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New technologies and redesigning learning spaces

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Ion ROCEANU

Carmen HOLOTESCU **Lucian CIOLAN** **Anca Cristina COLIBABA**

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"eLearning and Software for Education"

New technologies and redesigning learning spaces

Volume II

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Adapting STEM Automated Assessment System to Enhance Language Skills

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***Abstract**: Enhancing language skills is a duty for many institutions, schools and universities; Information and Communications Technology is nowadays supporting language teaching, heading also to the integration of foreigners. According to previous studies, the use of a Technology Enhanced Learning Environment can foster language competences through online tests. The goal of this paper is to show and discuss different typologies of automatically evaluated questions useful to learn languages and designed with an Automatic Assessment System, already successfully used for teaching STEM disciplines: Science, Technology, Engineering and Mathematics. This work has been carried out thanks to the collaboration between the Department of Mathematics and the Department of Foreign Languages. Five different typologies of questions are analysed: "Combining sentence elements" asks to combine given elements to form at least three correct and meaningful sentences; "Find the mistake" asks whether a sentence is grammatically correct and to explain why; "The Target puzzle" asks to join words together using precise links; "Scrambled text" asks the student the correct sequence of sentences in a scrambled text; "The Encrypted Crossword puzzle" is a crossword puzzle without definition clues. Linguists consider these question types effective to develop language competences and have already used them profitably in traditional teaching and language learning. To engage the learner and increase motivation, we will develop an implementation where the questions are self-evaluated, always available, with immediate and interactive feedback. These tools could be used in online language courses and in all those teaching activities that are carried out remotely by the student alone. All questions are outlined with the explanation of the grading code and a triplet of descriptors; they describe the Performance, Requirements and Objectives of each question and allow further studies on automatic detection of the relatedness between different language learning objects, in order to construct adaptive language tests.*

***Keywords:** Automated Assessment System; Language skills; Language learning; Ontology; Technology Enhanced Learning.*

INTRODUCTION

Knowing languages is not just a means of facilitating exchanges between countries: above all, it is the tool that allows to dig into different ways of thinking, where everyone can take the words, the models and the values that they find most suitable [2]. Italy is one of the OECD countries (Organization for Economic Cooperation and Development) characterized by an increasing immigration, and this has given rise to several issues, especially concerning the policy to be adopted in order to encourage a real

and not conflicting integration of foreigners. One of the possible solutions to make social integration of immigrants more effective is to seek for the help of Information and Communications Technology (ICT). In fact, immigrants are frequent users of new technologies, mainly to maintain relationships with family members and friends abroad [10].

In literature, there are few examples of online questions aimed at developing language competences: even in specialized books [18]. In the last years, there have been various Italian projects that involve the use of ICT in order to achieve the purpose of integration. "Italstudio" test [14] was developed by the University of Parma with the dual aim of certifying students' levels of competence and of guiding the school system towards a new methodological approach for quality assurance of language acquisition processes beyond elementary levels, i.e. up to levels of academic language autonomy. CALCOTE (Conosci gli ALtri, COnosci TE stesso) [10] of the University for Foreigners of Siena is an example of improving intercultural competences and integration. It consists of an online course for young immigrants that aims at spreading intercultural knowledge and enlarging social nets.

