Developing Creativity In Content & Language Integrated Learning

Editor Ruth Breeze

Foreword by Melinda Dooly

22-23 June 2018

Universidad de Navarra

Edited by Ruth Breeze
Co-editor Pilar Gerns
University of Navarra

Edita:
ISBN: 978-84-8081-609-0
Servicio de Publicaciones de la Universidad de Navarra
Carretera del Sadar, s/n.
Campus Universitario
31009 Pamplona (España)
T. 948 425 600
Junio, 2018

Table of Contents

Contributors and Biodata

Alessandra AGATI teaches Italian in the Instituto de Idiomas of the Universidad de Navarra. She has recently been active in designing material for Italian courses for medical purposes, and creative project related to art.

Amaia ALVAREZ DE LUIS is a teacher at the Liceo Monjardín institute. She has a degree in Biology and in Biochemistry, a post-graduate degree in Cellular and Molecular Biology from the University of Navarre and a PhD in Social Anthropology from the University of Murcia. She has been teaching science, chemistry, physics, maths and robotics for the last 10 years. She has been coordinating an Erasmus+ project for two years and trying to introduce STEM methodology into the students' learning process.

Ruth BREEZE is senior lecturer in English at the University of Navarra, Spain, and combines teaching with research as a member of the GradUN Research Group in the Instituto Cultura y Sociedad. Her most recent books are the co-edited volumes "Essential competencies for English-medium university teaching" (Springer, 2016), "Evaluation in Media Discourse: European Perspectives" (Peter Lang, 2017) and "Power, Persuasion and Manipulation in Professional Discourse" (Peter Lang, 2017).

Henri CASTLEBERRY is a PhD candidate at the University of the Basque Country and a member of the research group LASLAB, a multidisciplinary research group also based in the University of the Basque Country that investigates issues concerning speech and language acquisition. Additionally, he is the director of the English Department at NClic School in Vitoria, where they have incorporated English as a medium of instruction and the CLIL approach into their curriculum.

Melinda DOOLEY is senior lecturer (Serra Húnter Fellow) at the Department of Language, Literature and Social Sciences Education, Faculty of Education, Universitat Autònoma de Barcelona. She is the lead researcher of the publicly funded Research Centre for Plurilingual Teaching & Interaction (http://grupsderecerca.uab.cat/greip/en). She has been leading researcher on several nationally and internationally funded research projects and has participated as team member of over 20 other projects. Dr. Dooly has published widely in journals, books and chapters on multilingual education, technology and teaching practices. She was honorary lecturer at the Institute of Education, University College London in 2016.

Fernando ECHARRI IRIBARREN has a degree in Biological Sciences (University of Navarra, 1989) and PhD in Environmental Education (University of Navarra, 2009). He is associate professor in the Department of Environmental Biology of the University of Navarra (Pamplona, Spain), responsible for the subjects "Ecology" and "Environmental Impact Assessment", as well as teaching on the "University Master's Degree in Teaching" and Master's Degree in "Biodiversity, Landscape and Sustainable Management". Since 2014 he has been working at the University of Navarra Museum, as Head of the Educational Department. His subjects of interest are significant learning and significant learning experiences.

Immacolata ERCOLINO is a PhD candidate at Camerino University (MC), Italy, in Life Science teaching. The aim of her doctoral project is to create a platform in order to help teachers and learners to become more confident in Science teaching with CLIL methodology. She has been a Science teacher for more than 29 years in a Science High School in Naples, Italy, and she is particularly interested in education and hands on activities in Science. She had been a SISS supervisor for many years at University of Salerno and Suor Orsola Benincasa University

in Naples and now she is Tutor Coordinator of TFA as Science Teachers' trainer at the University of Naples "Federico II". She has expertise in hands-on activities, and as a science expert in more than 30 PON Projects courses for teachers and students from primary school to high school. She has experience also in ICT as a teacher trainer. She worked as an expert in the INVALSI school evaluation teams (NEV), and also as teacher trainer and author of teaching materials for MIUR (Italy). She has professional experience in Europe, where she was trained (EMBL and EMBO courses), and also in Japan, where she participated with some students in a school science contest in Shizuoka.

Laura GIAMATTEI has a degree in geological sciences and she teaches both mathematics and science. She has 18 years of teaching experience with 10-13-year-old students in schools in Naples, Italy. She has always been interested in highlighting links between science and everyday life, and now she focuses on innovative Science Lab projects using the CLIL method, which incorporates English as second language.

Maika GOYA ESPRONCEDA is a teacher at Liceo Monjardín. She has a degree in Pedagogy from the University of Navarra and a degree in foreign language education from the University of La Rioja. She has been teaching English, science and arts for the last 14 years, trying to create a rich and meaningful context that stimulates the creativity and the interest of her students in their learning process.

Abel MIGUEL MARQUÉS is a primary school teacher giving classes in natural science, arts and crafts and English at Colegio de Fomento Miravalles–El Redín, in Pamplona.

Laura MEDINA CABELLO is a teacher at Liceo Monjardín. She qualified as a primary school teacher, specialising in foreign languages (English), at the University of Valladolid. She is an English, science and arts teacher. She is keen on learning about robotics pedagogy and lesson plan applications in an interdisciplinary way to ensure her students' significant learning.

Angela RUOTOLO, born in Andria (Italy), works as teacher and coordinator-tutor at the Faculty of Education Sciences, Psychology and Communication in the Aldo Moro University of Bari. She has also been a teacher in primary school at the Verdi-Cafaro Institute in Andria for thirty-five years. In primary school, she has held numerous positions of responsibility and was deputy director for some years. She has specialized qualifications in clinical pedagogy. She teaches parents methods and techniques to facilitate communication among family members. At present, she is an official collaborator of INVALSI as expert evaluator of educational institutes. She organizes ICT courses for teachers and pupils. She is president of the UCIIM section of Andria, a national association that promotes training for teachers. She also collaborates with the INDIRE national research and innovation agency, which centres on Italian Language, science, history, geography, technology applied to teaching. She has published part of a manual for the preparation for the school leadership competition in Italy, some articles on clinical pedagogy, a vertical course for primary and secondary schools on the values of grammar for INDIRE, a multimedia CD on Italian literature for primary school classes, and many experimental teaching activities in various fields.

Izaskun TOMASENA HERMOSO DE MENDOZA is a teacher at Liceo Monjardín. She qualified as a primary school teacher, specialising in foreign languages (English), at the Public University of Navarra. She has been teaching English, science and arts for the last 11 years. She is keen on learning about new methods and applying them in order to keep motivating her students in their learning process.

FOREWORD

If you can think it, you can do it: Motivating creative minds through CLIL

Melinda Dooly, Universitat Autònoma de Barcelona (UAB)

CLIL has moved out of its infancy and is well into becoming a mature and established pedagogical approach that is widely accepted in Spain, indeed, across large portions of the European Union (Breeze, Llamas, Martínez Pasamar, & Tabernero, 2014). And like all pedagogical approaches that are growing in popularity, there is a need for reflection and discussion on what has been done, what works, what can be improved and how to move forward.

> [CLIL] was initially heralded as the potential lynchpin to tackle the foreign language deficit on our continent and was embraced as "a lever for change and success in language learning" (…). However, after this period of unbridled enthusiasm, over the course of the past half a decade, a more critical attitude has emerged (…), calling into question some of the core underpinnings of CLIL and shaking CLIL advocates out of their complacency. (Pérez Cañado, 2016, p. 10)

Theoretically speaking, CLIL is usually situated at the juncture where principally Vygotskian principles of socio-constructivism have been brought into a classroom where – in contrast to Vygotsky's original basis of the adult-child dyad for establishing the Zone of Proximal Development or ZPD – scaffolding for learning must be designed by one adult (the teacher) with twenty to twenty-five (or sometimes more) young learners. Needless to say, this is a daunting task. In what Hanesová (2014) calls "pedagogical constructivism", "CLIL lessons normally contain situations/tasks with some kind of cognitive challenges in which the active involvement of students is necessary" (p. 27). In brief, the CLIL teacher must become what I like to call a "participation architect".

As if that were not enough, today's teachers are also faced with the challenges of preparing their students for an uncertain future. It is common to hear debates about the future of education. Occasionally the discourse tends to the euphoric, sometimes it strays more to the dystopic. Often these talks centre on how educators can and should meet society's demands in the globalized, interconnected geopolitical situations of today. Educators, policy-makers and the general public can be heard voicing their concern about learners as future "global", "digitalized" citizens. So, teachers must ask themselves: what skills and competencies should our students have? What key knowledge should they acquire? Whether there is agreement or not on these issues, there does seem to be a general consensus that education is going to be transformed in the next decades as we accommodate rapid technological, socio-political, geographical, and environmental changes in the world.

Predictions about the type of jobs that will exist in 2030 (today's adolescent students will be in the working force by then!) run the range from the almost impossible to imagine (body modification ethnicists, organ agents) to already existent or almost inevitable ones (shareability auditors, biowaste optimisers). Along with new jobs, new concepts such as "share-economy" and "collaborative consumption" are changing the ways in which our society works, all of which have an impact on decisions teachers must make about exactly what content to teach (what knowledge and skills will be needed in the near future?), based on "guesses" about what jobs students need to be prepared for.

Students growing up in today's society have been steeped in a technology-infused society and are, on the whole, much more "tech-savvy" than their older counterparts (oftentimes including their teachers). So, for good or bad, teachers are working with children and youth who are smarter than them in many ways; who are "wired differently" in the sense that their thinking patterns and memory retention are different from the more written text-oriented generations of the past; who are emotionally and culturally different due to their global exposure to extremely diverse input; and who have information literally at their fingertips, so they are less willing to accept the teacher as the "expert". Perhaps most importantly these are students who prefer, indeed expect, to be cognitively challenged (in the best sense of the term!).

It can be argued that teachers of today have a moral and social obligation to ensure that their students are ready for tomorrow's challenges. They need to be problem-solvers, as this is the generation that will inherit the world's ills. They will be faced with serious environmental problems, resolving social and political crises (e.g. issues brought on by environmental problems) and will be tasked with making advances in health, education and society's general well-being. In other words, today's students must be equipped with what is rapidly becoming known as the 21st century competences. Almost all teachers have heard of these by now, as they are being touted by governments, policy-makers and the general public alike. Principal among the list of skills are: creative and critical thinking, collaborative skills, problem-solving abilities, social skills (e.g. leadership, entrepreneurship, etc.) and communicative skills.

Given their relevance in public discourse, the role of education in promoting these competences must also be interrogated. Promotion of these skills is often couched in minimally hidden neoliberal frameworks – the creation of the ideal, productive, science – oriented worker who can contribute to a nation's economic advancement. This may well be but for sake of brevity I cannot delve into this point further here. Still, there can be few teachers who would argue against the need for responsible, scientifically literate citizens as the individuals who can tackle the inherent inequalities encrusted in the aforementioned neoliberal framework! And this is precisely where CLIL can have an important role. After all, the two common axes to all of these 21st century competences (creative and critical thinking, collaborative skills, problem-solving abilities, social skills and communicative skills) are *language* and *knowledge*. These are the two unifying factors to thinking, to resolving problems, to collaborating, to simply "getting along" in society. And it is our responsibility, as teachers, to help our students become knowledgeable, multilingual, multicultural, multimodal communicators.

A good CLIL design is often associated with the 4Cs: Content, Communication, Cognition and Culture (Coyle, 2005). Perhaps it is time to pay extra careful attention to the C for cognition,

especially in light of the aforementioned future predictions of jobs, social infrastructures and geopolitical situations. For instance, there is going to be a growing need for individuals to be able to participate in "produsage" processes (Brun, 2008) whereby collaborative communities take part in extended and continuous building of already existent content, with an aim for steady and non-stop improvement of that same content. This is keenly exemplified by crowdsourcing. One of my favourite examples of this is the article in *Nature Structural & Molecular Biology* (Khatib, et al., 2011) that explained how online gamers helped scientists solve the structure of an enzyme involved in reproduction of HIV in just ten days – after these same scientists had struggled with the puzzle for over a decade! Distributed knowledge and connectivism are just two examples from a growing interest in finding new epistemologies for understanding how humans work and learn collaboratively. What these have in common is the relocation of knowledge outside of the classroom and the incorporation of multiple participants.

Of course, this is where CLIL comes in; or better said, a CLIL framework that is creative in design and implementation and which strives to stimulate the students' creativity as well. As Cross indicates CLIL can provide "a space for creative pedagogical engagement" (2012, p. 431) where the learners can make creative choices about what language(s) to use, how to use them and how to learn about the content. However, arguably, creativity in the CLIL classroom goes beyond even the opportunity of creative choices. Creativity in the classroom is about taking risks and making connections. It will emerge when children (and adults) are encouraged to actively explore their own ideas and given opportunities to express them through play. Creativity is evident as learners transform notions and ideas, using the resources around them, to make choices and decisions based on the unique way in which each individual experiences the world around them.

