Understanding languages and building literacies for citizens education

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Abstract

In the school context, the theme of digital citizenship is equally crucial and cumbersome. Since citizen's education is the A-aim of the educational system, nowadays school must deal with the new and complex dimension that the concept of citizenship took on in the last decades. Nevertheless, school must face topics such as technology or globalization in observance of the national and international policies but also staying loyal to its cultural and educational role. In our contribution, we assume that analytic philosophy is the cultural ground for an "unblackboxing" approach to languages; we also analyse an exploratory research aimed at ensuring the growth of basic literacy for citizenship and digital citizenship developed in this framework.

KEYWORDS: Languages, Literacies, Analytic Philosophy, Citizenship, Unblackboxed Technology.

1. Introduction

Newspapers have lately reported on Italian pupils' alarming situation of educational poverty, as underlined in recent reports. The aspect that hit the headlines is that 51% of pupils are able neither how to read nor how to understand a simple text upon completion of the first instruction cycle (Save the Children, 2022a). The same report draws the attention also on a peculiar aspect of educational poverty, viz. the digital education poverty (Save the Children, 2022b).

In a moral panic (Cohen, 1972) perspective we might be lead to think that in the *querelle des anciens et des modernes* (Preti, 1968), applied to the digital age, we are able neither to stand on the shoulders of giants nor to be agents of innovation. This leads us to reflect on the current scenario in which some paths oriented to citizens' education must be outlined.

In this contribution we set out these paths, by focusing on languages and by setting this theme in a broader perspective, that includes natural as well as formal language; they are both intended as the real ground for (our) action in the world. In the first part, we shape the basic structure of our world and society, in which we are knowers, learners and citizens; we also analyse the essential features of the European policies that define citizens in terms of learning and development of knowledge and skills. We also define a theoretical framework suitable to provide the language theme with a cultural horizon, to bridge culture and policies and to convert them into an interdisciplinary didactical proposal.

This way, we present our hypothesis applied to exploratory research. Finally, we analyse the research outcome useful to build up the *onlife* (Floridi, 2015) citizenship's competences and skills.

2. Context analysis

2.1. The current scenario

The Council of Europe webpage devoted to "Citizenship and Participation" reads:

> *"Traditions and approaches to*
> *citizenship vary throughout history and*

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across the world according to different countries, histories, societies, cultures and ideologies, resulting in many different understandings of the concept of citizenship."
(https://www.coe.int/en/web/compass/citizenship-and-participation)

One of the most impacting factors which characterise our society, as well as our reality, is the digital dimension. It is a matter of fact that our world results from a technological evolution that brings in changes and spreads them as quickly as ever before (Floridi, 1999). Between the two millennia, the possibility of simulating and observing phenomena, that would not otherwise be possible (Antinucci, 2001), of interacting with virtual reality (Floridi, 1999) and with augmented reality (Toschi, 2014) were almost creating a disruption to perceived reality. This world has some complexity due to an additional level of reality defined, from the different perspective of the philosophical recent analysis, *infosphere* (Floridi, 2019) on the one hand, and *docusphere* (Ferraris, 2021) on the other hand. This has led to the need for a new philosophical agenda that must differently face the already known dichotomies and relationships - real/virtual; man/machine/nature - and that goes beyond the usual epistemological frameworks to lead the development of new knowledge.

As noticed, "reality is one, digital and not digital; every distinction is the harbinger of storms" (Toschi, 2014) and the question is: what is nowadays the meaning of citizenship?

2.2. Citizenship and digital citizenship

The answer is digital citizenship. To define this concept by standing on the shoulders of giants, we must start from the idea of citizenship and its evolution; to ensure a full exercise of the same in the world we are describing, we must expand and problematize it *sub specie technologica.*

The Council of Europe followed this path: it laid down the framework of competences for the culture of democracy (CoE, 2018), it applied the ten domains for digital citizenship (Richardson & Milovidov, 2019) and came up with a conceptual model of digital citizenship (Gerhard, 2017).

The framework for the culture of democracy (CoE, 2018) includes twenty-one competences divided into four groups: values, attitudes, skills, knowledge and critical understandings.

The ten fundamental domains for digital citizenship education are collected in three main areas of participatory online life: Being online, declined as: Access and Inclusion, Learning and Creativity, Media and Information Literacy; Wellbeing online, specified in: Ethics and Empathy, Health and Wellbeing, ePresence and Communications; finally, Rights online, including: Active Participation, Rights and Responsibilities, Privacy and Security, Consumer Awareness (Richardson & Milovidov, 2019).