The main stimulus for our research can be found in the 2014 report of MIUR (Ministero dell'Istruzione, dell'Università e della Ricerca) [9] where it is stated clearly that linguistic competences and integration are incisive in the academic performance of foreign students. In fact, in 2013/2014 the percentage of Italian students admitted to the secondary school exit exam was 89,1% while only 76,3% of non-Italian students were admitted. Similar results can be found in the 2018 report of INVALSI (Istituto Nazionale per la Valutazione del Sistema dell'Istruzione) [21]. INVALSI report underlines the immigrant situation in Italy. 10% of students in Italy are foreigners; these students, on average, have lower scores than their Italian classmates, notably in Mathematics and Italian, while English is the only subject were foreign students are as good as Italian students. The reasons for these differences in Mathematics and Italian could be found in the economic situation of immigrants' families but also in their cultural and linguistic differences. The gap between the results of Italian students and foreigners, but mostly the gap between the results of first generation immigrants and second-generation immigrants, suggest that the level of integration in Italian schools could sensibly improve with a better teaching of the Italian language. Both the 2018 INVALSI report [21] and the 2014 MIUR report [9] underline the importance of teaching languages in Italy, namely Italian for foreigners and foreign languages for Italians. Besides ICT, one possible way to improve the teaching of languages in Italy is suggested by applied linguistics through the use of word games [16]. This is a more engaging way to bring students to memorize the formal aspects of words and sentences and the semantic links, which connect words in texts. Acrostics, anagrams, crosswords, rebus and riddles are usually designed for Italian native speakers but, if adapted properly, they can act as a pedagogical tool, with the aim of learning with fun (Ludolinguistica or Language Games) [12]. These games can be of many different levels of difficulty and adjustable to different audiences, from children to adults.

All these considerations brought to the development of five different typologies of question, inspired by word games, with the use of the model of formative automatic assessment and interactive feedback for STEM that uses the Automated Assessment System (AAS) Möbius Assessment [6]. The questions can be dispensed online with many advantages: automatic assessment, perpetual availability, immediate and interactive feedback. Each typology manifests some interesting properties, leading the online assessment of languages one step forward. The use of descriptors and computer codes demonstrates the requirement of many different areas of expertise to design similar activities. That is why this research was conducted in synergy between linguists, mathematicians and computer scientists. These questions can be applied in online language courses or in teaching activities to be carried out remotely and autonomously by students.

I. THEORETICAL FRAMEWORK

In this section, we will analyze the theoretical framework of actual experiences in improving language competences, the assessment strategies adopted and the technologies behind them. All listed experiences underline the importance of ICT for language assessments, the advantages of Technology Enhanced Learning (TEL) environments [17, 22] and the language competences that it is possible to foster using an AAS [1].

1.1 Language assessment

There are many theories about language assessment, all of them providing important food for thought. Balboni [2] focuses his attention on a student-centered perspective; with a continuous control, students can be monitored, checking whether the initial objectives are fulfilled [19]. Teachers can adjust their approach in an adaptive way, improving the effectiveness of the formative assessment, which is one of the most important methods to increase students' self-efficacy regarding the competences they are asked to develop. In particular, formative assessment could help students become able to identify their own motivation that causes the attitude toward the study subject, to detect their own strengths and weaknesses, to be aware of the level achieved, to proceed step-by-step, following suggestions given by feedback, which should be numerous and communicated timely to students. Serragiotto [22] states that self-assessment is an emotional and cognitive competence and allows teachers to fully exploit results of automated language proficiency assessment in a formative modality. This has been experimented for STEM disciplines [6], making self-assessment an optimal mode to support the formative process.

1.2 Learning technologies for languages

There are many advantages to using TEL for assessment. Here we summarize the ones that inspired our research [6, 17, 22, 19]:

- students immediately receive the results of the test and feedback;
- an online environment can increase the flexibility and the range of feedback to deliver students high quality information about their learning;
- randomized questions with casual parameters with equivalent difficulty level can encourage the dialogue around learning and avoid cheating behaviors;
- online tests usually foster positive behaviors and raise self-esteem as students can privately and repeatedly assess their knowledge without comparing their performances to others';
- all students' data are automatically collected by the AAS in a gradebook and they are available to students and teachers (helping the former to improve their learning and the latter to shape their teaching);
- the way of dispensing and replaying online tests is almost inexpensive;
- it is possible to create and catalogue sets of items and exercises that are easily reusable and comparable.