As the pressure of educating the 21st century citizens grow amongst clamours by concerned parents and policy-makers, CLIL practitioners can supply answers by including 'participation architecture' in their lessons in order to combine two closely related dimensions of thinking: creative and critical. Participation design moves beyond engaging the learners in student-centred pedagogy. This implies opening up the classroom to more potential participants. For instance, the CLIL teacher can bring in other learners (for instance through telecollaboration) so students can experience first-hand the geographically-distanced collaboration that is becoming so common in the workplace. Participation architecture implies integrating other experts (beyond the teachers in the school) and bringing in non-traditional information sources. In other words, CLIL lessons can imitate the 'connected', distributed knowledge society that our learners will populate in a few years' time.

To ensure that students develop critical thinking, CLIL lessons should help learners recognise and develop their own reasoning processes, encourage learners to seek and make explicit evidence that supports their reasoning and leads to coherent and well-argued conclusions. The lessons must also promote synthesis of information for problem-solving. For creative thinking, learners must have ample opportunities to generate and apply new ideas in the different disciplines integrated in the CLIL context. They must be encouraged to see familiar situations and information in a new light (cross-disciplinary comparisons can be an excellent way to do this) so they can identify alternative explanations for the phenomenon they are observing. And perhaps most importantly for creative thinking, learners must have abundant occasions to make

new links to the newly acquired knowledge in original and imaginative ways such as artistic performances or creations.

The chapters in this book foreground these aspects of critical and creative thinking in CLIL contexts. The contributions included here describe the ways in which innovative CLIL practitioners endeavour to foster and develop creativity in their own classrooms and across disciplines, from history to maths to outside-the-classroom experiences. The chapters will be illustrative and inspiring for anyone who wants to know more about fostering children's creativity in the CLIL classroom.

References:

Breeze, R., Llamas, C., Martínez Pasamar, C. & Tabernero, C. (2014). *Integration of theory and practice in CLIL*. Amsterdam: Rodopi.

Bruns, A. (2008). *Blogs, wikipedia, second life, and beyond: From production to produsage*. New York: Peter Lang.

Coyle, D. (2005). *Developing CLIL: Towards a theory of practice*, APAC Monograph 6. Barcelona: APAC.

Cross, R. (2012). Creative in finding creativity in the curriculum: the CLIL second language classroom. *Australian Educational Researcher*, 39(4), 431–445. https://doi.org/10.1007/s13384-012-0074-8

Hanesová, D. (2014). Development of critical and creative thinking skills in CLIL. *Journal of Language and Cultural Education*, *2*(2). Retrieved 15 June 2018 from http://files.jolace.webnode.sk/200000127-b21d1b317f/JoLaCE%202014-2-Hanesova.pdf

Khatib, F., DiMaio, F., Foldit Contenders Group, Foldit Void Crushers Group, Cooper, S., Kazmierczyk, M., Gilski, M., Krzywda, S., Zabranska, H., Pichova, I., Thompson, J., Popović, Z., Jaskolski M., & Baker, D. (2011). Crystal structure of a monomeric retroviral protease solved by protein folding game players. *Nature Structural & Molecular Biology*, *18*, 1175–1177.

Pérez Cañado, M.L. (2016). From the CLIL craze to the CLIL conundrum: Addressing the current CLIL controversy. *Bellaterra Journal of Teaching & Learning Language & Literature*, *9*(1), 9-31. DOI: http://dx.doi.org/10.5565/rev/jtl3.667

Towards creativity in CLIL

Ruth Breeze, University of Navarre

Introduction

The term creativity is notoriously difficult to define precisely. If people are asked to explain what it means, words like "inspiration", "imagination", "originality" and "freedom" often come up, but when they are questioned further, a certain vagueness sets in. There is a certain tendency to see creativity as the particular attribute of a small number of outstandingly gifted individuals (artists, writers, inventors) – the "genius" of the poets. But it is also common to conceptualise creativity as a kind of special ingredient that is to be found in many contexts, but in a limited sense – something that is available only in minute quantities to the average person. To shed light on this issue, some authors have distinguished between the "historical" or "big-C" creativity of da Vinci or Mozart, and the "personal" or "small-c" creativity that we apply in a multiplicity of everyday contexts, which is also extremely important. Few of us will be acclaimed as geniuses – but everyone can benefit from adopting a more creative attitude to problem-solving. As Carter observes, creativity can be understood in its widest, most democratic sense "not as a capacity of special people, but as a special capacity of all people" (2004: 13).

In this, however, it is important to note that both "big-C" and "small-c" creativity involve working imaginatively and engaging in process of exploration, combination and transformation (Boden, 1990). Moreover, both types of creativity rely on the acquisition of knowledge and skills, and operate under certain constraints (of a conceptual, material or practical nature) which paradoxically actually contribute to making creativity possible: "it is the partial continuity of constraints which enables a new idea to be recognised, by author and audience alike, as a creative contribution" (Boden,1990: 83). This combination of innovation and constraint is highly applicable in any discussion of creativity in teaching, and of course, wholly relevant to our present exploration of creativity in Content and Language Integrated Learning (CLIL).

Understanding creativity in CLIL

So how can we come closer to understanding creativity in CLIL? In a useful chapter on creativity in English-medium teaching, Alan Maley (2017: 87-89) lists some features that may bring us closer to seeing where the potential for creativity lies in our own contexts. His list includes "newness" (novelty, originality, surprise), "experiment" (curiosity, exploration, problem-solving), "seeing relationships" (connections, associations, synthesis, analogy, metaphor), "constraints" (borders, rules, conventions), and "flow" (relaxed attention, intense engagement, timelessness). By allowing room for these factors in the teaching-learning process, CLIL teachers can hope to stimulate deeper learning, richer language use and more creative responses on the part of their students. Other authors also point to the idea that creativity in the teaching context is multi-dimensional, and therefore involves a range of factors which may be pedagogical, social and affective, as well as purely cognitive (Hafner et al., 2017). They stress that creative teaching must be both open-ended and student-oriented, and they emphasise that teachers must be willing to accept outcomes that go beyond what they had planned. Teachers with an awareness of the need for creativity are likely to be more flexible and student-centred in their teaching style, more receptive to different types of response from their students, and more sensitive to the potential for promoting positive initiatives on the part of their students. In short, they will provide a more stimulating environment within which creativity can flourish.

One further strand in the bibliography on creativity makes a useful distinction between teaching creatively and fostering students' creativity (Cremin, 2017). Although the two often go hand in hand, as is assumed above, the emphasis is usually placed more on one than on the other, and teachers need to be clear about what they are trying to achieve in a given situation. For example, if teachers themselves perceive a need to adopt a more creative approach to a particular course, they could work with their colleagues to brainstorm and map out some innovative activities, and then monitor the outcomes carefully in order to improve the plans for the following year. Although some people are doubtless more creative than others by natural inclination, sharing ideas and experiences is an essential step on the road to developing more creative professional practices. On the other hand, if teachers want to promote creativity among their pupils, they need to address students' preconceived ideas about what creativity might or might not be, as well as the essential point that "knowledge and creativity are two sides of the same coin, not opposing forces" (Boden, 1990: 99). In other words, it is not ethical for teachers to promote "creativity" at the expense of imparting knowledge. As we have seen above, every act of creation takes place within the structures that are socially available and can only be understood insofar as it relates to these. Students who have greater content knowledge and more refined cognitive and communicative skills will be capable of creative responses on a higher level than those who lack the basic information and competences that are needed to underpin new acts of creation.

Fostering creativity in CLIL

There is no simple recipe for fostering creativity in our own practice as CLIL teachers, or in our students' responses to subject taught in English. But there are a number of ideas that can help. Proposals such as those by Paloma García Hormigo or Aviva Mirels Lauria, to mention just two of the excellent articles in the E-book from our last conference (García Hormigo, 2016; Mirels Lauria and Erla, 2016) provide models of how different media and methods can be

combined to design more stimulating learning activities that encourage creative responses from CLIL students from pre-school through to the last years of primary education.

With higher age groups, such as secondary school students, creative approaches also afford opportunities to reinforce the language curriculum by extending and deepening it within content courses. This can happen by the strategic application of higher order thinking skills (Naylor, 2016), as students use the target language to carry out tasks requiring them to verbalise their incipient comprehension of complex concepts. But creativity is also stimulated by projects, such as those reported by del Pozo (2016) for the geography syllabus. Activities requiring students to retell, but also reformulate and re-genre, the content that they have studied in, say, the history classroom are also ideal for CLIL, and for fostering creative responses to course content (Jiménez et al., 2014). When it comes to higher education, as Hafner et al. (2017) show, creative, hands-on projects can also stimulate students to improve important professional and academic literacies.

So what ingredients can help us to promote creativity in the primary CLIL classroom? Maley lists a number of pointers that could help professionals to revisit typical classroom activities and routines in a more creative way, opening the door to different responses on the part of students. These include bringing in techniques from other fields (drama, music, art), as illustrated in the CLIL context by Breidbach and Medina-Suárez (2016). Importantly, though, they may also mean consciously breaking with well-loved routines by, say, reversing the order in which each part of the class is done, or (temporarily) reversing the roles assigned to teacher and student. In a highly relevant section, Maley (2017: 96) also lists a number of "enemies of creativity", including the control paradigm, fear of change, apathy, and the minimalist approach to professional development. As Breidbach and Medina-Suárez (2016: 99) discuss, CLIL teachers can "become 'dis-invested' and disengaged in CLIL if they are working under conditions of external control and pressure", but if they are involved in the process of innovation and enjoy freedom to act and participate, they can respond very positively to the methodological challenges that CLIL poses.

In a discussion that is helpful for teachers wishing to enhance their everyday practices by factoring in more scope for creativity, Hafner et al. (2017: 121-122) offer the following questions for reflection:

Consider a teaching and learning context that you are familiar with. To what extent can that context be considered a creativity enhancing learning environment?

- *Is the design of tasks authentic and meaningful?*
- *Do the tasks provide students with challenges to be creatively overcome?*
- *Are students explicitly encouraged to be creative?*
- *Do students work in a collaborative team that allows them to pool diverse skills and expertise?*
- *Are there regular opportunities for students to reflect on their experiences?*

On the other hand, although all these approaches and innovations can prompt change in the classroom and spur students on to develop deeper subject knowledge and meaningful personal responses, if we apply them in a routine manner they are unlikely to transform our classrooms. Taking a step back, Cremin (2017) highlights the fundamental importance of enthusiasm ("passion for the subject"), reporting on a project covering a wide range of disciplines (arts, humanities, science, technology, mathematics) which used a large number of different data collection methods, including observations, interviews and questionnaires, to find out what

creative teaching meant in practice (Craft et al., 2014). Reporting on the results of this study, Cremin concludes that (2017: 105):

> Subject passion was seen to encompass personal enthusiasm and commitment and a deep-seated desire to make the subject so interesting, engaging and vital that students too developed their own subject fervour. The lecturers' subject passion appeared to drive four sensitively-tuned pedagogical strategies which aimed to: respond to the students' perceived perspectives about creativity and relationships; foster independent thinking; develop equality through conversation and collaboration; and orchestrate the construction of new knowledge.

What are the implications of this for teachers who want to foster creativity in their classrooms? The point is that teaching with and for creativity is not as different from what we might regard as general good teaching practices as some people might suppose. Teachers who transmit enthusiasm for their subject are more likely to inspire their students. Students who are more interested in the subject are more likely to respond by making an extra effort, by applying greater initiative, by sharing ideas and asking questions. The "long conversations" of the classroom become more animated, more engaging, more profound. Does this add up to more creative teaching and learning? Cremin would argue that it does, because the degree of involvement is higher, and when this is the case, the potential for creative personal response on both sides is much greater.

Training teachers for creativity in CLIL

The early years of CLIL implementation have shown that the CLIL paradigm holds real potential for bringing bilingual and multilingual education within the reach of entire populations of schoolchildren. However, CLIL is still relatively new on the scene, and like all new phenomena in education, it has been the subject of bitter controversy for some, while raising unrealistic expectations for others. Within all this, two issues that still hold considerable scope for discussion are the integration of language and content, on the one hand, and training for teachers, on the other. Although it is broadly clear that CLIL as currently practised across Spain "works", i.e., CLIL helps students to acquire stronger English language skills than their non-CLIL peers, it is not clear how CLIL methodology – particularly the mysterious "integration" between content and language teaching – envisaged by authors such as Coyle et al. (2010), is generally put into practice. This, in turn, has implications for teacher training: how can we prepare student teachers properly for teaching in CLIL classrooms if we lack a proper understanding of the way that content and language can be taught in harmony?

Against this background, the problem of creativity becomes both more pressing and more challenging. Creative approaches are needed to exploit all the untapped potential within this growing field. But as the discussion above has made clear, creativity does not operate in a vacuum – rather, it draws on learned principles, practices and routines, and transforms them productively to release new energies. Just as the artist has to learn to draw hands, so the creative teacher has to learn to teach – and in the case of CLIL, she or he has to learn to teach content and, in some way, also language. Only when some degree of technical mastery has been attained can creative teaching really start to take shape.