2.3. Key competences, core competences and learning compass

The definition of the essential grounds for citizens' full participation is supported by the European Reference Framework on the Key Competences for Lifelong Learning, published in 2006 and revised in 2018. In both editions (CoE, 2006, 2018), one of the first purposes is the need to identify and define the key competences necessary for active citizenship in the first version, and active and responsible citizenship in the second one.

Even in the summaries of the key competences we can find recurrences and a significant evolution.

As to "Digital competence", the label remains unchanged, whereas the definition − according to the conceptual model of digital citizenship − is extended to include confident, critical and responsible use, engagement for participation in society, data and media literacy.

The aspects of languages also change significantly: "Communication in foreign languages" evolves in "Multilingual competence" and "Communication in the mother tongue" becomes "Literacy competence".

The definition of Literacy turns out to be particularly significant in the previously described scenario, and it seems to match with the broad meaning of "languages" that we propose in the research subject-matter of this contribution.

Actually, "Literacy" is defined as "the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts".

The OECD Learning Compass as well highlights the muldimensionality of literacy with a specific focus on learning.

The Compass identifies the "core foundations" on which competencies can be built; they are of three kinds: cognitive foundations, health foundations, social and emotional foundations.

The introduction of data and digital literacy in the educational framework is relevant for our purpose. Nevertheless, the Compass results coherent with our approach, claiming the importance of traditional literacy and numeracy "upon which digital literacy and data literacy can be built" (p. 48).

2.4. Citizenship and disciplines in the Italian school

The issue of citizenship officially entered the Italian school in 1958, when *Civic education* was introduced from primary schools, pursuant to Presidential Decree no. 585/1958. At that time, it was up to the history teacher to initiate students into the principles of social, legal and political life.

Subsequently, the various reforms began to swing between the concept of civic education as a formative cultural horizon to which all disciplines contribute (programmes of 1979 and 1985, Law 30 of 2000 of the De Mauro Commission) and that of an autonomous subject (*Education for civil coexistence* in Law 53/2003 and *Citizenship and Constitution* in Law 169/2008).

In line with the European key competences and the UN 2030 Agenda, the ministerial document called *Indicazioni nazionali e nuovi scenari (National Advices and New Scenarios)* of 2018 highlights the school's task "To promote students' ability to make sense of the variety of their experiences, in order to reduce the fragmentation and episodic character that risk characterizing the lives of children and adolescents. [...] the school is therefore invested by a question that includes, together, learning and knowing how to stay in the world" (*Ibidem*, p. 4).

The 2018 document, in fact, identifies in the various disciplines the cultural tools for citizenship, with a view to educating to the complexity hoped for by Morin (2000). These tools naturally include languages from a multilingual and intercultural point of view, history and geography, arts, scientific and mathematical thinking, but also computational thinking.

The last stage of this path is Law 92/2019, which perhaps is a step backwards, or a compromise between the two instances. *Civic Education* is included in schools' national curriculum as a transversal subject, with its own number of hours, training objectives and final grade, to which the various disciplines contribute. The initiative has raised doubts in the world of school and its stakeholders, maybe due to the somewhat rigid and simplistic solution given to the complexity of the problem (Ambel, 2020).

In any case, education to citizenship, from which stem both individuals and citizens, remains the strategic purpose and the common horizon of school, the inspiring principle of a standard curriculum, to which all disciplines contribute (Ambel, 2020). Yet, disciplines play this role when they are presented not only as a list of contents, but rather as cognitive, critical and potentially transformative cultural tools (Bruner, 2007) and when they are proposed through a teaching methodology that favours reasoning, analysis and exchange of views.

2.5. Literacy competence

As underlined by the Italian national guidelines and the *Council Recommendation on key competence*s of 2018, the first access to cultural, social and political competence takes place through confident, critical and multilingual literacy competence, as defined in the *Indicazioni nazionali e nuovi scenari (National Advices and New Scenarios)*:

> "The mother tongue, the language of school and the European languages, which are the languages of education, help to promote the

> *right of the subject to the full development of their identity while experiencing linguistic and cultural diversity. Multilingual and intercultural education is a resource functional to the enhancement of diversity and school success of everybody and is a prerequisite for social inclusion and democratic participation"* (2018, p. 9).

