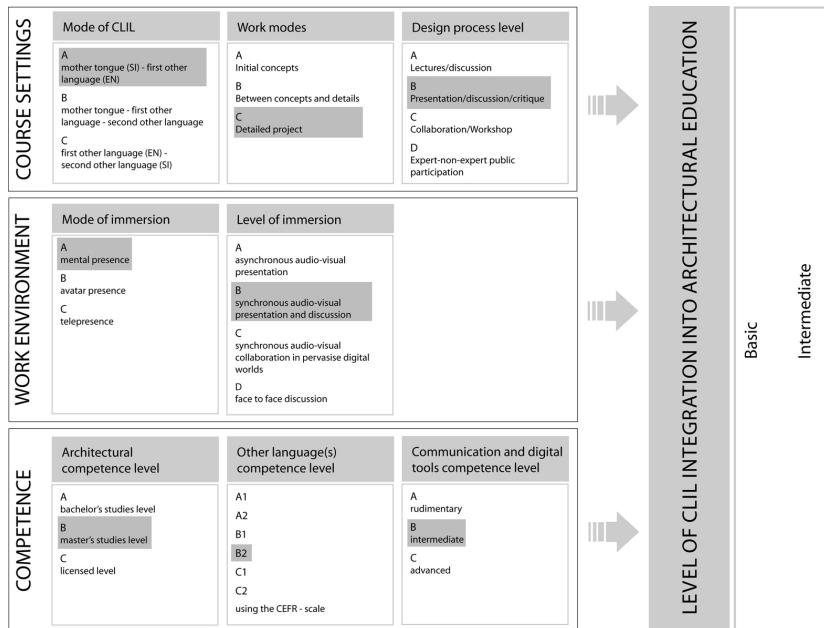

Figure 4
The integration of CLIL in the course of Workshop: Lighting guerilla [4] - part of the international initiative - is presented with its variables and demonstrates one of the possible uses of the evaluation system. With the inputs as shown, you can expect or even predict similar integration results. The course was part of Archi21 project and done in collaboration with partner institutions in SS 2011/12.

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