It is therefore important to state firmly that training for CLIL cannot mean a radical departure from training for standard content or language teaching. And since training for CLIL has to encompass both of these, the teachers need to become adept at teaching their subject, while also learning how students' language development should be actively fostered in the classroom. As Barranco et al. (2016: 167) explain in the context of primary science teaching, the basis for CLIL methodology is to be found in cognitive constructivist teaching-learning approaches, illuminated by insights from communicative language teaching. Basic principles of content teaching such as concreteness before abstraction, sequencing of lower and higher order thinking skills, and age-appropriate scaffolding have to be placed side by side with principles of language acquisition and learning, such as the transition from comprehension to production, progression from interpersonal communication to academic language proficiency, and the slow process of socialisation into disciplinary literacies (Barranco et al., 2016).

So where, in all this, does the potential for creativity lie? The answer is that the scope is immense. Innovation and imagination can generate an upward spiral, as long as some fundamental principles are observed. CLIL teachers should find inspiration in the lesson that history has taught us over and over again, which is that when two disciplines are brought together, the opportunities for cross-fertilisation multiply exponentially. To take just a few examples, the time is ripe to revisit the field of disciplinary literacies at different levels within the educational system, as well as to tap the potential of task-based learning and thinking-based learning for teaching contents communicatively. It is also time for teachers to look more seriously at how students' thinking skills can be fostered and provide appropriate scaffolding that includes linguistic and cognitive resources. Lastly, teachers should not neglect the "classic" resources associated more readily with creative self-expression: the visual arts, music, poetry, literature, dance, theatre, etc. By maintaining that creativity is not exclusively found in the arts, no one is trying to detract from their importance in education – or their potential role in CLIL.

To conclude, our field is wide open for creative approaches. Teachers who embark on this voyage will find that this "special capacity" for creativity discussed in the introduction will equip them to traverse the uncharted waters of CLIL. At some moments more than others, they will need to apply the content teaching and language teaching skills they have acquired in unpredicted ways and find the special tactics that will enable them to tackle new problems successfully. In all of this, a particular awareness of creativity – their own, and that of their students – will be indispensable in helping them to reach their full potential.

References

Barranco, N., Sanz Trigueros, F.J., Calderón Quindós, M.T. & Alario Trigueros, A.I. (2016), SciencePro Project: Towards excellence in bilingual teaching. *Estudios sobre Educación* (Special issue on Content and Language Integrated Learning) 31, 139-175.

Boden, M. (1990). The Creative Mind. Myths and Mechanisms. London: Routledge.

Breeze, R. (ed.). (2016). *CLIL + Science. New Directions in Content and Language Integrated Learning for Science and Technology*. Pamplona: Servicio de Publicaciones de la Universidad de Navarra.

Breidbach, S. and Medina-Suárez, J. (2016). Teachers' perspectiveon CLIL and classroom innovation in a method based on drama games. *Estudios sobre Educación* (Special issue on Content and Language Integrated Learning) 31, 97-116.

Carter, R. (2004). *Language and Creativity: The Art of Common Talk*. London: Routledge.

Coyle, D., Hood, P. & Marsh, D. (2010). *CLIL. Content and Language Integrated Learning*. Cambridge: Cambridge University Press.

Craft, A., Hall, E., Costello, R. (2014). Passion: Engine of creative teaching in an English university? *Thinking Skills and Creativity* 13, 91-105.

Cremin, T. (2017). Teaching creatively and teaching for creativity. In Breeze, R. and Sancho Guinda, C. (eds), *Essential Competences for English-Medium University Teaching*. Cham: Springer, 99-110.

del Pozo, E. (2016). Teaching social sciences through English: geography projects that work. In Breeze, R. (ed.) *CLIL + Science. New Directions in Content and Language Integrated Learning for Science and Technology*. Pamplona: Servicio de Publicaciones de la Universidad de Navarra, 92-99.

García Hormigo, P. (2016). Moving toys in pre-school education. In Breeze, R. (ed.) *CLIL + Science. New Directions in Content and Language Integrated Learning for Science and Technology*. Pamplona: Servicio de Publicaciones de la Universidad de Navarra, 27-30.

Hafner, C., Miller, L. & Ng, C. (2017). Creativity and digital literacies in English for Specific Purposes. In Breeze, R. and Sancho Guinda, C. (eds), *Essential Competences for English-Medium University Teaching*. Cham: Springer, 111-123.

Jiménez, F., Muszyńska, A. & Romero, M. (2014). Learning processes in CLIL: Opening the door to innovation. In Breeze, R., Llamas Saíz, C., Martínez-Pasamar, C. and Tabernero Salas, C. (eds), *Integration of Theory and Practice in CLIL.* Amsterdam: Rodopi, 111-122.

Maley, A. (2017). In search of creativity. In Breeze, R. and Sancho Guinda, C. (eds), *Essential Competences for English-Medium University Teaching*. Cham: Springer, 85-98

Mirels Lauria, A. & Erla, S. (2016). Balancing theory and practice in the middle-school science CLIL classroom: a unit on heat energy. In Breeze, R. (ed.) *CLIL + Science. New Directions in Content and Language Integrated Learning for Science and Technology*. Pamplona: Servicio de Publicaciones de la Universidad de Navarra, 56-60.

Naylor, S. (2016). Concept cartoons: talking science, thinking science. In Breeze, R. (ed.) *CLIL + Science. New Directions in Content and Language Integrated Learning for Science and Technology*. Pamplona: Servicio de Publicaciones de la Universidad de Navarra, 18-22.

FEATURED CHAPTERS

PROYECTO MUSEO

Alessandra Agati & Fernando Echarri Iribarren
Universidad de Navarra
alagati@unav.es

Resumen: El *PROYECTO MUSEO* presenta la actividad didáctica del Museo Universidad de Navarra dirigida a los más pequeños, además de un proyecto de innovación educativa llevado a cabo en el aula de lengua extranjera con la colaboración del Museo.

El proyecto "Cuéntame el museo" pretende desarrollar la transmisión de contenidos y la competencia lingüística en lengua extranjera, a la vez que promueve la colaboración con los museos locales y permite desarrollar otras competencias transversales. El objetivo es grabar un breve vídeo en lengua extranjera para presentar el museo elegido y algunas piezas de su colección. Para alcanzarlo se realizan distintas actividades en clase (preparación de los contenidos y de los recursos lingüísticos para expresarlos) y fuera de ella (visita al museo), que culminarán con una sesión de proyección de los vídeos grabados.

El proyecto piloto se ha llevado a cabo con la colaboración del Museo Universidad de Navarra. Este Museo programa la creatividad como una de sus tres líneas educativas estratégicas, junto al aprender a pensar y la interdisciplinariedad, que incluye la competencia lingüística. Sus programas incluyen todos los niveles educativos. Por ejemplo, para 5º y 6º de Educación Primaria se realiza el programa "Box Project" que pretende desarrollar la creatividad de los más pequeños, centrándose en obras de la colección. Tras la visita a las exposiciones, ya en el espacio de talleres, se realizan diversas actividades creativas individuales y grupales.

Proyecto Museo

Una de las principales intenciones de los museos consiste en fomentar la educación de las personas y proporcionar experiencias significativas entre sus visitantes (Falk and Dierking, 1992; Hein, 1998, 2000, 2012; Hooper-Greenhill, 2005; Falk, 2009; Burnham and Kai-Kee, 2011). Para ello, el museo proporciona un espacio experiencial de formas variables (Rivière 1989) que puede ayudar a la aplicación de innovaciones pedagógicas (Pastor, 2004; Hooper-Greenhill, 2007; Filippoupoliti and Sylaiou, 2015; Kristinsdóttir, 2017). El Museo Universidad de Navarra[1] también recoge esta intención educadora e innovadora y proporciona así un "Significant learning environment" (Falk and Dierking, 1992, xv), un entorno de aprendizaje visual en el que los visitantes puedan desplegar sus propias estrategias y repertorios interpretativos (Hooper-Greenhill, 2005, 3) de las diferentes narraciones estéticas que se van produciendo.

La programación educativa del Museo, de acuerdo con Pastor (2004, 44), trabaja específicamente la capacidad de observación y contemplación de la obra de arte mediante la educación de la mirada (Berger 1972), de modo que se generen experiencias significativas que

[1] El Museo Universidad de Navarra es un museo de arte contemporáneo de reciente creación, inaugurado en enero de 2015 en el corazón del campus que esta universidad tiene establecido en Pamplona.

ayuden a avanzar en el desarrollo personal y que produzcan aprendizajes duraderos (Ausubel 1976; Novak 1977; Novak y Gowin 1984). Se trata de fomentar la experiencia contemplativa, tratando de establecer un diálogo visual entre "el que mira" y "la obra" para pasar de la conexión visual a la conexión experiencial.

Con esta intención, el Museo Universidad de Navarra ha desarrollado el programa educativo "Box Project" dirigido a 5º y 6º de Educación Primaria:

Objetivos:

- Desarrollar la sensibilidad creadora de los niños y niñas
- Fomentar la observación, la atención, la percepción, la inteligencia, la memoria, la imaginación, la creatividad, la capacidad de sorpresa, el descubrimiento, el ingenio.
- Aprender a representar, a través del arte, la conciencia emocional de la persona.

Competencias:

- Aprender a pensar
- Artística
- Creativa
- Emocional
- Lingüística

La actividad tiene una duración de dos horas y se inicia con una introducción sobre el arte contemporáneo y sus lenguajes y sobre la creatividad y la importancia de aprender a mirar y de expresar las emociones y las ideas. A continuación, se visitan las salas expositivas, donde se presta atención especial a dos obras: "Composició amb Cistella" (1996), de Antoni Tàpies y "Poliedro vacío" (1957), de Jorge Oteiza. Se trabaja la educación de la mirada y el concepto de "caja", en el que podemos guardar lo que queramos, tanto tangible como intangible (pensamientos, emociones, etc.). Luego los alumnos regresan al espacio de taller, donde se pone a su disposición cajas y diverso material plástico. Cada escolar tiene que llenar una caja donde incluirá lo que él estime. La actividad termina con una puesta en común donde cada persona explica su creación como resultado y la reflexión sobre su proceso creativo.

La actividad incluye una ficha de trabajo en la que aparecen estas cuestiones:

- Título
- ¿Qué emociones vas a guardar?
- ¿Qué quieres expresar con tu caja?

La actividad ha conseguido evaluaciones muy positivas, tanto por parte del alumnado como del profesorado, lo que sugiere que esta actividad puede ser empleada para el aprendizaje de la competencia lingüística.

El proyecto "Cuéntame el museo" ha sido probado como programa piloto a lo largo del curso 2017-18 con estudiantes de lengua extranjera de la Universidad de Navarra, en colaboración con el Museo Universidad de Navarra -concretamente, con nueve alumnos del curso de italiano A2, con el nombre de "Raccontami il museo". El planteamiento del proyecto es, sin embargo, susceptible de ser adaptado a otros idiomas y a otra tipología de alumnos, incluyendo a los más pequeños, con algunas modificaciones del planteamiento general.

El objetivo general es la realización de un vídeo en lengua extranjera en el que los alumnos "cuentan" el museo elegido y una obra de su colección– en este caso, del Museo Universidad de Navarra de arte contemporáneo. Las actividades necesarias para la realización del vídeo llevan a desarrollar los ejes principales de la competencia comunicativa en sus vertientes lingüística (mediante actividades orales y escritas de refuerzo de la lengua extranjera), discursiva (fórmulas de introducción y conclusión propias de los vídeos de tipo documental) y pragmática (entorno museal y artístico).

A la vez que se fomenta la autonomía y la creatividad del alumno en la elección de la obra y en la realización del vídeo, entran en juego competencias transversales: la búsqueda de información en internet, la utilización de sencillas herramientas de grabación de audio y vídeo o hablar en público, entre otras.

Unas fichas elaboradas por el profesor sirven de guía a los alumnos durante cada actividad. En ellas, se les pide que tomen notas, que redacten breves párrafos y que los revisen según las sugerencias del profesor. Además, es útil que realicen una grabación audio del texto, para perfeccionar la pronunciación en lengua extranjera en vista del vídeo final. El trabajo de escritura y reescritura es crucial para que los alumnos adquieran un buen dominio del contenido y de su forma expresiva en lengua extranjera porque los distintos textos resultantes de las actividades constituirán el núcleo del guion final.

El proyecto se articula en **7** fases:

1. El Museo: visita virtual y producción de un breve texto que responde a preguntas básicas sobre el museo, su ubicación y su actividad.
2. El Museo: visita guiada con toma de notas sobre su contenido, elección de la obra para el vídeo final.
3. El artista: búsqueda de información sobre su vida y su obra, redacción de una sencilla biografía y presentación en clase.
4. La obra de arte: descripción objetiva y subjetiva (motivo de la elección).
5. El guion: preparación del texto que acompañará el vídeo.
6. El vídeo: grabación.
7. Proyección final de los trabajos.

Nueve alumnos han participado en el proyecto "Cuéntame el museo" y su implicación con el curso ha sido mayor, con respecto a cursos parecidos de años anteriores. Los resultados de la evaluación final también han sido mejores.

Este proyecto piloto se ha llevado a cabo en un museo de arte contemporáneo y está hecho a la medida de una disciplina de tipo artístico y creativo. Sin embargo, el docente puede adaptar las actividades a contenidos disciplinares distintos, por ejemplo, la descripción de cuadros de "Campos de batalla" (Bleda y Rosa, 2018) puede añadir la dimensión histórica a la artística; la visita a un museo orientado a las ciencias (naturales o experimentales) puede sugerir la grabación de un vídeo sobre el medio ambiente, la flora, la fauna, o sobre un sencillo experimento científico realizado por los alumnos.