The text called *Dieci tesi per un'educazione linguistica democratica (Ten Theses for a Democratic Linguistic Education)* drawn up by Giscel (1975) for the first time in Italy enhances the privileged relationship between linguistic competence and democracy, referring to Art. 3 of the Italian Constitution. This document calls both school and teachers to ensure equal activation of everyone's language skills in order to lift the barriers to an informed participation in society. The verbal language in one's mother tongue falls within the context of a knowledge of other languages and of the development of the individual's communicative ability (semiotic ability).

To be democratic, education must be able to "develop written and oral productive and receptive capacities and simultaneously stimulate metalinguistic reflection, that is the ability to observe, describe, analyse and evaluate the facts of language" (Ambel, 2020, p. 102).

Democratic language education is opposed to an "imitative, prescriptive and exclusive" language education (Giscel, 1975, VII Thesis), based on spelling, on learning rules and on the realisation of artificial tasks far from representing the communicative functionality of language (IX Thesis) and from being a profound reflection on its forms.

3. Theoretical framework

3.1. Philosophical ground

In the educational context, we identify a theoretical ground in the analytic philosophical tradition that allows to assume a coherent framework both for mother-study and codified languages, in order to face an approach to a conscious citizenship sustained by a literacy as previously described.

Not well known in the school context, the analytic philosophy has many peculiar aspects. According to D'Agostini (1997), we can define "analytic" an attitude characterized by rigorous procedures sharing-oriented and, aimed to codified languages, schemes, and formalisms.

The recent document called *Orientamenti per l'apprendimento della Filosofia nella società della conoscenza* (*Guidelines for Learning Philosophy in the Knowledge Society*, 2017) looks at the possible applications of Philosophy in education and training. Already in 1998, with *Contenuti essenziali per la formazione di base (Essentials for Core Learning)*, the Italian school on the one hand considers the inclusion of

philosophy among school disciplines as a positive feature, appropriately based on a historiographic approach and on the other hand underlines that philosophy cannot be limited to a historiographic perspective.

The analytic tradition has a quite recent history in Italy.

Analytic philosophy has been excluded from the Academy in the first decades of the 1900s, with the exception of the neo-scholastic interest in logical issues. Between the 1950s and 1960s, translations of analytical philosophers began to circulate: Russell's texts were already widespread and translations of linguists such as de Saussure and Chomsky and philosophers of language such as Wittgenstein, Ryle, Black were also published. Between the '60s and '70s, De Mauro, Trinchero, Marconi and others began to write works of philosophy of language that take into account Frege and Wittgenstein's contributions (Penco, 2021).

It is necessary to realize, also in the curricula, that philosophy has profoundly changed its appearance with a turn that dates back to the end of the 19th century with Gottlob Frege and came to its full expansion in the first half of the 20th century.

Analytic philosophy provides the methodological and epistemological grounds for a better understanding of disciplines and of their interrelation in the cultural, personal and social path that characterizes citizenship, of which school should lay the foundation.

Actually, analytic philosophy recognizes the importance of understanding the history of thought; nevertheless, it stands as a method of analysis and reflection on the themes of the individual and society, rather than as a structured corpus of thesis.

Michael Dummett, one of the most significant voices of this movement, says that the analytic attitude entails that the theory of meaning is the basis of philosophy. Analytic philosophy recognises and analyses the role of language in thought and correspondingly sets the way philosophy works (D'Agostini, 1997). In this tradition, we can find a distinction (D'Agostini, 1997; Penco, 2004) useful to give a conceptual basis for the specific aspects of literacies:

> 1. formal and codified language, analysed by the philosophers of the ideal language, followers of Frege and Russell, who try to reconstruct the languages of sciences and to structure ordinary language;
> 2. ordinary language, dealt with by philosophers of the common language, followers of Moore and the second Wittgenstein, who highlight the wealth of language and the problems stemming from it.

The philosophy of language also includes the study of language as a systematic whole, with different perspectives based on de Saussure and Chomsky. The central node here is the search for the underlying language structure that orders lexicon and gives a structure to generative and not taxonomic grammars.

3.2. The Valency Grammar as reflection on language

Among the various grammatical models, the Valency Grammar is a theoretical model of description and explanation of the functioning of the sentence very effective from the didactic point of view due to its simplicity, coherence and capability to explain the uses of language (Sabatini, 2004; Lo Duca, 2004), as demonstrated by empirical research also conducted by Indire (Pona et al., 2018; Camizzi, 2020).