1.3 Similar learning experiences at the University of Turin

When taking into account language learning, well designed online tests are objective, guided and structured and they can therefore assess lexical, oral, linguistic, morphosyntactic, cultural and intercultural competences [1]. In 2003, the Department of Mathematics at the University of Turin, in collaboration with the Computer Science Department, started a renewal of the assessment process [3] integrating the Virtual Learning Environment Moodle with the AAS Möbius Assessment [15]. A further collaboration with the Department of Foreign Languages and Literatures and Modern Cultures of the University of Turin gave birth in 2014 to the project AttraSS (ATTRAzione Studenti Stranieri; https://orientamente.unito.it/course/view.php?id=163) [7] with the aim of teaching Italian language to foreign students who intended to start their university career in Turin. This project proposed to develop innovative methodologies to teach Italian with Möbius Assessment, until then mainly and successfully adopted for teaching and learning STEM disciplines [4]. AttraSS project started in the frame of the wider project: Orient@mente (https://orientamente.unito.it/) [5] that takes advantage of the AAS and it is aimed at supporting secondary school students in their University choice. On the Orient@mente platform many automatically assessed online tests were developed to facilitate self-assessment in different subjects, including languages. Afterwards, "Esplorare (con) i Dizionari Digitali" has the specific goal to support students in using digital dictionaries to learn languages [11]. The TEL environment developed for this project (http://esploradizionari.i-learn.unito.it/) contains communicative tasks designed for secondary schools. The designed exercises are activities of text comprehension with consultation of digital dictionaries online; most of them are "adaptive" exercises, as the system automatically changes the question according to the student's performance. More than a hundred exercises have been developed in different languages, mostly multiple choice or multiple selection, matching or fill-in-the-blanks. The latest experience is start@unito (https://start.unito.it/), designed to

promote and facilitate the transition of students from high school to university. All these projects have been instrumental in launching the use of an AAS mainly adopted for STEM and for language assessment, giving an impulse to the present research.

II. RESEARCH GOALS

How can well-known question types used in language teaching be improved through automation to enhance language skills, in particular when self-paced learning is concerned? We developed the following typologies of questions: Combining sentence elements, Find the mistake, The Target, The Encrypted Crossword Puzzle, Scrambled text. These questions were chosen within the wider set of language teaching tools, because they represent a good blending of educational and ludic aspects and are considered by linguists effective to develop language competences. In order to get the best from TEL, the questions were designed following the model of formative assessment and interactive feedback developed by the Department of Mathematics of the University of Turin [7], which entails the following important key features:

- availability: the assignments should be always available to allow students to solve them at their own pace;
- algorithm-based questions and answers: the questions should be defined by random values and parameters that change at every attempt, and should be able to implement grading code;
- open answers: the use of textual response areas where the AAS search the keywords in students' answer;
- immediate feedback: i.e. results should be computed in a few moments and shown to the students while they are still focused on the task;
- interactive feedback: the assignments should use the methodology of guiding students to the solution through a step-by-step process;
- contextualization: the assignments should be developed within a real world context which engages students more and helps them to better understand the contents.

III. RESEARCH METHODS

The questions were developed through a collaborative work. After a first implementation, linguists provided feedback on what had to be changed and what had to be enforced: improvements of the questions were made in order to make them more accessible and relevant. While the complexity of algorithms was increasing, the support of computer programmers became of great importance. The synergy between three different kinds of experts allowed the research to be effective and productive: in the end, native Italian people carried out an assignment to verify the quality of questions and answered an evaluation questionnaire. Experts in programming languages and in automatic assessment systems were required in the process, but the usage of questions can be administered by teachers without further ICT skills: they can easily clone and change contents while preparing their lectures and interactive materials. According to the definition given by Porcelli [19], for each question we added a triplet of descriptors: Performance, Requirements, Objectives. We inserted this ontology in our questions for future perspectives about language teaching, an idea which arose from previous experiments in creating automatic learning paths for STEM through natural language processing. Descriptors are outlined in order to strengthen instructors' reasoning on the selection of contents, developing an instructional strategy, and constructing tests and other tools for assessing and then evaluating students' learning outcomes:

- **Descriptor of performance** is proposed to activate a reflection on the structure of the materials used online, therefore it should be useful to teachers both in the design phase and during the subsequent research balance. A well-written "Performance" descriptor should meet the following criteria: describe a learning outcome, describe the conditions under which the student will perform the task (be student-oriented), be observable;

- **Descriptor of requirements** states the learning goals that should be acquired before attempting to answer the response area. They represent essential prerequisites to achieve both linguistic and mathematical competences;
- **Descriptor of objectives** should explain the skills achieved at the end of the exercise; they are different from "Performance" descriptors because they do not depend on the type of response area embedded. Action-verbs are suggested to compose objectives descriptors.