CREATIVITY, ROBOTS AND STEM

Amaia Álvarez, Maika Goya, Laura Medina & Izaskun Tomasena
Liceo Monjardín
aalvarez@liceomonjardin.com

Abstract: Two years ago, we started teaching students robotics in the first level of secondary school. Last year, we expanded the experience to year four and primary school. In our school, we are aiming at integrated and transversal learning and this subject allows us to launch this initiative. Not only does it give us the opportunity of linking different subjects such as Physics, Maths or English but it also enables the students to relate the concepts they learn at school to real applications.

Our main purpose is to introduce P&G BL, STEM and Robotics into the students' learning process by appealing to the role of creativity in our day-to-day teaching. As part of the process, literacy and communication are some of the important skills in these activities. Moreover, in these classes we have also taken into consideration those students with outstanding technological know-how to ensure that their skills are further strengthened by providing an inspiring and encouraging environment in which they can exploit their potential to the maximum. We have also taken into account the students' aptitudes for Art and Design, as they play a key role in robot-based projects. Our hope is that the outcome of this venture will foster a learning environment in which motivation and creativity can stimulate our students' learning process.

INTRODUCTION

Our world today is shaped by a constant flow of information, the emergence of new technologies, and movements of people within and between nations. In response to numerous stimuli, educational systems are changing worldwide. The stimuli include the globalization of learning made possible by the Internet and new computer technologies, and they include demands for new types of learning owing to the growth of knowledge-intensive jobs in today's economies (Larson & Murray, 2017). Thus, education is becoming increasingly important to young people's success in an information-rich world. Science, technology, engineering, and mathematics (STEM) education is a crucial issue in current educational trends. Research shows that integrative approaches improve students' interest and learning in STEM (Becker & Park, 2011).

STEM methodology is based on the idea of educating students in these four specific disciplines in an interdisciplinary and applied approach. Rather than teaching the four disciplines as separate and discrete subjects, STEM integrates them into a cohesive learning paradigm based on real-world applications (LiveScience). It is based on integrated and interdisciplinary science learning, mainly by means of solving open problems and situations rather than structured ones, using the content and procedure of these subjects as a whole. Instead of teaching the four disciplines as separate, STEM integrates them into a cohesive learning based on the real world. Integrated STEM is formally defined as "the application of technology/engineering design-based pedagogical approaches to intentionally teach content and practices of science and mathematics concurrently with the practices of technology/engineering education" (Sanders, 2008, 2012).

On the other hand, in many parts of the world, bilingual education is currently an important issue, but there is little consensus on what it means in practical terms, or how different languages can best be incorporated into the education system (Breeze & García, 2016). The need for multilingual citizens is becoming more and more evident in many different social spheres which encompass not only the job market, but also social integration (ever increasing migratory movements being a very good case in point), education, research and many others. As a result of this global trend, the learning of FLs (Foreign Languages) is playing a major role in many educational systems all over the world. This is the context in which CLIL programmes are becoming commonplace and leading many necessary avenues of research to suggest themselves (Lasagabaster & Sierra, 2009). Content and Language Integrated Learning (CLIL) emerged in the 1990s as a timely solution to upgrade foreign language proficiency in Europe and to eventually achieve plurilingualism in a context where many of the educational programmes did not seem to have provided the desired results in term of language learning outcomes. (Marsh, Maljers & Hartiala, 2001). CLIL is the most common term used in the European setting to describe the approach to teaching a curriculum subject through a foreign language with the dual focus of acquiring more subject knowledge and improving one's skills and competences in the foreign language. The approach promotes the development of diverse learning strategies, the application of innovative teaching methods and techniques and the increase in learner motivation (Ioannou-Georgiou & Pavlou, 2011). Although not everyone is convinced of the benefits of multilingual education, many researchers have been able to show that the academic performance of students in bilingual/CLIL schools is comparable to that of students in monolingual centres, or that they even attain better results (Van de Craen et al., 2007).

As researchers have continuously urged foreign language educators to seek alternatives to traditional instruction, during the last decade the GBL (Game Based Learning) educational approach has been increasing in the foreign language learning context. GBL exploits the potential of games to make language education entertaining and to provide learning environments that contextualize knowledge and immersive experiences for learners. In addition, the GBL approach to foreign language learning provides more effective learning compared to traditional methods, develops positive attitudes in students and increases the retention process. GBL also provides the opportunity for Content-based Learning (CBL), as "games are not necessarily about memorizing or providing correct answers", but rather about the comprehension of the content provided in the game and the application of various learning strategies (Dourda et al., 2014).

In the same way, Robotics in Education tries to strengthen the learning skills of future engineers and scientists by means of robot-based projects. Both in school and in college, presenting robots in the classroom will give students a more interesting (and fun) vision of science and engineering, and they will be able to observe directly the practical application of theoretical concepts in the fields of mathematics and technology. One could also point out that R-in-E furthers and strengthens in both curricular and extracurricular activities values such as creativity, innovation, support, cooperation and teamwork. Clearly, these values must be promoted in our society (Curto & Moreno, 2016).

Popular interest in robotics has increased astonishingly in recent years. Robotics is seen by many as offering major new benefits in education at all levels. There is no doubt that many

children and adults find robots fascinating (Johnson, 2003). Educational robotics programs have become popular in most developed countries and are becoming more and more prevalent in the developing world as well. Robotics is used to teach problem solving, programming, design, physics, maths and even music and art to students at all levels of their education (Miller & Nourbakhsh, 2016).

PURPOSE

The main purpose of this venture has been to introduce the aforementioned methodologies, namely, CLIL, STEM and Robotics, into the students' learning process by appealing to the role of creativity in our day-to-day teaching as a means to foster students' interest in STEM, thus developing social skills and teamwork among motivated learners. As part of the process, literacy and communication have been two of the important aspects of these activities. Moreover, in these classes we have also taken into consideration those students with outstanding technological know-how to ensure that their skills are further strengthened by providing an inspiring and encouraging environment in which students can exploit their potential to the maximum. We have also taken into account the students' aptitudes for Art and Design as they play a key role in robot-based projects. Our hope is that the outcome of this venture will undoubtedly foster a learning environment in which motivation and creativity will help to stimulate the learning process of our students.

Among the foreseeable goals we have set ourselves, the following are particularly important:

- To form a link between the primary and secondary school sections as regards their syllabus and contents
- To introduce STEM methodology into primary education
- To boost the students' interest in Science, Technology, Engineering and Maths (STEM) through robots and other projects right from primary school onwards
- To reinforce the English language through Game Based Learning
- To make students explore and create new learning environments

To ensure that our strategy works, we have broken down the contents into three grades depending on the different levels and learning capacities of the learners as follows:

1st Grade

- Review the different techniques learnt in Arts and Crafts to decorate the mat: Open lines, closed lines, pointillism.
- Tell the difference between simple and complex machines.
- Learn to identify the different types of machines.
- Be able to identify the various parts of a computer.

2nd Grade

- Review the vocabulary of the unit: parts of the town.
- Be able to ask for and give directions using the vocabulary learnt in the unit.

- Review the mathematical concept of grid movement.

6th Grade

- Learn to use a ruler to draw different geometric shapes.
- Draw the different polygons using specific measurements.
- Identify the different types of angles.
- Participate in teamwork activities, being responsible for their own tasks and learning from others.
- Build a machine

MATERIALS & METHODS

The materials used in all the lesson plans were based on robotic materials: Arduino mother-boards, sensors and actuators (continuous rotation servomotors, 0-180 degrees servos, LED, Buzzers, etc.) as well as the "mouse-bots" best suited for the younger learners. Regarding Arts and Crafts, different materials were used for the robotic-arm construction. The methodology which was used is a mixture of STEM methodology and CLIL combined with our Service-Learning, as students from upper levels have taken charge of teaching the learners at the lower levels.

Figure 1.

Figure 2.

RESULTS

As we can see in the pictures, the six-grade pupils built a robotic arm. It was able to rotate clockwise and anticlockwise due to continuous servos as well as to move upside down due to the 0° - 180° mini servo. For their part, the first and second grade pupils programmed the "mousebot" (Figure 1 & 2) in order to complete organised sequences or events in which various maths concepts were applied. In both cases, the English was the language used for communication, thus giving our students more opportunities to practice and use the vocabulary and grammar contents already learned.

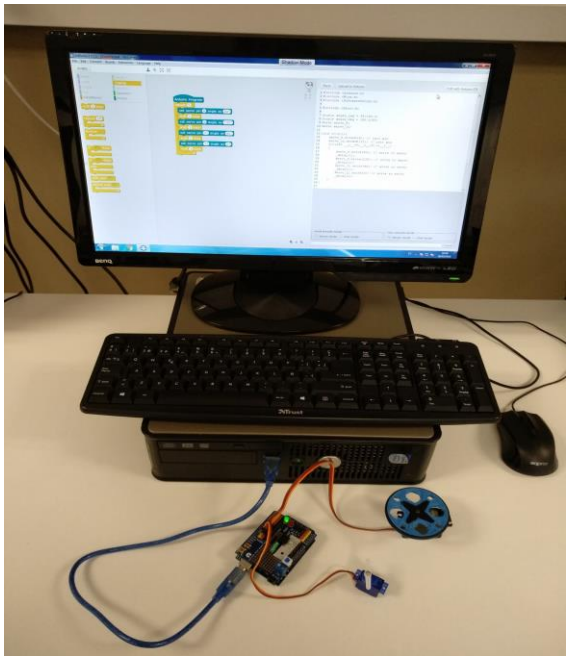


Figure 4.

Figure 5.

CONCLUSION

In the light of the results, we can conclude that robotics activities not only provide new learning opportunities to our students but also ensure an entertaining and creative environment in which problem solving and pair learning play a key role. Critical thinking, collaboration across networks and leading by influence could as well be mentioned as some of the other important outcomes that we have observed from in the above process.

References

Becker, K. & Park, K. (2011). *Effects of integrative approaches among science, technology, engineering, and mathematics (STEM) subjects on students' learning*: A preliminary meta-analysis. Journal of STEM Education, 12, 5-6.

Breeze, R. & García, J. (2016). *Issues in Teacher Education for Bilingual Schools.* Estudios sobre educación, 31,9-12. DOI: 10.15581/004.31.9-12

Curto, B. & Morno, V. (2016). *Robotics in Educatio*n. J Intell Robot Syst, 81, 3-4.

Ioannou-Georgiou, S. & Pavlou, P. (2011). Guidelines for CLIL Implementation in Primary and Pre-Primary Eduaction. Nicosia (Chipre): PROCLIL.

Johnson, J. (2003). Children, robotics and education. Artif Life Robotics,7, 16.

Dourda,K., Bratitsis,T., Griva, E. & Papadopoulou, P. (2014). Content and Language Integrated Learning through an online Game in Primary School: A case study. The Electronic Journal of e-Learning, 12, 3, 243-258.

Larson, R. C., & Murray, M. E. (2017). STEM Education: Inferring Promising Systems Changes from Experiences with MIT BLOSSOMS. Syst. Res, 34, 289-303.

Lasagabaster, D. & Sierra, JM. (2009). *Language Attitudes in CLIL and Traditional EFL Classes*. International CLIL Research Journal, 1,2.

Life Science. Retrieved (29th May 2018 from: https://www.livescience.com/43296-what-is-stem-education.html .

Marsh, D., Maljers, A. & Hartiala, AK. (2001). Profiling European CLIL classrooms. Languages open doors. University of Jyväskylä: Jyväskylä.

Miller D.P. & Nourbakhsh I. (2016) Robotics for Education. In: Siciliano B., Khatib O. (eds). Springer Handbook of Robotics.

Sanders, M. (2008). Integrative STEM education: Primer. The Technology Teacher, 68,4,20-26.

Sanders, M. E. (2012). Integrative STEM education as "best practice." Paper presented 12/8/12 at the 7TH Biennial International Technology Research Conference, Queensland, Australia.

Van the Craen, P., Ceuleers, E & Mondt, K. (2007). *Cognitive development and bilingualism in primary schools.* In: Teaching maths in a CLIL environment, in *diverse contexts – Converging Goals*. CLIL in Europe. Eds Marsh, D. & Wolff. Frankfurt: Peter Lang, 185-200.

ENGAGING YOUNG LEARNERS
IN A PRE-PRIMARY AND PRIMARY CLIL CLASSROOM

Henri Castleberry
UPV/EHU
hecastleberry@gmail.com

Abstract: Having young EFL learners engaged in their own learning process is more than just having them participate in the traditional classroom activities. It is about having the students draw on their own perspectives to help them with their language and content learning. Students need to come to our classrooms feeling happy and comfortable, so they are more apt to retain what they have learned. Pre-primary and primary CLIL students need to be fully engaged in the classroom.