This model was theorized by the French linguist Lucien Tesnière (1893-1954) who, observing the functioning of different languages, identified a common structure that governs the relationships within the elements of the sentence in terms of dependence, starting from the verb and its meaning (Sabatini, 2016).

The structural order of the sentence elements prevails over the linear order and can be represented by tree charts (Andreose, 2017). The Valency Grammar has a structuralist matrix from which it draws the idea of the systemic nature of language; thus, all linguistic phenomena can be explained on the basis of a model, through a methodological rigour and a formalism typical of logic and mathematics (*Ibidem*).

In its adaptation to the Italian language and to school teaching, in particular by Francesco Sabatini (2004; 2011; 2016; 2022), the above model has been integrated and clarified. Sabatini better illustrated the types of relationships occurring between verbs and the various elements of the sentence; he also proposed a new graphic representation through radial graphs with ovals, colours and continuous and dashed links between the elements of the sentence, in order for students to have a clearer and more immediate perception of the sentence structure (Camizzi, 2020).

There also seems to be a link with Chomsky's Generative grammar, that considers grammar the formal and explicit description of native speaker's language skills. In fact, the Valency model starts from a reflection on the implicit grammatical knowledge of the speaker to reconstruct the regularities of the language system.

Therefore, the reflection on language conducted in the classroom according to the Valency model and that starts from the children's observations and hypotheses, fosters:

- the development of cognitive abilities, accustoms students to the scientific method and gradually educates them to abstract thinking (Lo Duca, 2018);
- the ability to draw on one's own metalinguistic competence to better understand more complex texts, to correct one's mistakes in writing activities (Lo Duca, 2018) and to produce more effectively communicative texts (Sabatini, 2016).

3.3. Coding and codified languages, logic and computational thinking

Nowadays, talking about codified language, especially in the school context, implies talking about "coding". Coding is a slang term for computer programming, viz. writing code. In its most refined and academic form, this activity is linked to computational thinking, coined by Papert (1980) and brought to the fore by Wing (2006).

We can easily understand that coding and computational thinking are connoted as languages of the current world when we read in *Piano Nazionale Scuola Digitale* (*National Digital School Plan*, MIUR, 2015, p. 72) that: "digital is the alphabet of our time – whose core is computational thinking – a new syntax, between logical and creative thinking, which forms the language we speak increasingly often nowadays".

Similarly, we find a first link between coding, logic and analytic philosophy in the *Indicazioni nazionali e nuovi scenari* (*National Advices and New Scenarios*, MIUR, 2018) in which computational thinking is defined as: "an education in logical and analytical thinking directed towards the solution of problems" (p. 13).

Coding has been recently characterized by visual elements, typical of block programming, or by perceptual-sensory elements, introduced by the use of robotic mediators with various levels of complexity.

Nevertheless, code writing consists in the use of a coded language, based on logic and formalization.

On the one hand, coding has its deep origins in Leibniz's *lingua characteristica* and in Frege's *Begriffsschrift*; on the other hand, computational thinking and related skills, are based on the concepts of procedure and algorithm elaborated by Turing.

We can therefore adopt an analytic attitude to approach coding as study, practice and understanding of the relationships between natural and formalized languages (Casalegno, 2011). From the same analytic viewpoint, coding can be also a poietic activity to address the relationship between code and languages, based on formalization processes (Penco, 2004). This way, we can outline a path which makes us aware of the deep mechanisms governing technology; therefore, like Dennett (2013), we can consider computers as powerful tools for thinking, because the concepts themselves, processed by computer scientists, are tools for thinking.

3.4. Constructionism to know and learn

We identified theoretical bases that allow a conscious approach to the identified literacies. The recent philosophical reflection on epistemology required for our world enables us to identify a framework which encompasses the knower and the learner, and then the conscious citizen. We are talking about Floridi's constructionism.

We take constructionism as our model of theory of knowledge in this context for several reasons.

As Floridi (2011) declared, his constructionism looks to Papert theory that we can grant as base in developing an active learning structure to sustain knowledge and skills. Moreover, constructionism is based on the philosophical as well as on computational practices (Floridi, 2019).

