7 - 9 November

Cagliari, Italy

16TH INTERNATIONAL CONFERENCE
COGNITION AND EXPLORATORY
LEARNING IN DIGITAL AGE

CELDA 2019

PROCEEDINGS

Edited by
Demetrios G. Sampson
Dirk Ifenthaler
Pedro Isaias
Maria Lidia Mascia

iadis
international association for development of the information society

16th INTERNATIONAL CONFERENCE
on

COGNITION AND EXPLORATORY LEARNING IN THE DIGITAL AGE (CELDA 2019)

PROCEEDINGS OF THE 16th INTERNATIONAL CONFERENCE on COGNITION AND EXPLORATORY LEARNING IN THE DIGITAL AGE (CELDA 2019)

CAGLIARI, ITALY

NOVEMBER 7-9, 2019

Organised by

iadis
international association for development of the information society

Co-Organised by

As a member of Crossref (a non-profit membership organization for scholarly publishing working with the purpose to make content easy to find, link, cite and assess) each published paper in this book of proceedings will be allocated a DOI (Digital Object Identifier) number for its fast and easy citation and indexation.

Edited by Demetrios G. Sampson, Dirk Ifenthaler, Pedro Isaías and Maria Lidia Mascia

Associate Editor: Luís Rodrigues

ISBN: 978-989-8533-93-7

TABLE OF CONTENTS

SHORT PAPERS

REFLECTION PAPER

FOREWORD

These proceedings contain the papers of the 16th International Conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2019), held during 7 to 9 November 2019, which has been organized by the International Association for Development of the Information Society (IADIS) and co-organised by University Degli Studi di Cagliari, Italy.

The CELDA conference aims to address the main issues concerned with evolving learning processes and supporting pedagogies and applications in the digital age. There have been advances in both cognitive psychology and computing that have affected the educational arena. The convergence of these two disciplines is increasing at a fast pace and affecting academia and professional practice in many ways.

Paradigms such as just-in-time learning, constructivism, student-centered learning and collaborative approaches have emerged and are being supported by technological advancements such as simulations, virtual reality and multi-agent systems. These developments have created both opportunities and areas of serious concerns. This conference aims to cover both technological as well as pedagogical issues related to these developments. Main tracks have been identified. However innovative contributions that do not easily fit into these areas will also be considered as long as they are directly related to the overall theme of the conference – cognition and exploratory learning in the digital age.

The following areas are represented in the submissions for CELDA 2019:

- Acquisition of Expertise
- Assessing Progress of Learning in Complex Domains
- Assessment of Exploratory Learning Approaches
- Assessment of Exploratory Technologies
- Cognition in Education
- Collaborative Learning
- Educational Psychology
- Exploratory Technologies (Simulations, VR, i-TV, etc.)
- Just-in-time and Learning-on-Demand
- Learner Communities and Peer-Support
- Learning Communities & Web Service Technologies Pedagogical issues related with Learning Objects
- Learning Paradigms in Academia
- Learning Paradigms in the Corporate Sector
- Life-long Learning
- Student-centered Learning
- Technology and Mental Models
- Technology
- Learning and Expertise
- Virtual University

The CELDA 2019 Conference received 87 submissions from more than 25 countries. Each submission was reviewed in a double-blind review process by at least two independent reviewers to ensure quality and maintain high standards. Out of the papers submitted, 48 were accepted as full papers for an acceptance rate of 55%; 15 were accepted as short papers and 1 was accepted as reflection paper. Authors of the best

published papers in the CELDA 2019 proceedings will be invited to publish extended versions of their papers in a book from Springer.

In addition to the presentation of full, short and reflection papers, the conference also includes one keynote presentation from an internationally distinguished researcher. We would therefore like to express our gratitude to this year keynote speaker: Dr. Baltasar Fernández Manjón, Director of the e-Learning Research Group e-UCM, Complutense University of Madrid (UCM), Spain.