This issue of language learning through teaching content in a foreign language to very young learners is a phenomenon that has increased a great deal in recent years. This is due to many factors, but in part this increase has been at the request of the families, educational and political authorities who want to increase the linguistic competence of the students in order to make them more international and strengthen their global competitiveness. The global spread of English has greatly increased and its importance is no longer only placed on English language teaching, but also on education through English as a medium of instruction (Galloway, Kriukow and Numajiri, 2017). Between 2001 and 2014 there was an unprecedented growth of higher education courses and programs predominantly in Europe, where English as a medium of instruction programs have increased by 1,000 percent (Wächter and Maiworm, 2014).

This phenomenon is not only happening in higher education but also in primary schools, and in some cases in pre-primary classrooms. In Europe, pupils are generally between five and nine years old when they have to start learning a foreign language. In Belgium, pupils are even younger as they are taught a foreign language in pre-primary education from the age of three. Many countries have implemented reforms or pilot projects to bring forward the teaching of foreign languages (Enever, 2011).

According to the European Commission key data on Teaching Languages at School in Europe, English is a mandatory language in 14 countries or regions within countries. It is by far the most widely taught foreign language in nearly all countries at all educational levels. Trends since 2004-05 show an increase in the age of pupils learning English at all educational levels, and particularly at primary level. This increase in English learning in primary age students is moving alongside the spread of methodology based on Content and Language Integrated Learning (CLIL).

This increased use of CLIL in the pre-primary and primary classroom has its challenges as the younger students often do not know how to read or write and are just learning to do this in their own mother tongue. So how do we get them to learn content and acquire the language skills they will need to in order to succeed in their language quest?

Let´s take a typical subject like “Professions” that students in pre-primary and first of primary are normally taught. Do we just show them pictures in a book to show them what a doctor looks like or have them colour a worksheet and hope that their prior knowledge of what a doctor is will help them acquire the vocabulary in the new language? Or could we instead involve the student in their own learning by permitting them to fit the reality of the world into their own interests and knowledge? So how do we do this?

Teachers should ask themselves: do we have any parents that are doctors or nurses in our classroom or our school? Or do we know someone who is a doctor? If they do, then let them come in to the classroom and have them explain what they do with authentic materials. Have them show the students some of the things that are common in a hospital and that young learners can easily identify in their L1 such bandages, thermometers, syringes (no needles, please) or stethoscopes.

The students now have a real-life experience with the vocabulary you want them to learn, but we need to go beyond a mere visit by a parent or friend, we need to get the kids to take ownership of what they are learning. Is there something that the students can easily identify as being hospital related and that can help them learn about the health professions? How about an “ambulance”? Let them create their own vehicle. Normally, teachers would have the students colour a worksheet with a picture of an ambulance - but what if the class creates a large-scale cardboard ambulance where the students can role play the part of the ambulance driver or the EMT who takes care of the injured who ride inside the vehicle?

Figure 1. Students creating a cardboard ambulance

Figure 2. Student playing the role of an ambulance driver

We now have gone from a visit to the classroom to students creating their own materials. The students are now starting to take ownership of the content they are learning. Once you create materials and you have built up the vocabulary that identifies the particular profession, let the students have fun with it. A role play is a great way to teach content especially if they have already acquired the language through hands on activities. Have the students take turns in being the doctor who receives the ambulance at the hospital, or the nurse who comforts the patient. Of course, we need patients with different degrees of illnesses. The students have now learned and experienced all about the different professions in a hospital and have gone above a simple worksheet with the picture of a doctor. By assuming different roles and interacting with props, toys and their peers, children build language skills in a meaningful setting.

This can also be done with older primary students. Imagine that you have programmed that the students are going to learn about ancient Rome. There are hundreds of videos about Rome and all kinds of information about how Romans lived. But how often do students get to be a legionnaire, a senator, an inn keeper, gladiator or even an emperor? Give them the chance to become a Roman citizen with all their rights, and this can lead your class to discuss how our political system, architecture, human rights and many other subjects are connected to Rome.

What if your students received a letter from Julius Cesar telling them that he heard that they wanted to learn more about where he is from and how he lived? Working in cooperation with the maths department, the students could make Roman coins (with clay) to learn about Roman numerals. The limit of what they can create and learn is endless.

With young learners it is important to make sure that the activity is relevant to their lives and their surroundings. You can motivate the students to learn using methods that are creative and inspire them to want more. Another typical subject students have to learn is about their city, towns, villages and neighbourhood. Instead of having the students make a poster about where they live, what if you have them each draw/create their own house or apartment where they live? Afterwards, combine all of the different homes to create your own classroom

neighbourhood. This is relevant to all of your students as each one of them has contributed to the activity. So instead of showing the students a typical house divided into sections (bathrooms, bedrooms, kitchen, etc.) (and by the way, most Spanish students do not live in this type of home), have them create something that is relevant to them and that motivates them to learn.

Our students have a great imagination and fantastic capacity for creating activities. We as teachers have to help them experience the content and language which will make them want to learn more. It is a lot of hard work but in the end, it is worth it and lots of fun for everyone!

References

Galloway, N., Kriukow, J. & Numajiri, T. (2017). *Internationalization, higher education and the growing demand for English: an investigation into the English medium of instruction (EMI) movement in China and Japan.* The University of Edinburgh: British Council. Retrieved from: https://www.teachingenglish.org.uk/sites/teacheng/files/H035%20ELTRA%20Internationalisation_HE_and%20the%20growing%20demand%20for%20English%20A4_FINAL_WEB.pdf

Wächter, B & Maiworm, F. (2014). *English-Taught Programmes in European Higher Education: The State of Play in 2014.* Bonn: ACA Papers on International Cooperation in Education.

Enever, J. (2011). *Early Language Learning In Europe*. London: British Council.

HANDS-ON SCIENCE

Laura Giamattei
I.C. Adelaide Ristori School in Napoli
l.giamattei@libero.it

Abstract: This paper reports on an experimental project carried out for the last 3 years with a class made up of 10- to 11-year-old Italian students. The project concerns interactive classroom lab science sessions which include CLIL methodology in a creative and successful way. In fact, each student performs an assorted collection of fun hands-on scientific activities that are introduced, on a weekly basis, using the CLIL resources on a wide range of curriculum scientific topics.

Young learners need "fun–input" to study science topics through English. For this reason, the idea of this project is to combine hands-on activities and CLIL resources. This is a successful method capable of involving students who are deeply interested in science understanding and in English acquisition. The strength of the approach proposed is based on the use of everyday objects and tools. It is at a low cost, as recycled materials are used. Language learning takes place as young learners associate the sound of the English words with the objects they see and know.

Figure 1. Overview of materials used for "hands-on science" experiments.

A basic level of English is used as many words and actions are repeated within the classroom sessions during the school year. This supports language learning firmly with new areas of English vocabulary. Every session is unforgettable because it includes the following activities: an introductory theoretical technical explanation, some written exercises, the practical activity and a final team game.

Two examples

In the first example, the student worksheet is provided in parallel with the teacher's notes in order to elucidate the roles; in the second example, only the student's worksheet is provided since the work method implied in the teacher's notes remains the same and has to be tailored to the specific case.

TITLE: Put a shine on your silver jewel	
STUDENT'S WORKSHEET	**TEACHER'S NOTES**
WHY: Have you ever noticed that the bright shiny surface of your silver object gradually darkens to black? Today we see that we can use chemistry to reverse the tarnishing reaction and make the silver shiny again.	A few days before the class session meets, curiosity should increase in the students. At this point ask them to search and bring to school one tarnished silver jewel or object with no stones or glue on it - without explaining anything else.
MATERIALS WE NEED: A tarnished object made of silver, aluminium foil, hot water, baking soda, a kettle, a plastic bowl, oven gloves.	**WARM-UP:** Brainstorming! Show pictures of objects made up of different metals and materials. Elicit the names of other metals.
TEXT: A redox reaction is a transformation of substances into different ones, involving an *exchange* of electrons between those substances. When silver *tarnishes* it reacts with air oxygen and sulphur to form silver sulphide. By removing the *coating* of silver sulphide the silver object becomes *shiny* again. We do a chemical *removal* by the reaction that converts the silver sulphide back into silver metal.	Materials are all prepared on the desk in the lab in advance; name and show them one at the time so that learners associate the English sound with the objects they see; explain unknown words, then ask for a student-assistant to distribute materials to all students.
This kind of reaction is called redox, where silver sulphide reacts with the aluminium so that sulphur atoms are transferred from the silver jewel to the aluminium foil in the baking soda solution. The reaction is faster when the solution is hot.	To give the students the real chemical redox reaction involved is optional depending on the age and the curriculum of the students.

GLOSSARY: exchange-scambio; tarnishes-scurisce; coating-patina; shiny-lucido; removal-rimozione; flows-scorre **EXERCISE**: complete the sentences after reading the text above: **1)** A redox is ..... **2)** By removing the ..... silver jewel becomes shiny again **3)** When ….. tarnishes it reacts with air oxygen and sulphur **4)** To do the experiment we need	Encourage practising of new words by carrying out exercises.
EXPERIMENT: **STEP1** Heat the water to boiling. **STEP2** Place the aluminium foil onto the bottom of the bowl. **STEP3** Put 2 table spoon of baking soda on the aluminium foil. **STEP4** Wear your oven gloves. **STEP5** Wait until the teacher pours very hot water into the bowl. **STEP6** Quickly dip the silver object half into the water and make sure it touches the aluminium foil. Et voilá...	Each student performs the activity individually with his/her own materials. Explain it in English, show and mimic what they have to do, step by step and wait until each student has completed the activity step before going to the next one.  **Figure 2. Put a shine on your silver jewel**.
IS IT MAGIC? NO, IT'S SCIENCE!	"Is it magic? No, it's Science!" is the motto in my class. It is repeated when the amusing result of the experiment is successful.
COMPARISON Compare the results of experiment to each other on different silver objects used **APPLICATIONS:** this scientific method is easy to use in everyday life, so ask your mother to try it. **T/F LITTLE TEST:** - Water needs to be 10°C for the experiment to succeed. - The experiment involves iron powder. - You pour flour powder into the water.	Give some time for students to compare each other's results and to manipulate and combine used objects and ideas in their own ways.

- Silver becomes shiny when in contact with aluminium foil. - Electric current moves up from silver to aluminium - black coating of the object is made of silver oxide.	
EXTENSION activity: could you use this experiment in everyday life?	Encourage students to write as many words as possible in 3-4 minutes.
GAME TIME: in 2 teams -One student at a time writes on the board (divided in 2 parts for the 2 teams) the new words learned during the session.	
-Pick from the desk any used material and ask other team members to label them; take note of the right answers on the board.	Before you let the students leave, ask them to clean up and place used materials back in the cabinet.
TIME TO TIDY UP	

TITLE: Communicating vessels

STUDENT'S WORKSHEET

WATCH for few minutes the video https://www.youtube.com/watch?v=CZmP0vsRBZ8

MATERIALS WE NEED: various containers with different shapes and sizes; rubber tubes (for aquarium), pipette, food colouring, water.

TEXT: "Communicating vessels" is the name given to a set of containers containing a homogeneous fluid: when the liquid settles, it balances out to the same level in all of the containers regardless of the shape and volume of the containers. Also, if additional liquid is added to one vessel, the liquid will again find a new equal level in all the connected vessels. There's no limit to the number of vessels that can be used. This process is part of Stevin's Law and occurs because gravity and air pressure on the water are constant in each vessel.

GLOSSARY: homogeneous- omogeneo; settle- si stabilizza; volume- grandezza; vessel- contenitore.

EXERCISE: answer *yes* or *no* to the following questions:

1) Does water settle at the same level in both connected vessels?

2) Does the water level depend on the shape of the containers?

3) Does the water level depend on the volume of the containers?

4) Are the containers connected by a tube?

5) Can any kind of homogeneous liquid be used?

6) Can more than 2 vessels be connected?

7) Are gravity and air pressure constant in each vessel?

Figure 3 – Communicating vessels

EXPERIMENT

STEP1 Mix a few drops of food colouring in a vessel filled with water.

STEP2 Put one end of the rubber tube in the vessel filled with water and using the pipette on the other end suck water out.

S**TEP3** Leave the water flowing down into another vessel.

STEP4 Wait and see what happens.

"IS IT MAGIC? NO, IT'S SCIENCE!"

OBSERVATIONS-COMPARISON: Are the final water levels in the vessels the same? Enjoy repeating the experiment, setting different levels of water in the two vessels.
Is there any limit to the number of vessels that can be used? Try, with the help of your classmate, to connect more containers in a line

APPLICATIONS: Since the days of ancient Greece the concept of communication between vessels has been used for indoor plumbing. Nowadays in cities water towers are sometime still used so that town plumbing will function as communicating vessels by distributing water to higher floors of buildings with sufficient pressure

A TEST/GAME: “Who is the winner today?” Write as many words as you know from “Communication vessels” lab session, on the reverse of your student’s sheet, in 3 minutes from now.