Technological awareness is essential to digital citizenship. From a poietic perspective, we do not know what we can only observe - which is therefore a "black box"; we only have a deep knowledge of what we make, that is a "white box" (Greco et al., 2005). Floridi's constructionism lays in the maker's knowledge tradition and seems close to the maker movement and FabLab tradition (Blikstein, 2018), against "black boxed" technology.

We assume a constructionist point of view according to which knowledge is a modelling process that shapes reality and make it intelligible (Floridi, 2019).

4. Hypothesis and research question

We therefore hypothesized a new and peculiar role for philosophy as a scenario for the development of literacies. The analytical perspective constitutes a methodological basis that allows controllability, justifiability and rigorous argumentation on a unique ground for discussion through shared languages. We built-up a proposal in which we deem that philosophical knowledge may be considered as the fourth pole of didactic transposition (Chevallard, 1985) and is added to the path leading from disciplinary knowledge (*savoir savant*) to subject-matter knowledge (*savoir enseigné*) up to learning (*savoir appris*).

We took the philosophy of language, linguistics and philosophical logic as tools to analyse natural languages and formalized languages, as well as keys to understand the underlying epistemology and developing core competencies.

This way, philosophy may represent a scaffolding both for teachers and students. It is an epistemological structure, a cultural and project support to the former and a learning scenario and a key for knowledge systematization to the latter.

Given the history of analytical philosophy and the directions of the European policies, we started from the theme of languages to identify a *fil rouge* that links two experiences, two relatively new areas, but on which Indire has already developed an expertise: the Valency Grammar and coding.

We identified three kinds of relationship: that of grammars with linguistics; mother tongue and study skills with the philosophy of ordinary language; coding with formalized languages. The philosophy of linguistic turn, which combines these elements, is the natural basis for the proposal we designed and suggested to teachers and schools.

The questions arising thus from our research is: can teachers' training on philosophy of language and logic

from an analytic perspective support a learning path aimed at developing those competences required to build literacies?

5. Project development and data collection

In September 2019, Indire started in field research named "*La filosofia come chiave di lettura nelle altre discipline - Linguaggi*" (*Philosophy as a key to understanding the others disciplines - Languages*), involving eleven teachers of different disciplines and degrees of two *Istituti Onnicomprensivi* (from primary to upper secondary schools): the *Convitto Nazionale Colombo* in Genoa and the *San Marcello Pistoiese* near Pistoia. The teachers were involved in a training path and empirical activities about the wide theme of the languages concerning analytic philosophy, philosophy of language and logic, formal coding language, reflection on language through grammatical models. In particular: three teachers of a primary school worked on Coding; one teacher of a primary school, three teachers of a lower secondary school and two teachers of a two-year period upper secondary school worked on the Valency Grammar; two teachers of a two-year period upper secondary school worked on analytic philosophy.

The project structure was adjusted on the Design Based Research (Kelly, 2003), that relies on an interactive process of design, enactment, analysis and redesign (Design-Based Research Collective, 2003), and was characterized by a close collaboration between researchers and teachers.

The first three months (September – December 2019) were devoted to a preliminary phase of teachers' training on philosophical framework, coding and the Valency Grammar, with the support of disciplinary experts (university professors and skilled schoolteachers) with seminars and individual study sessions of especially created study materials.

Then such experts and Indire proposed a format and a synoptic table to the teachers for them to design a learning path (with a variable duration, generally from four to ten lessons) on a "language" and within a philosophical framework, considering their context and objectives. During this design phase (December 2019 - February 2020), there was a great deal of interaction between teachers, experts and researchers to define the lesson plans (which were also the first data collected for research analysis).

The implementation phase (March 2020) unfortunately coincided with the start of Covid-19 emergency, and all schools switched to distance teaching in Italy. Therefore, there have been many delays and most of the teachers were able to put into practice their lesson plans with students only in the next school year, in autumn 2020, when schools resumed in-person classes. As it was not possible for researchers to make observations in classrooms, they supported teachers remotely for any closer examinations, advice and *in itinere* corrections.

Teachers were strongly recommended to be observed by a colleague during their lesson performance, in order to introduce the practice of peer observation.

During the implementation phase, the teachers had to produce some documentation, which researchers collected for analysis:

- *Logbook - Diario di bordo*: a written tool where teachers put down after each lesson any events, contingencies, strengths, weaknesses, developments;
- *Observer tool - Strumento dell'osservatore:* a written tool used by the peer observer during lessons;
- photos, videos, audios or other documentation about the lessons.