IV. RESULTS AND DISCUSSION

4.1 The five questions

Combining sentence elements

Performance: Given three lists, where the first one contains four potential subjects or direct objects, the second one 4 verbs in the 3rd person singular and plural, and the third one list four possible objects with preposition, the student has to form at least three morphosyntactically correct meaningful sentences.

Requirements: remembering the definition of "subject-verb agreement"; understanding the meaning of words in the context of the sentence; recognizing a noun group that can work as a subject; recognizing a noun group that can work as a direct object; recognizing the verbs that can be followed by a direct object; recognizing the verbs that can be followed by a complement with preposition; recognizing the prepositions that a verb requires when combined with a complement with preposition.

Objectives: Creating meaningful sentences with subject, verb and eventually complement.

This question is an inductive way of fixing transitivity or intransitivity of Italian verbs plus subject-verb agreement. The order of elements in an Italian sentence is not fixed; nevertheless, we insert constraints in order to help students better understand the logical structure of the phrase. Anyway, the grading code allows to face non-standard order of elements, if it is the case. To evaluate the question, a "solution vector" was created, containing all possible meaningful sentences (in the form of strings) that can be constructed with the elements given by the text. The evaluation algorithm divides the student's response (which for the automatic assessment system is initially a single string of characters) into a list of strings, so that each sentence entered matches a string. To avoid the input of identical phrases, the string list is converted into a mathematical set (thus containing only distinct elements). The presence of the string in the "solution vector" is then checked and for each match a counter variable (initialized to zero) is increased by one unit. Once all the comparisons have been completed, the value of the counter variable will be equal to the number of correct sentences entered by the student. The score of the application is calibrated on the number of correct sentences inserted by the student with respect to the total of the inserted ones. The student who identifies and writes up to two sentences obtains the score in thirds (as 3 is the minimum number of answers required), while the student who writes more than three sentences will have a score attributed by dividing the number of correct answers by the number of distinct sentences inserted.

Find the mistake

Performance: given a sentence, the student will be able to recognize whether it is correct and to identify the reason why by selecting one of the three given options.

Requirements: recognizing a noun group that can work as a subject; remembering the definition of "subject-verb agreement"; remembering the meaning of words in the context of the sentence.

Objectives: recognizing when a verb needs a direct object; recognizing when there is no subject-verb agreement; recognizing when a verb is followed by a complement with the wrong preposition.

This question has been chosen because of its e-learning properties, because it exploits the option of viewing details of the submitted answer with an adaptive section (according to the definition given by Posner [20]). From the point of view of the teacher and of the linguist who designs tests, writing multiple-choice for this type of exercises is challenging. They must face a robust pruning of metalinguistic terminology, and they must consider whether the question is for a mother tongue or L2 student. In order to solve this issue, a pop-up link has been inserted that gives the opportunity to consult

dictionaries when not understanding the meaning of words or when needing suggestions about the verb pattern.

The "Target" puzzle

Performance: given a scrambled list of words, the student will be able to write them in a sequence where each word is connected to the following by formal linguistic links like anagrams, adding, subtracting or changing one letter, or by semantic links like being hypernyms, synonyms or antonyms, or by encyclopedic and pragmatic reasons

Requirements: recognizing an anagram; recognizing the change, addition or subtraction of a letter; recognizing a synonym or to know how to search it in a dictionary; recognizing an antonym or to know how to search it in a dictionary; recognizing relationships of various kinds (e.g. mouth/tooth, flower/rose, hair/blond, marriage/groom) or to know how to look them up.