TIME TO TIDY UP

References

CLIL Lessons. (2018). Oxford University Press Network. Retrieved from https://elt.oup.com/student/networkitaly/level1/clil?cc=it&selLanguage=en

(2018). Retrieved from: www.onestopclil.com

(2018, February). Retrieved from: https://www.youtube.com/watch?v=CZmP0vsRBZ8

ENGLISH, SCIENCE AND ARTS

Abel Miguel-Marqués
Colegio Miravalles-Redín, Pamplona
amiguel@fomento.edu

Abstract: This idea arose at the beginning of the year when I was looking at a way to combine English, Natural Science and Arts in year 1 so that one could reinforce the other. The main problem was with Arts, because we wanted it to be linked more closely with the other subjects. In order to give more importance to Arts, I started using it as a support subject for English and Science. An example of this is that when we had to learn the seasons of the year in the English subject, we also did it in Science and used the Arts lessons to reinforce the concepts. I included some collaborative and group work techniques as cross-curricular contents. This proved a very productive way to teach English in year one in a clear and easy manner.

Main ideas and experiences

As stated above, the main idea was to give the Arts and Crafts subject more importance as well as use it as a supportive space when teaching English. I used the arts subject to reinforce concepts previously seen in the Science and English lessons. I consider this important because it helps children to lose their fears when speaking English at the same time as it helps them internalize all the vocabulary and some typical grammar structures.

The process was always based on the same **structure**:

1. Explain the activity to the pupils.
2. Let them become familiar with the activity.
3. Once they know what the activity is about and they are comfortable with it, I start talking to them in a one-to-one basis.
4. In the one-to-one conversations the target is to get them talking about what they are doing and how they are solving the problems that might arise when completing the activities proposed.
5. Sometimes I use peer-to-peer conversation where some students explain to others what they have been doing.
6. In some lessons at the end, the pupils explain what they have been doing throughout the activities proposed.

All this is based on what I call “micro projects”. The “micro-projects” generally last for at least two to three weeks. The timing is quite easy as we have two lessons a week of Natural Science, two lessons a week of Arts and Crafts and eight lessons of English. With this, it is easy to do at least two activities a week in the Arts lessons related to either English or Natural Science. The “micro projects” always start with one or two individual activities, continue with different group activities and finish with a whole class activity. This is because one of the main purposes in the lessons is to get them to start working in cooperative groups.

I have been doing this "micro projects" throughout the year, however it is important to mention that it is not always possible to do them at all times due to the way in which our school is organized, and the amount of time available is not enough most of the time.

In the following lines I would like to summarize three of the "micro projects" that I carried out with my pupils throughout this academic year we just finished.

1) The "know ourselves" micro project

When a new academic year starts I always like to get my pupils to get to recognize their own body and to be able to represent themselves. This year, when we started the body in Natural Science, I decided we will be working on it in Arts as well. As I was teaching the body in Natural Science I did related activities about the body in Arts.

For instance, the first concepts I taught about the body were related to the face, and in English I introduced descriptions. What I wanted them to do in the first activity in Arts was to try to represent their own face. And here is where the "micro project" comes in useful, in order to get the pupils to practice. As they start drawing (following a series of instructions) I start an individual conversation with them asking questions such as: which colours are you going to use? Why? Which colour are you going to use for the eyes? Etc.

The second part of the "micro project" involves activities such as drawing a classmate and describing them emphasizing the use and correct pronunciation of words related to the parts of the body and the face. To finish the micro project, we introduced work in pairs where the pupils had to represent each other's silhouette on a life-sized piece of paper and colour it.

Figure 1. Partner's silhouette activity.

This activity took about two sessions and I used the same techniques to get pupils speaking, asking them about their partner's silhouette paying special attention to words related to the body and descriptions.

2) The autumn micro project

The idea of this micro project arose when teaching days of the week, the weather conditions and the seasons of the year. I thought it would be nice to do activities related to the autumn in the arts class, so that I could also reinforce the concepts learnt both in the English class and in the Natural Science classes. In this micro project I also included concepts such as the team, as it is important to create a good environment in the class, especially at the beginning of the academic year and with six-year-old pupils.

To make them feel an important part of the group, the first thing about the autumn we did was to create a massive display on one of the walls in the corridor (where all the classes can see it). The central piece of this display consisted of a big autumn tree. The leaves were made with paper hands made by each pupil and with different autumn colours.

Figure 2. "Big class autumn tree" formed by all student's hands.

All this was used to explain the concept of the importance of being part of a team, and to try to get them to understand how important it is to help others, as they need to see that competition is not the best way to learn, but that they can share what they know with their class mates and help them achieve to a similar level. In this "micro project", the group work was done at the beginning because I find it good to start by understanding the importance of the group, and how this is very important to help others.

Once this was done, we did various individual activities related to the autumn.

The first one was an autumn landscape. They needed to represent an autumn tree using their hand (here I also included "parts of the body" vocabulary), and they needed help from their classmates to complete the tree. It is very hard to hold the paper and do the shape of your hand when you are small. Here I introduced a bit of cooperative work. For the first few minutes I let

them try to do the shape of their hand alone, but after a few minutes, they started to realize that they needed help from someone to do it in the right way.

The second activity consisted of colouring an autumn landscape using the colour code given. The teacher role in this activity was to get them to describe the landscape for me and then to some of their classmates in small groups with a maximum of four members. All this activity was done while in the English lessons we were concurrently learning about weather conditions, and especially autumn weather conditions.

Figure 3. Students' landscapes.

The closing activity for the autumn micro project consisted of getting the pupils to represent and be able to explain an autumn landscape using different pieces of coloured paper. The development of this activity was quite tough at the beginning as it was a bit hard for them to understand that they needed to cut and stick pieces of paper together to represent a landscape but the final outcome was awesome.

Figure 4. Autumn landscape made of coloured paper pieces.

Figure 5. Making the autumn landscape.

From the second lesson onwards, the pupils were able to describe on their own what they were doing as well as their own landscapes. To finish this activity, they were "teacher for a day" and they explained their landscapes to their classmates.

All the activities we did related to the autumn "micro project" were shown on the Autumn display described previously. It is amazing how children used the display: they were very impressed and any time they were near it, they stopped and looked at it for a while, telling other children about it.

3) The tessellation micro project

This "micro project" does not actually have much to do with the merging of English, Natural Science and Arts, but it does relate English, Arts and Mathematics. It was a great experience and the pupils loved it. I think it might be worth describing it briefly.

Figure 6. Tessellation project.

This "micro project" has a lot to do with maths. I started doing it when the pupils were learning about geometrical shapes. I used it to introduce geometrical vocabulary as well as to introduce

the primary and secondary colours. The main purpose of this “micro project” was to get pupils talking about geometrical shapes and colour in an easy way.

These activities lasted for three weeks, during which time we were colouring different tessellation patterns and talking about them in the class. The final activity of this “micro project” was a whole class activity where pupils had to colour different lizards to end up creating a tessellated lizard. Later on, we displayed the lizards on the corridor walls.

Figure 7. Tessellation outcomes.

Conclusions

Analysing the outcomes of all the micro projects I carried out throughout this academic year, I personally think that it has actually been a very good experience both for me and the pupils. They have learned a lot without much effort, as they found all the activities entertaining and challenging. I also think it is important to get children to lose their fears when talking English as sometimes they feel shy when they think they are not saying things right. When it comes to planning, this is a very helpful way to go through the subjects, as everything is interrelated and that makes it easy for both the pupils and the teacher.

A CLIL HANDS ON ACTIVITY AS A COOTIE CATCHER TO TEACH ABOUT WISELY USING NATURAL RESOURCES

Angela Ruotolo - University of Bari, Italy
Immacolata Ercolino - University of Camerino (MC), Italy
Daniela Amendola - University of Camerino (MC), Italy
angelaruotolo60@gmail.com; immacolata.ercolino@unicam.it ; daniela.amendola@unicam.it

Abstract This chapter focuses on how students learn science better by actively engaging in hands-on activities at school. Fostering pupils' curiosity is very important. In fact, we want to demonstrate that making experiments and inventing toys increases citizenship in pupils. Citizens make every day personal and community decisions by reaching conclusions, so it is better if children grow up with a strong knowledge of science and scientific methodology, in order to make decisions supported by scientific information. They need to learn to evaluate data and convince the community through scientific argumentation. This is the reason why we want to boost pupils' interest by focusing their attention on a 3Rs CLIL teaching unit on Recycle, Reduce, Reuse, in primary school. Recycling paper, glass and metal used at home helps in protecting and conserving the Earth's natural resources.

Introduction

In this work we analyze a science CLIL pathway developed in fourth grade of primary school, where we tried to engage pupils by making them center on their learning, inspiring them with authentic projects with tasks coming from reality. We understood that students produce more if they are given hands-on fun activities. In fact, when students do a teaching unit close to their interest they become eager to complete the projects that they have created and even choose to do more schoolwork autonomously outside of class. This autonomy is student-centered, designed to increase their learning. Successful learning in CLIL lessons motivates students because they know they have learned and understood new things (in both content and language). With this aim, the 3Rs unit was selected by the students in class after a brainstorming session, led by the teacher, inviting the students to make questions. At the same time the teacher sampled a variety of students' responses intentionally and systematically in order to explore and to better map students' thinking in order to size up their real knowledge requirements. The teacher then tailored a lesson plan with the aim of developing a more interesting unit very close to the students' needs. The collaborative feedback between the teacher and students was continuous. We also used the "4Cs Framework" applied for designing the teaching plan in order to better analyze our results, considering the starting point and the basic course contents.

Content

A crucial topic was to recognize features of some different kinds of materials, to know what they are made of and to learn about the 3Rs: Recycle, Reuse, Reduce. This is the reason why we designed on our own an original Cootie Catcher, which is a fun teaching tool (Figures 2 and 3), that can vehicle content and language in a very informal way.

Figure 1. Hands-on activities in class.

Cootie catchers are great tools that can foster students' science learning. In fact, this teaching tool helps students memorize scientific concepts and master the subject glossary (Ercolino, 2017) through a learning game.

See Cootie Catcher below and instructions:

Cootie Catcher: How to play

1. Ask a partner to choose a number. Pinch and Pull the Cootie Catcher to open and close the number of times that he/she chose. Tell the partner the number available for them to choose from 1 to 10.
2. Then open up the Cootie catcher and tell to the partner to lift up the options that are inside the cootie catcher (i.e., paper, compost etc.).
3. Ask a partner to choose another number. Tell his/her to read the topic that is next to that chosen number.

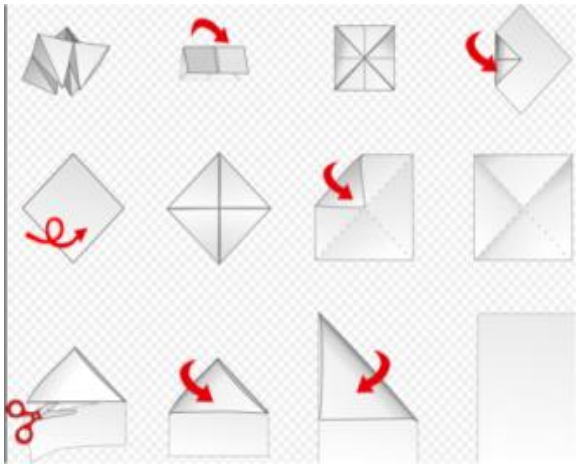


Figure 2. Cootie Catcher.

Figure 3. Cootie Catcher.

Language

"By using the learning language for learning content, communication becomes meaningful because language is a tool for communication, not an end in itself" (Perez-Vidal, 2009). In this activity, students learned the English name and material of common objects they use every day, and after learning the meaning of recycling, they learned to write a recycling glossary and identify the specific characteristics that would enable them to sort objects like cans, paper, plastic, glass and metal into different waste bins.

Group..... Class ..... Date.....

CLIL ACTIVITY n° 3 : What can I recycle?

Write the names in the table below.

Material	What I can recycle	How I can recycle
Paper		
Plastic		
Glass		
Metal		
Compost		
Others		

Figure 4. Recycling glossary.

The teacher asked pupils to make a list of words on the IWB related to recycling. After inquiring about the effects of recycling on the environment and why it is important to know these terms, the teacher invited students to search for two words in the dictionary in order to make a short list that soon increased as the students added new specific terms to their own dictionaries: recycle, reuse, reduce...etc.

GROUP :

DATE:

RECYCLING VOCABULARY

SCRAMBLE WORDS

PUT THE SCRAMBLED WORDS IN THE RIGHT ORDER. WORK IN GROUPS .

Recycle, reuse, reduce. Glass, paper, plastic, metal, compost, food scraps, yard trimmings, grass cutting, waste bin, landfill, litter, ecology, natural resources,

1.yleccre…….

2.eeusr……...

3.educre…….

4.sasgl……

5.apper……..

6.tiplasc…….

7.etaml…….

8.poscomt…….

9.odfo rapssc……

10.aryd mmintrigs…….

11.asgrs tingcut…….

12.tewas inb……..

13.laillndf……..

14.ttlier…….