The researchers decided to expand the data collection with additional tools:

- seven remote focus groups with students, to inquire directly their opinions about the experimental educational path;
- two remote interviews with teachers who worked on coding to investigate the theme of coding as a language.

6. Data analysis and discussion in the light of the theoretical framework

6.1. Focal point to build-up and analyse learning experiences

Our project covered a series of main nodes concerning the themes and disciplines dealt with, throughout its phases, from teacher training to design and to classroom learning activities (Table 1). The nodes relating to philosophy have been used both for the teaching discipline and as a cultural framework for the approach to languages in grammar and coding.

The thematic nodes were developed on the basis of the theoretical framework and in particular of the analytical perspective adopted. The researchers and experts identified such nodes in each specific area, both in terms of philosophy and of the Valency Grammar and coding. They were then shared and evaluated to identify the core to be used by the whole involved workgroup.

The same nodes have been used as categories of the entire analysis path. In the *on desk* analysis, they were the tools to screen the materials elaborated by the teachers, with a particular attention to lesson plans; in the *in field*, analysis, they were used to set the instruments and to analyse the *Logbook - Diari* and the results of observations, interviews and focus groups.

The approach chosen is aimed on the one hand to take into account and respect the peculiarities of the discipline, both for thematic purposes and for methods, and on the other hand to provide a common theoretical and methodological framework with an analytical approach.

THEMATIC NODES

Philosophy					
Ordinary language and its characteristics	Ideal language and its characteristics	Relationship between ordinary and formal language	Relationship between the truth of declarative statements and their form	Role of language in the work of thought	Logical connectives
Valency Grammar			**Coding**		
Relationship between form and function	The role of verb	The minimal sentence structure	Definition of coding		Use of symbolic languages
Relationship between semantics and syntax	Language as rule and choice	From sentence to text	Algorithms: characteristics and applications		Use of programming languages

Table 1 - Main nodes concerning the themes and disciplines.

This allowed each experience to maintain its own peculiarities and to develop the proposed nodes according to autonomous paths.

In the outcomes of each area, which can be found in the following description, the thematic nodes were used as tags to analyse the collected material.

6.2. The Valency Grammar experience

In the *in field* research, six teachers chose to work with the Valency Grammar: one primary school teacher, three lower secondary school teachers and two upper secondary school teachers.

The reasons that led such teachers to experiment with the Valency Grammar path are the following: to improve the understanding of texts, even the scientific and mathematical ones; to improve the pupils' logic and sentence analysis skills; to involve pupils more actively in language reflection; to integrate better the teaching of Italian and Latin by fostering comparative language reflection, to develop also transversal skills such as critical thinking and problem solving.

Figure 1 shows the themes chosen and implemented by teachers in their classes according to the different levels and on the basis of the issues proposed by the experts (Table 1).

It can be noted that the basic concepts of the Valency Grammar have been dealt with in all school levels, with an increasing focus in secondary schools. The relationship between sentence (system) and text (communication) has been explored in all school levels (Sabatini 2011, 2016, 2022).

The observation and analysis of the documentation showed some interesting aspects that were partly confirmed by other research carried out on the Valency Grammar in classrooms (Camizzi ed, 2020) and which are ground for further investigation.

The pupils of all the involved levels understood the profound structure of sentences, by going beyond their linear order and the mere association of different morphological units. Starting from the reflection on the meaning of known verbs, close to their experience, they understood the relationships arising in a sentence among its different elements (syntax and semantics).

"The most important element is the verb, because it allows you to understand what happens, you have to say what it does" [Primary school Student 1].

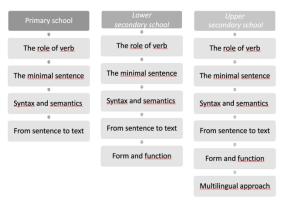*"It is better understood than when [words] are on the line" [Primary school Student 2].*

Figure 1 - Themes chosen by teachers.

Thanks to this discovery, secondary school students were also able to reflect on the relationship between the form of words (morphology) and its function in the sentence (syntax), unlike what happens in grammatical and logic analysis, that is often meaningless for them:

It helps to look at sentence structure, thus to select things and join each part by its role [Lower secondary school Student 1]

It was an intuitive work. It is a more schematic and intuitive grammar if compared to work on complements [Upper secondary school Student 1]

This turned even more evident when a teacher, together with the coding process, used Lego to represent the relationships in a sentence.