Objectives: recognizing, within a given list, two words where one is the anagram of the other; recognizing, within a given list, two words that differ by the change, addition or subtraction of a single letter; recognizing, within a given list, two words that are synonymous or one the hypernym of the other (ISA relation); recognizing, within a given list, two words where one is the opposite of the other; recognizing, within a given list, two words that are frequently used together for reasons of various kinds.

The Target is a common linguistic game that is possible to find in many riddles magazine. In this implemented version, the first connection is always given; students can ask for a hint if needed. From an educational point of view, it is really interesting as it has a great adaptability to levels and ages of students; it can be easier for L2 students when passages are totally formal (anagrams, change or addition or subtraction of letters) and in that case it is given with the purpose of fixing the correct graphic aspect of words. When it includes semantic, encyclopedic or pragmatic passages, it is more difficult to play and the answer might not be unique. The score engine can be settled to face different answers in order not to provoke mistrust in students. The challenge was to offer it for the first time with automatic assessment. Here the advantage of using Möbius Assessment with its specific computational engine is that it can grade (or better, partially grade) a response that is a list. Thus, the correct evaluation for this question concerns the correctness (whenever they appear) of the links between words of the target. Students should get more points when they place two words correctly next to each other, less points in other cases. In a list made up of N elements, there are N - 1 links to evaluate. We considered all links counting equally for the question score. The algorithm considers the elements of the correct list one by one, searches them in the student's answer and checks whether the following term is the correct one. If correct, the question score is increased by 1 / (N - 1), so that the sum of all correct links is 1, the maximum score. No increase otherwise, that means the student does not gain any points if the passage is incorrect or if the item appears more than once in the student's answer. When there is more than one possible answer, the system considers the maximum score obtained by matching the student's answer with all other possible solutions.

Scrambled text

Performance: given a list of scrambled sentences, the student will be able to reorder them and write them in the correct meaningful order.

Requirements: recognizing temporal links between sentences expressed via tenses, adverbials, conjunctions; recognizing cause and effect relationship between sentences.

Objectives: reconstructing meaningful texts.

This typology of question, like the "Target" puzzle, is adaptable to different levels and ages of students but it implies a minimum A2 level, because it deals with whole sentences and not with isolated words. It is a textual exercise [13] and a very useful one in untutored e-courses in which free productivity of texts cannot be checked. By reordering scrambled sentences, students show that they understood the type and final goal of the unscrambled text, that they could spot explicit and implicit signs of ordering and use them when they create their own texts. It is to be highly appreciated that Möbius Assessment. can read the text with the sentence order the student is creating step by step: in the past, this kind of task was either proposed with strips of papers each containing a sentence or - as in Hot Potatoes J-Mix - with a drag and drop mechanism. From a technical perspective, the sentences are presented in a random order and they are associated to a letter; in order to answer, students will write the sequence of letters in the response area in the order they think it is correct. The preview button allows students to read the whole text with the sentences arranged in the order they chose. The evaluating algorithm is similar to the Target puzzle one explained.

The "Encrypted Crossword" puzzle

Performance: given an empty crossword puzzle, without definition clues but with three or four letters revealed, the students will be able to fill it according to the rule that all the boxes showing the same number should be filled with the same letter.

Requirements: remembering the sequence of letters in a word and analyzing which might satisfy the rules given; remembering and applying frequent sequences of letters that occur in derivative morphemes, for instance It. –zione or –mento; remember frequent morphological features of natural languages, for instance Italian words generally end by vowel –a, -e, -o, -i.

Objectives: remembering the right spelling of the words to be written; appreciating the productivity of morphemes.