15.oloecgy……

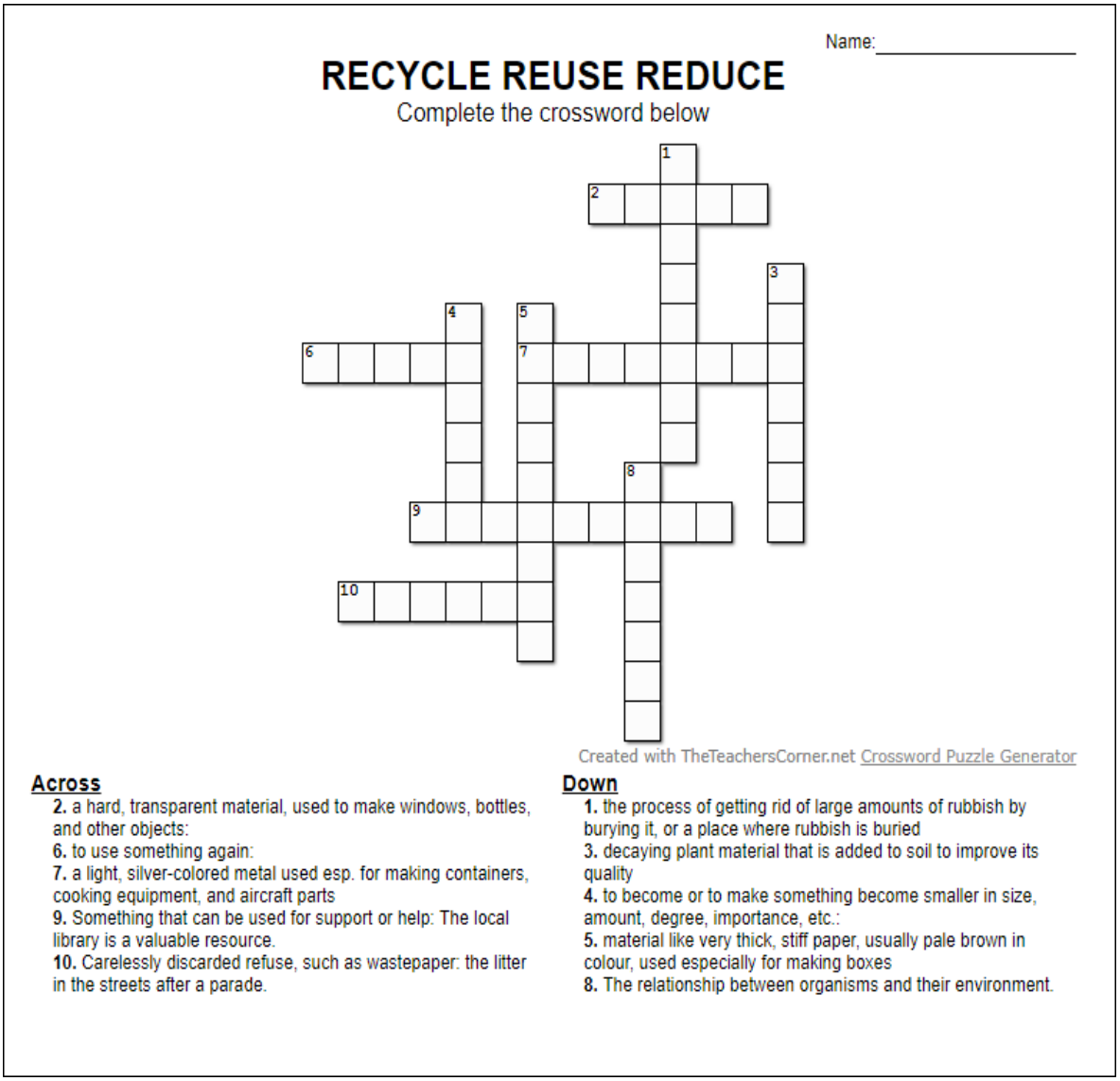
16.aturnal ourceress……..

ANSWERS:

1.recycle 2.reuse 3. reduce.4. glass 5.paper.6 plastic 7.metal 8.Compost 9. food scraps 10.yard trimmings 11. grass cutting 12.waste bin 13.landfill 14. Litter 15. ecology 16. natural resources

Figure 5. Scrambled Words Activity.

One of the activity consisted of using the worksheet to create a "recycling vocabulary". The class discovered more words, and students added the words to their dictionaries. As scaffolding activities, see the crossword below.



Name:_____

RECYCLE REUSE REDUCE

Complete the crossword below

Created with TheTeachersCorner.net Crossword Puzzle Generator

Across

2. a hard, transparent material, used to make windows, bottles, and other objects:
6. to use something again:
7. a light, silver-colored metal used esp. for making containers, cooking equipment, and aircraft parts
9. Something that can be used for support or help: The local library is a valuable resource.
10. Carelessly discarded refuse, such as wastepaper: the litter in the streets after a parade.

Down

1. the process of getting rid of large amounts of rubbish by burying it, or a place where rubbish is buried
3. decaying plant material that is added to soil to improve its quality
4. to become or to make something become smaller in size, amount, degree, importance, etc.:
5. material like very thick, stiff paper, usually pale brown in colour, used especially for making boxes
8. The relationship between organisms and their environment.

Figure 6. Crossword Activity.

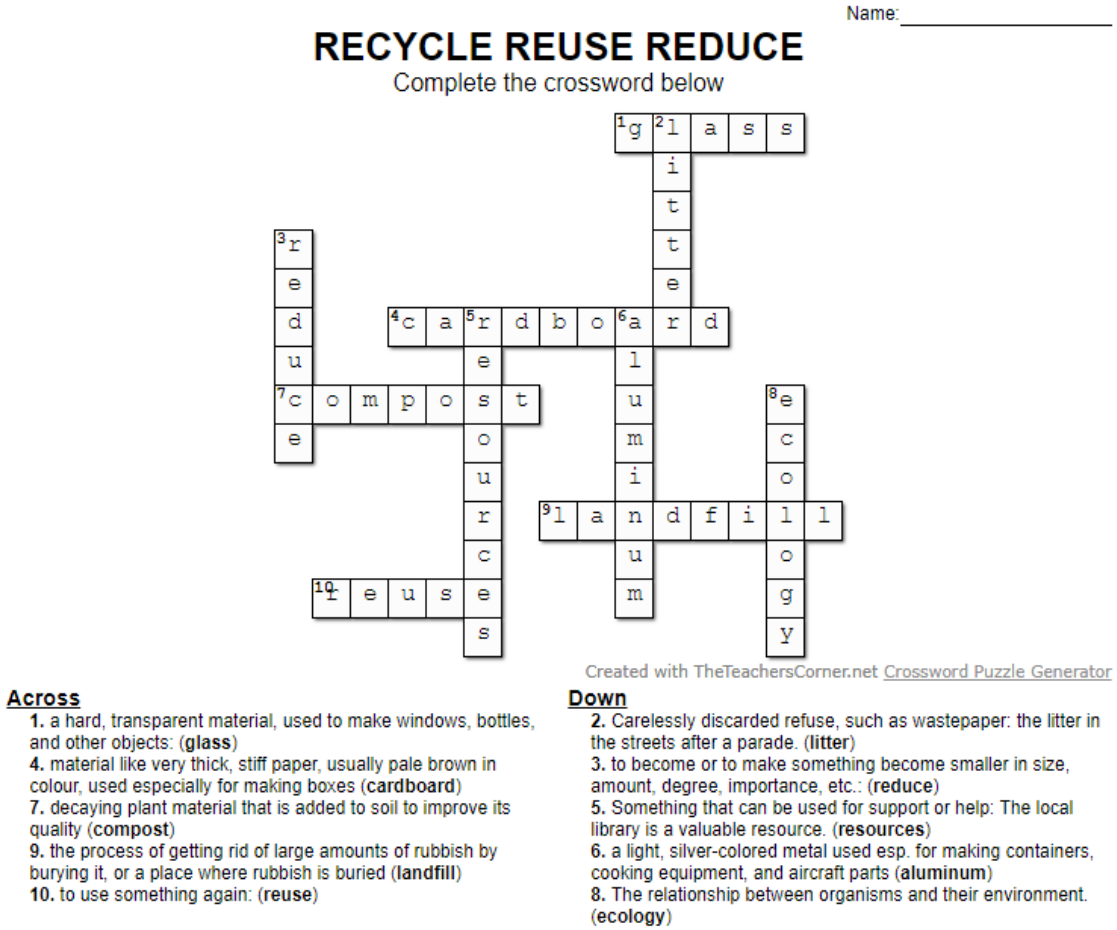


Figure 7. Crossword Answer Sheet.

Cognition

"Good CLIL practice is driven by cognition" (Mehisto et al., 2008). Pupils working in groups discussed how to recycle objects and tackle problems regarding pollution and fill in a worksheet (task 3). They learned the cause and effect principle (no recycling/pollution). After this activity, students succeeded in comparing different types of materials, recognizing those which can be recycled and those which cannot. They helped in differentiating waste at home better because they had understood concepts and could give reasons and draw conclusions related to how to protect the Earth.

Culture

This unit was developed to give students a better understanding of environmental issues. In particular, activities were designed to help students in respecting their environment and applying what they had learned about solid waste management to their day-to-day world.

The aim was to prepare our pupils to be responsible citizens, and to develop the skills, awareness and determination necessary to become responsible guardians of the environment.

Students need flexibility and innovation in their learning but at the same time they need to interweave learning and relationships on different levels.

Conclusions

One crucial goal for all teachers is to lead students to acquire basic knowledge and skills. This has always been true, but today it seems almost unattainable: the territorial horizon of education is becoming ever wider. We believe that by developing an understanding of environmental matters in a foreign language with cross-curricular CLIL activities at an early age, children are going to develop awareness and respect towards natural resources in such a way that environmental citizenship becomes a way of life.

References

Coyle, D. (2007) *The CLIL Teachers Toolkit: a classroom guide*. Nottingham: The University of Nottingham.

Coyle, D., Hood P. and Marsh, D. (2010). *CLIL: Content and Language Integrated Learning*, Cambridge: Cambridge University Press.

Ercolino I. (2017). *A CLIL tool for teaching geosciences and safety rules in primary school Geosciences: a tool in a changing world.* Congresso congiunto della Società Italiana di Mineralogia e Petrografia, Società Geologica Italiana, Associazione Italiana di Vulcanologia e Società Geochimica italiana.

Mehisto, P., Frigols, M. J., & Marsh, D. (2008). *Uncovering CLIL*. Oxford: Macmillan.

Bailey, N. (2015). *Attaining Content and Language Integrated Learning (CLIL) in the Primary School Classroom*. American Journal of Educational Research 3(4), 418-426. DOI:10.12691/education-3-4-6.

Perez-Vidal, C. (2009). *The integration of Content and Language in the classroom: A European Approach to Education*. In Dafouz, E. & Guerrini, M. (eds). (2009). CLIL Across Educational Levels. Madrid: Richmond.

Paper Fortune Teller. Retrieved from: https://en.wikipedia.org/wiki/Paper_fortune_teller.

LIFE IN A BOTTLE

Angela Ruotolo - University of Bari, Italy
Immacolata Ercolino - University of Camerino (MC), Italy
angelaruotolo60@gmail.com; immacolata.ercolino@unicam.it

Abstract: This chapter focuses on a hands-on natural science project for primary school children used for teaching about ecosystems. By creating a micro-terrarium in a bottle, the children learned principles about how natural life cycles work. They also acquired basic vocabulary for talking about the environment, and learned citizenship principles about the social ecosystem.

Introduction

Our project focuses on a natural science lesson for primary school children designed to teach them how to create a micro terrarium in a bottle: the project's name is "Life in a bottle". We developed a new way of teaching natural science to children using the CLIL methodology, which introduces a "learning by doing" methodology focusing on our pupils' manual skills, and which enabled us to promote social and ecological responsibility and awareness towards our environment. The detailed description and constitution of a real 'closed ecosystem', made of worms, insects, plants, woods, grass, water and gases, offers pupils a valuable inside into how those elements stand in connection and make a natural cycle work. By means of this project we want the children to be aware of the interdependence of all the parts within an ecosystem, whether they are animate or inanimate members, and the corresponding effect that occurs when one of them is missing, and how this affects the total system. This idea can be transposed to our society as well, showing our children indirectly how each living-being fulfils an indispensable function in an eco-cycle. So, each of us has our unique place and role in our society, which should never tempt us to discriminate or exclude anybody from our social 'ecosystem', because we are all essential for this world. With this in mind, with our project we also want to foster the campaign against bullying, since this is counterproductive and harmful for our schools, children and the future citizens of this world. We need more inclusion programs that help us to establish and promote a more social, civil, inclusive and ecological attitude within our society.

Figure 1. Collecting materials.

Figure 2. art of nature.

"Science is curiosity, discovering things and wondering why. It is a process of formulating questions not of information acquisition. We must always start by formulating questions, not giving answers, creating interest in things, phenomena and processes, creating a state of mind that craves knowledge, interest and wonder, helping children to find knowledge, giving suggestions, guiding them, raising questions."

Weisskopf

The aim of this project is above all to teach children about real ecology, encourage them to develop some positive attitudes for the protection of the environment and guide them towards the awareness that in nature, nothing happens by chance and that every element is strictly connected with the others. Each ecosystem has its own features, but there are some fundamental factors that determine the environment and the consequent forms of life that we will find inside it. The miniature ecosystem in the terrarium, in spite of its isolation from the outside world, succeeds in absorbing light to carry out photosynthesis, the process by which plants produce the energy they need to grow. The scientific, experimental and teaching pathway, designed according to the CLIL methodology, is divided into two lessons: the first lesson is devoted to the verification and/or consolidation of the knowledge pupils have already acquired in relation to plants and their life; the second lesson focuses on the construction of a closed ecosystem.