In all classes, the students identified a standard pattern applicable to more complex study texts, such as mathematical problems, through the analysis of simple sentences within their reach. They thus found their own key to understanding. About the understanding of mathematical problems, some lower secondary school students report:

"[We have] some troubles when we do not know the meaning of the verb to understand which actions must be performed or when we lack a datum" [Student 2].

"It is necessary to read well the text and to identify and understand the verb" [Student 3].

The students of the third level of a lower secondary school (introductory course in Latin) and of the upper secondary school (scientific upper secondary school) who worked with the Valency Grammar jointly with Italian and Latin, were able to grasp the same structure in the two languages and to understand better the construction and translation mechanism of Latin.

"The sentence structure of the two languages is the same. Languages are all similar, they all need a verb, subject and arguments, not only in Latin and Neo-Latin, but also in English and in every language" [Upper secondary school Student 2]

"Doing valence and regency together clarified some mechanisms of both languages" [Upper secondary school Teacher 2]

There were some difficulties in groups which approached the Valency Grammar directly with the study of Latin, without first experimenting it in Italian.

The teachers also took the opportunity to work in general on some logical categories linked to the Valency Grammar, such as the concept of "relationship". In the students' reflection, this notion was also extended to human relationships or to those of other disciplines, such as chemistry and mathematics. This way, the students got accustomed to using the schemes of specific disciplines to understand the complexity of reality.

Finally, the grammar lesson changed (Camizzi, 2020), as it involved pupils in an individual and collective

search for regularities starting from the reflection on simple and familiar linguistic data. This is an inductive process similar to the logical and scientific one, which favoured greater learning motivation and awareness. Furthermore, it contributed to build up useful skills in study and in life, such as the problem solving, management of complexity and increased awareness of one's own learning processes.

"The other [grammar] explains it, this one makes us think" [Primary school Student 3]

"We changed our point of view and we understood better" [Lower secondary school Student 3]

"We remember it better because we practice it by playing rather than learning with explanations" [Upper secondary school Student 3]

6.3. From linguistic to digital awareness: an analytic path

The two disciplinary experiences of philosophy were centred one on logic and the other on the philosophy of language. The former dealt with some of the proposed themes: the relationship between the truth of declarative statements and their form; the role of language in the work of thought; the logical connectives.

The latter tackled the theme of ordinary language and its characteristics by analysing the understanding of natural language, the role of the community of speakers, the uniqueness and the multiplicity of the reference.

We analysed the disciplinary experiences with a philosophic background to see which thematic nodes were useful to build up a framework. Grammar activities may be linked to the following nodes: ordinary language and its characteristics; the relationship between ordinary and ideal language; the role of language in the work of thought.

Coding activities focus on the relationship between ordinary and ideal language; the possibility of formalization; the logical connectives.

In the previous paragraph we discussed grammar activities, whereas in this paragraph we focus more on coding activities, whose analysis is aimed at the theme of technological and digital awareness.

Of the two implemented experiences, one focused on unplugged activities and the other one on the use of simple programming languages. Yet, they both pivoted around the following themes:

- relationship between natural and formal language (philosophical node);
- understanding of natural language (specific to the philosophical node "Ordinary language and its characteristics");
- possibility of formalization (considering the philosophical node "Ideal language and its

characteristics" and the coding node "Use of symbolic languages");

- identification of connectives and logical elements (considering the philosophical node "Connective logical" and the coding node "Use of symbolic languages");
- algorithm, its characteristics and applications.

Both experiences have taken into account the theme of algorithms, for which teachers have requested an in-depth training. The unplugged activity had a greater focus on the use of symbols and algorithms as a process.

The programming-oriented activity has given much room to the relationship between natural and formalized languages and to the man-machine relationship.

The activities drew up a path that starts from the analysis of ordinary language, goes on with the need for language structuring and comes to its formalization; this path was followed the other way round if compared to the school levels.

We analysed it with regard to the issues of citizenship and digital citizenship identified by the European documents.

We took as patterns the work of an upper secondary school class on ordinary language, that of lower secondary school classes on Latin from a multilingual perspective and that of primary school classes on coding.

The upper secondary school class worked on ordinary language and language games, starting from a discussion born spontaneously on cultural differences.