Solving encrypted crossword puzzles is relatively easier in Italian than in other languages, as it uses a lot its five vowels, and monosyllabic words are not frequent; moreover Italian language has many words formed by derivative morphemes and it has many online free dictionaries which allow search with ? or * characters. For any language using an alphabet, it is in any case a rewarding exercise to fix in students' memory frequent sequences of letters. This question has been implemented using the HTML response area, in order to create a table and insert the input target in each box to be filled. All the details about the format settings of the table and the input boxes (e.g. font size, maximum number of characters) have been modified in the CSS. A JavaScript function was created to evaluate the question: it reads the content of each input box and it saves the entered values in a string-variable. The evaluation algorithm is based on the Hamming distance that is the number of character positions where two strings differ. The percentage evaluation is therefore given by the percentage of correctly entered characters with respect to the total number of characters to be inserted.

4.2 Testing results

An assignment containing the five questions was delivered to 27 people, who made multiple attempts, 68 in total with an average of 2.52 each. The score shows a greater difficulty of two questions (the target puzzle and scrambled text), probably due to a higher need of competences. It suggests that it should be adapted for foreign students. Afterwards, the participants to this experimentation were asked to submit a questionnaire about their experience. In Table 1 the results of the evaluation questionnaire are outlined. Users have to fill a 5-point Likert scale where 1 means very low and 5 means very good.

Feature	Average on 5-point Likert scale
availability	3.4
readability of the instructions on how to insert the answer	3.5
usefulness of immediate feedback	4.3
usefulness of the interactive feedback	4.5
usefulness of the interactive feedback in this assignment	2.8
usefulness of the answer preview	4.2
usefulness of the answer preview for changing the answer	3.9
variability of questions, when available	4.0
contextualization	4.4

Table no. 1 Results from the evaluation questionnaire

The results show a good score in the key features listed above. It is remarkable to note that the people consider the interactive feedback very useful, but probably in this assignment it was not correctly designed.

V. CONCLUSIONS

The questions satisfy all the features required by design features, regarding both competences and usability. The questions developed in this research could be used in MOOCs and online language learning tools for foreigners. These questions might be used to enhance competences, to recover gaps, to support traditional teaching, to expand learning opportunities. Lastly, a computer is more patient than a teacher, mainly when it comes to corrections and, if correctly instructed, it adapts teaching strategies

to every student. These playful questions can allow students to learn in a more entertaining and engaging way, thus increasing their interest in the subject. After the experiences of "AttraSS", "Esplorare (con) i Dizionari Digitali", "Start@unito" and "Orient@mente" at the University of Turin, we are planning a wide experimentation for the academic year 2018/2019 with different levels of students and involving different languages. For example, "start@unito" for the academic year 2018/2019 will expand its offer with new resources, especially with courses entirely taught in English. The University of Turin online services portfolio will enlist a new project called "Foundation Programme": it addresses students coming from countries where either the duration of pre-University education is shorter than that provided for by Italian law (twelve years), or the school year ends six months prior to the Italian one. This project will host this new kind of language assessment. Another future application of this research concerns the use of descriptors for language teaching. This could lead to an automatic detection of the relatedness between language learning objects for the construction of adaptive tests and paths. More studies could follow aiming at defining models for structuring shared materials available in disciplinary repositories of virtual communities and delivering learning objects trajectories on an automatically generated digital map.

Reference Text and Citations

[1] Arpetti, A., Di Dio, L. *P.O.L.I giovani: un esperimento di valutazione/certificazione per adolescenti. In: Tecnologia e didattica delle lingue,* UTET, Torino, pp. 269–280 (2012).

[2] Balboni, P.E. *Le sfide di Babele. Insegnare le lingue nelle società complesse.* UTET Università, Torino (2011).

[3] Barana, A., Marchisio, M., Rabellino, S.; Automated Assessment in Mathematics. In: *2015 IEEE 39th Annual International Computers, Software & Applications Conference, COMPSAC 2015*, CPS, Taichung, pp. 670–671 (2015).

[4] Barana, A., Marchisio, M.; Ten good reasons to adopt an automated formative assessment model for learning and teaching Mathematics and scientific disciplines. In: *Procedia - Social and Behavioural Sciences*, vol. 228, ELSEVIER, València, Spain, pp. 608–613 (2016).