Science - Lesson 1 –The world of plants

The World of plants: Plant Parts and Life Cycle
(Verification and consolidation of the prerequisites)

Linguistic objectives

Vocabulary: students name anatomical parts of plants (seed, roots, stem, leaves, flower bud, flower, pollen) and learn verbs connected with the life cycle of a plant (drop, grow, the sun shines, the rain falls, the flower opens, producer).

Skills: students understand simple information from the authentic video presented by the teacher.

Functions: students label parts of plants and order the stages of a life cycle.

Content objective

Students name parts of plants and understand the life cycle of a plant.

Communication

Students talk about parts of a plant and the life cycle of a plant.

Cognition / Reasoning

Students put the stages of a plant and life cycle in a logical sequence. The teacher projects the figure of a plant without the names on the IWB to consolidate and scaffold already studied concepts. Then he invites the children to see the following funny video:

- https://www.youtube.com/watch?v=X6TLFZUC9gI

Teacher and students talk about different parts of the plant - *The plant has different parts: a stem; leaves, some flowers, roots, etc.*
Then, the teacher draws a large plant on the IWB or a poster of a plant. A series of labels are shown - roots, stem, leaves, and flowers - and the pupils are asked to label the different parts of the plant. The students complete some figures.

The teacher can also present the following videos, to visualise the content part:

- The Needs of a Plant (song for children about 5 things that plants need to live) https://www.youtube.com/watch?v=dUBIQ1fTRzI

- Life cycle of plants https://www.youtube.com/watch?v=zPqnYYI2Uq8

- Photosynthesis for Kids - How Plants Make Food - Animation Science https://www.youtube.com/watch?v=_xeYNnzwpSE

Some questions for the students:

- Are the plants autotrophic?
- What do plants need to live for?
- What is the photosynthesis?
- What is a chloroplast?

Time: 1.20 minutes.

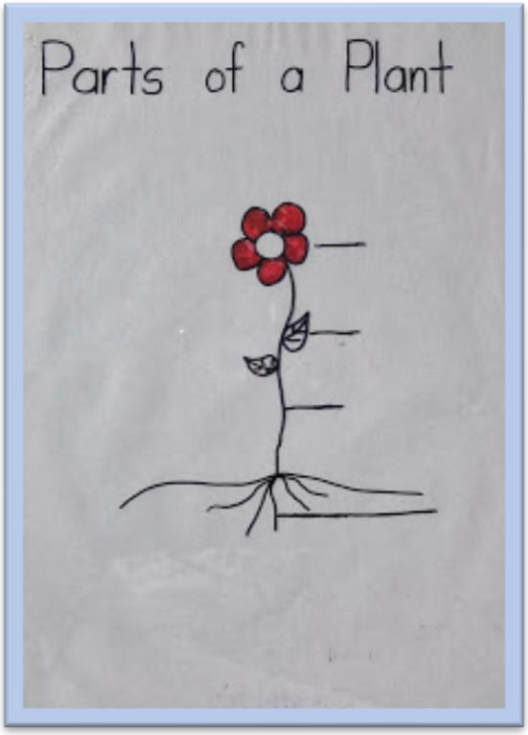


Figure 3. Worksheet: parts of a plant.

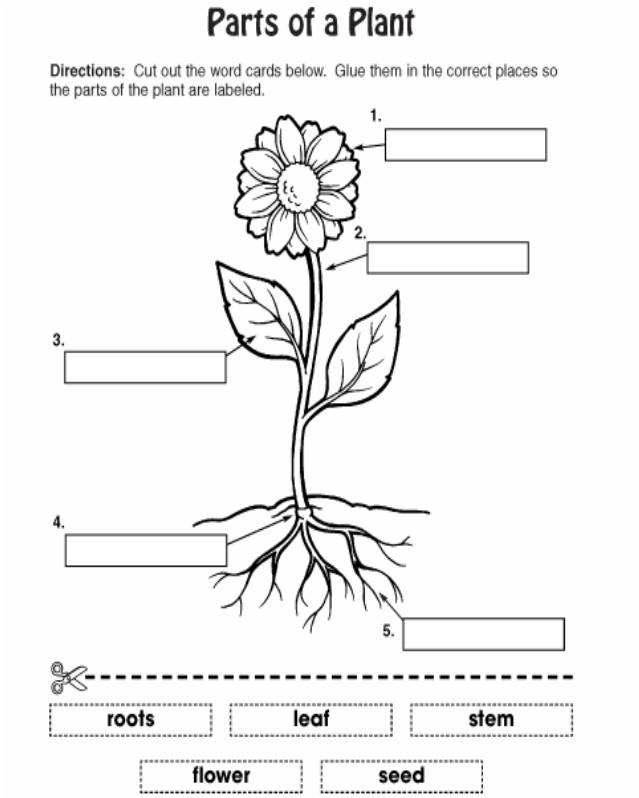


Figure. 4. Worksheet: parts of a plant (with scaffolding).

PLANT PARTS

Draw a picture of your plant in the box below!

Try to include all the plant parts you learned in class.

Figure. 5. Worksheet: drawing your plant.

Science - Lesson 2 – The life in a bottle

Linguistic objectives

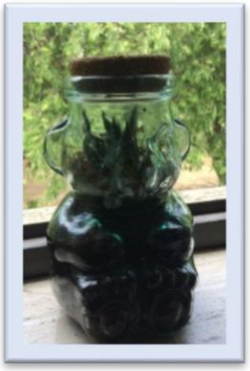
Vocabulary: students name the elements necessary for the construction of a closed ecosystem: bottle, expanded clay, coal, pebbles, moss, uncontaminated soil, worms, sunlight, chlorophyll, oxygen, carbon dioxide, water vapour, condensation, evaporation, pot, making a hole, covering it with soil, pouring water, sunlight, Fittonia, ferns, moss.

Skill: students receive instructions for doing an experiment: https://www.youtube.com/watch?v=jNnsbfslxxc

Content objective: the students name the elements necessary for the construction of a terrarium and understand the life cycle of a plant in a closed ecosystem.

Communication: students hypothesise about how a plant can live in a closed ecosystem.

Cognition / Reasoning:
Students build a terrarium. The teacher writes some questions on the blackboard and invites the students to answer first orally and then in writing.



What do plants need to live?
Plants need:

- Sun
- Light
- Water
- Mineral salts

Can plants live in a closed bottle?
Yes, they can live, as long as we provide them with all they need. A natural life cycle is what allows plants to survive. Plants take nourishment from the soil, absorbing water and mineral salts.

What do you need to make a terrarium in a bottle?
To make a terrarium in a bottle you need:

- A bottle with a cap
- Expanded clay or sand
- Pebbles
- Coal
- Uncontaminated soil
- Small pieces of wood
- Fittonias, ferns, moss and ivy can be perfect in wet environments

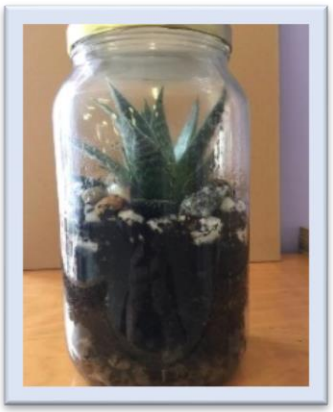


Figure 7. A completed micro-terrarium.

Figure 6. The class preparing the soil for the micro-terrarium.

Figure 8. The class with their finished bottle gardens.

Subsequently, the teacher prepares the workshop and invites the students to put on the desks everything needed for the construction of a closed ecosystem. All the students are involved emotionally in the realization of their terrarium, as shown in the photos. The students follow with interest the phases for creating the ecosystem. They take the bottle, remove the cork, insert: expanded clay, coal, pebbles, soil, worms, plant, moss, sticks, worms and water. At the end, they close the bottle with the cap and put it in a place where there is light, but not much heat. The students are happy!

Time: 90 minutes.

Conclusions

Making a living ecosystem inside a bottle by using plants and all other forms of life necessary to maintain it in a healthy status represents a great way to help children understand the necessities of life. This experiment teaches us that changing the fragile ecosystem equilibrium is dangerous and could be one of the main causes of environmental pollution.

References

Council of Europe (2011). *Common European Framework of Reference for: Learning, Teaching, Assessment (CEFR).* Retrieved from: http://www.coe.int/t/dg4/linguistic/cadre1_en.asp

Coyle D., Hood P. & Marsh D. (2010). *Content and Language Integrated Learning*. Cambridge: Cambridge University Press.

CLIL Compendium. Retrieved from: http://clileducation.blogspot.com/p/clil-compendium.html

European Commission. (2003). *Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions*. Promoting Language Learning and Linguistic Diversity: An Action Plan 2004-2006. Retrieved from: http://eurlex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52003DC0449

EUROCLIC. *The European Network for Content and Language Integrated Classrooms*. Retrieved from: http://www.euroclic.net/

UNIVERSIDAD DE NAVARRA

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Department of Education Sciences,
Psychology, Communication
Prof.Giuseppe Elia
ORDINARY PROFESSOR
Angela Ruotolo
Science Teacher Primary School
Coordinator Tutor in Science Education Department
University of Bari
Clinical Pedagogist
angela.ruotolo@uniba.it

Istituto Comprensivo Verdi Cafaro Andria
Headmaster Grazia Suriano
Teacher Angela Ruotolo
fourth grade primary school pupils sections B-G

UNICAM Università di Camerino 1336
Università di Camerino

Immacolata Ercolino
immacolata.ercolino@unicam.it
High school Science Teacher
PhD Candidate in Life Science Teaching
University of Camerino (MC) ITALY
Tutor Prof.Cristina Miceli

Life in a bottle

Presenters: Angela Ruotolo , Immacolata Ercolino

This work focus on a science lesson in primary school for learning about natural habitats by creating a terrarium (life in a bottle). Life in a bottle is the title of this hands on activity built with fourth-grade primary students according to the CLIL methodology, a new "teaching style" ,the result of many studies and experiments in other countries of the world. In this way, students learn science with enthusiasm engaging in the practices of science .The aim of the project is above all to put pupils in the center of their learning engage children in ecology in order to develop positive attitudes for the protection of the environment and to guide them to the reflection that in nature nothing happens by chance and that every element is strictly connected with the others: in a wood, for example, life swarms in a thousand and one thousand forms, from plants that feed herbivores, to insects that pollinate flowers to the mud that hosts the micro-organisms that make the soil fertile. Each ecosystem has its own characteristics, but there are some fundamental factors that determine the environment and all the life forms that we will find inside it. The miniature ecosystem, in spite of isolation from the outside world, succeeds in absorbing light to carry out photosynthesis, the process by which plants produce the energy they need to grow. Science teaching in all European countries, begins as a unique, general, integrated subject, aimed at stimulating children's curiosity about the environment, providing them with a basic knowledge of the world and the tools with which they can investigate it further. The integrated science subjects promote an investigative approach to the environment and prepare the children for more in-depth studies in the following years. Children come to school with the cognitive capacity to engage in serious ways with authentic tasks in Science. These delighting indoor craft science authentic tasks allows pupils to realize their very own little garden, and watch plants grow. Children become active citizens with rights and responsibilities versus nature so School has a key role in create from the childhood the conditions for citizenship and the spaces in which it can be exercised in and outside the class. Teachers play a central role in promoting kids' curiosity structuring their experiences supporting their learning reducing complexity and sustaining their learning attempts answering their questions and clear their misconceptions teaching science with CLIL approach in order to observe (*see the Eurydice Brief Key Data on Teaching Languages at School in Europe – 2017 Edition*).

Yes, they can live, as long as if we could provide them all what they need.
What allows plants to survive is to re-create their natural life cycle.
Plants take nourishment from the soil, absorbing moisture. This is then released from the leaves'pores and deposited on the walls of the glass bottle. This produces condensation, which falls as droplets on the same plants, watering them. Light is the key to everything. This produces the right energy amount to activate the life's processes, such as photosynthesis and development.

To make a terrarium in a bottle you need:

- a bottle with a cap
- expanded clay or sand
- pebbles
- coal
- uncontaminated soil
- small pieces of wood
- Fittonias, ferns, moss and ivy can be perfect in wet environments
- worms
- water

Making a living ecosystem inside a bottle using plants and all other forms of life necessary to maintain a healthy ecosystem is a great way to help understanding the necessities of life. This experiment is also crucial to catch that is dangerous for life change the fragile ecosystem equilibrium and it is very simple to get pollution in the environment. Plants collaborate together in bottle and pupils cooperate in class to understand how can save together the environment as young responsible citizens. They learnt scientific glossary with CLIL methodology in order to become sentries of the environment in the world.

This e-book brings together a wide variety of innovative proposals and attractive examples responding to the challenge of teaching CLIL with greater creativity in the Pre- and Primary school classroom. Creativity has gained increasing importance in the area of education, and is now considered a key element for fostering motivation in both students and teachers. In this regard, this book provides a helpful source of inspiration for those involved in CLIL across the world.

Universidad de Navarra