Within this framework, students deepened the dialogue on different positions with the support of the *Lezioni e conversazioni* (Wittgenstein, 1967) [the volume presents, in Italian translation, the *Conference on Ethic* and the incollection *Lectures and Conversations on Aesthetics, Psychology and Religious Beliefs* edited by Cyril Barret]. An analytical approach to language allowed them to engage in an open and respectful discussion.

Actually, the results attained by the focus group were as follows:

- language must be differentiated according to the linguistic game [Student 2];
- "it is possible to analytically tackle a subject from a linguistic viewpoint, what it is said, each word, as if it were mathematics" [Student 3];
- Starting from this perspective, "starting from Wittgenstein, we do not merely rely on our opinions, but we are also more open to the group's thought" [Student 4].

In the lower secondary school, the study of the Valency Grammar as a tool to approach an ancient language accompanied a first reflection on the underlying structure of languages. In the observations of the online lessons, students noticed some basic hints about any possible similarities with the most known languages, such as Italian and English. Attention was paid to the possible use of a grammatical model for other languages.

Some students focused on its use for various types of languages, such as Arabic or Neo-Latin. A more structured reflection was also made: "It can also be useful for other languages, because it helps to look at sentence structure".

In coding activities, reflection on the relationship between natural and formalized languages was a way to bring about changes both in teachers and students. In teachers, it influenced the way of looking at coding and computational thinking. Usually, these activities are seen as useful to keep up with times and motivate children. The involved teachers, after a training on the philosophy of language and logic, were able to prepare the activities by keeping in mind a specific target and to analyse the implemented path with peculiar criteria.

The learning outcome expected by the teacher who designed the activity aimed at using programming languages is similar to the already analysed notion of unblackboxed technology. In fact, he underlined the importance of making students aware of what machines are, that they are programmed by the man and that to do this, a programming language is required. In an interview, the teacher dealing with the unplugged activity claimed that, before following this path, she used floor robots such as Bee Bot and Dot, without knowing either the internal processes and educational purposes, or their connection with logic.

The results achieved by the focus groups show that the children of both classes acquired some awareness and began to look at technology, that has become part of their reality, from a different perspective. They learned that the clarity and certainty of language are essential:

> *"If you have to give instructions to a PC, they have to be even more precise than those given to a human being [...]. If you give a computer an information less than precise, that computer will not understand it."* [Primary school, Class 2, Student 6]

Students realised how natural language, which we are currently accustomed to thanks to the use of voice commands, is of help to manage technology, not to unblackbox the behaviour of a machine:

> *"Instructions are given by means of codes. We did not use natural language, we used an algorithm."*
> [Primary school, Class 2, Student 4]

7. Conclusions and lines of development

As we have seen in the excursus on the European policies, digital citizenship is not a merely state of fact, but rather a way of life in a constantly evolving society, that must be built-up by means of a responsible political and social action. To help its growth, it literacy, numeracy, data and digital literacy must be sustained by a cluster of knowledges, competences and skills.

Clearly, school education can play a crucial role in laying the foundations to build up citizenship as well as digital citizenship. This can take place provided that school is able not only to approach a specific theme, but also to provide it with a cultural framework. It is actually necessary to acquire an unblackboxing attitude and then consciously achieve the basic literacies needed for citizen of our society.

Our hypothesis is that philosophy, especially the analytic one, can support this cultural path. It is important to keep in mind that new proposals in a school context must be introduced carefully, with an evidence-informed approach, taking account of school's readiness. The described exploratory research allowed us to take our first steps in testing the hypothesis in a small context from which we could draw insights for future experimentation.

First of all, the observation and analysis of the documentation showed the teachers' difficulty in dealing altogether with all the different aspects of the project (philosophical, linguistic and methodological); it also showed the need for a in-depth study of the theoretical aspects of the disciplinary fields, as well as their relationships. It would be advisable to provide teachers with higher theoretical (disciplinary) and practical (planning and mediation) skills. This issue can be tackled in future experimentation with a longer introductory training, opportunities for sharing, guided reflection and training on the job.

Nevertheless, the proposed path seems to draw the attention to peculiar aspects, such as language structure, relationship between natural and codified language, their characteristics and their relationship. In particular, great importance is attached to the approach of natural languages and their use, as well as of formalized ones and the resulting technology as subject-matter of study; this way, they can be analysed and understood with an active, unblackboxing attitude that can be the real basis for the growth of citizens.

Credit author statement

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