[5] Barana, A., Bogino, A., Fioravera, M., Marchisio, M., Rabellino, S.; Open Platform of self-paced MOOCs for the continual improvement of Academic Guidance and Knowledge Strengthening in Tertiary Education. *Journal of e-Learning and Knowledge Society,* vol.13(3), pp.109–119 (2017).

[6] Barana, A., Conte, A., Fioravera, M., Marchisio, M., Rabellino, S.; A model of formative automatic assessment and interactive feedback for STEM. In: *Proceedings of 2018 IEEE 42nd Annual Computer Software and Applications Conference*, pp. 1016–1025. IEEE Computer Society Conference Publishing Services (CPS), Tokyo, Japan (2018).

[7] Corino, E., Marchisio, M.; MapleTA e italiano LS: quando matematica e lingua si incontrano su Moodle. In: *Teach Different! Proceedings della multiconferenza*, EMEMITALIA 2015, Genova University Press, Genova, pp. 87–90 (2015).

[8] Di Caro, L., Fioravera, M., Marchisio, M., Rabellino, S.; Towards adaptive systems for automatic formative assessment in virtual learning communities. In: *2018 42nd IEEE International Conference on Computer Software & Applications*, COMPSAC 2018, CPS, Tokyo, pp. 1000–1005 (2018).

[9] Elaborazione ISMU su dati MIUR, http://www.istruzione.it/allegati/2014/Notiziario_Stranieri_13_14.pdf, last accessed 2019/01/20.

[10] La Grassa, M.; Troncarelli, D.; Orientarsi in rete, *Didattica delle lingue e tecnologie digitali*, Becarelli, Siena, pp. 184-211 (2017).

[11] Marchisio, M., Marello, C.; Dizionari digitali italiani in rete. Come farli conoscere. In: *Quaderns d'Italià, "Lessicografia italiana tra presente e futuro"*, vol.23, Calvo Rigual, C. (eds.) (2018).

[12] Marello, C.; Dizionari in rete per l'apprendimento delle lingue e delle strategie di ricerca (query strategies), Atti Didamatica 2015, pp. 1-8 (2015).

[13] Marello, C.: Testualità. In: Cardinale, U., Corbucci, P., Fagotto, M. (eds.*) Le Olimpiadi di italiano. Un osservatorio sulle competenze logico-linguistiche degli studenti delle scuole superiori*, Il Mulino, Bologna, pp. 213–239 (2017).

[14] Mezzadri, M. *Testing Academic Language Proficiency*. Cambridge Scholars Publishing, Newcastle upon Tyne (2017).

[15] Moebius Assessment, https://www.digitaled.com/products/assessment/index.aspx., last accessed 2019/01/20.

[16] Mollica, A.; Ludolinguistica. Imparare una lingua con giochi di parole, *Ludolinguistica. Apprendere con giochi di parole, Ludolinguistica. Parlare e scrivere con creatività,* 3 voll., ELI edizioni, Loreto (AN) (2018).

[17] Nicol, D. and Macfarlane-Dick, D.; Formative assessment and self-regulated learning: A model and seven principles of good feedback practice*, Studies in Higher Education*, vol.31(2), pp. 199–218 (2006).

[18] Pederzoli, L. Insegnare le lingue on line e su app. Pacini editore (2018)

[19] Porcelli, G. *Educazione linguistica e valutazione.* Petrini, Torino (1998).

[20] Posner, Z. *What is Adaptive Learning anyway?*, McGraw-Hill Education (2017).

[21] Rapporto Prove INVALSI 2018, http://www.invalsi.it/invalsi/doc_evidenza/2018/ Rapporto_prove_INVALSI_ 2018.pdf, last accessed 2019/01/20.

[22] Serragiotto, G.; Nuove frontiere nella valutazione linguistica. *EL:LE*, vol.5(2), pp. 153–187 (2016).

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