A successful conference requires the effort of many individuals. We would like to thank the members of the Program Committee for their hard work in reviewing and selecting the papers that appear in this book. We are especially grateful to the authors who submitted their papers to this conference and to the presenters who provided the substance of this meeting. We wish to thank all members of our organizing committee.

Last but not least, we hope that participants enjoy Cagliari and their time with colleagues from all over the world.

Pedro Isaías, The University of New South Wales (UNSW Sydney), Australia
Maria Lidia Mascia, University Degli Studi di Cagliari, Italy
Conference Co-Chairs

Demetrios G. Sampson, University of Piraeus, Greece & Curtin University, Australia
Dirk Ifenthaler, University of Mannheim, Germany & Curtin University, Australia
Program Co-Chairs

Cagliari, Italy
November 2019

PROGRAM COMMITTEE

CONFERENCE CO-CHAIRS

Pedro Isaías, The University of New South Wales (UNSW Sydney), Australia
Maria Lidia Mascia, University Degli Studi di Cagliari, Italy

PROGRAM CO-CHAIRS

Demetrios G Sampson, University of Piraeus, Greece & Curtin University, Australia
Dirk Ifenthaler, University of Mannheim, Germany & Curtin University, Australia

COMMITTEE MEMBERS

Ah-Choo Koo, Multimedia Univerisity, Malaysia
Alke Martens, University of Rostock, Germany
Anthony Y. H. Liao, Asia University, Taiwan
Aparna Lalingkar, International Institute of Information Technology, India
Arif Altun, Hacettepe University, Turkey
Baltasar Fernandez, Universidad Complutense de Madrid, Spain
Carol H. C Chu, Soochow University, Taiwan
ChanMin Kim, Penn State University, USA
Charalampos Karagiannidis, University of Thessaly, Greece
Chien Sing Lee, Sunway University, Malaysia
Chih-Hung Lai, National Dong Hwa University, Taiwan
Chun-Wang Wei, Kaohsiung Medical University, Taiwan
Davinia Hernandez-Leo, Universitat Pompeu Fabra, Spain
Farshad Badie, Aalborg University, Denmark
Flavio Manganello, National Research Council, Italy
Giuliana Dettori, National Research Council, Italy
Giuliana Guazzaroni, University Politecnica Delle Marche, Italy
I-Fang Liu, National Central University, Taiwan
Imran Zualkernan, American University of Sharjah, United Arab Emirates
Jirarat Sitthiworachart, King Mongkut Institute of Technology Ladkrabang, Thailand
Juan Felipe Calderon, Universidad Andres Bello, Chile
Katherine Sinitsa, Int. Res. Training Center for Info. Technologies and Systems, Ukraine
Kuo-Liang Ou, National Hsin-chu University of Education, Taiwan
Kyparisia Papanikolaou, School of Pedagogical and Technological Education, Greece
Lence Miloseva, Goce Delcev University, Macedonia
Luis Anido, University of Vigo, Spain
Maiga Chang, Athabasca University, Canada
Michael Verhaart, TANZ eCampus, EIT (Hawkes Bay), Open Polytechinc, New Zealand
Ming-Chi Liu, Feng Chia University, Taiwan
Ming-Puu Chen, National Taiwan Normal University, Taiwan
Minjeong Kim, Dankook University, Republic of Korea
Monica Landoni, University of Lugano, Switzerland
Ni Chang, Indiana University South Bend, USA

Norlaila Hussainn, Dhofar University, Oman
Patrick Blumschein, University of Education Freiburg, Germany
Radu Vasiu, Politehnica University of Timisoara, Romania
Richard Huntrods, Athabasca University, Canada
Sanghoon Park, University of South Florida, USA
Veronica Rossano, University of Bari, Italy
Vincent Barre, Le Mans University, France
Vivekanandan Kumar, Athabasca University, Canada
Yen-Ting Lin, National Pingtung University, Taiwan

7 - 9 November

Cagliari, Italy

16TH INTERNATIONAL CONFERENCE
COGNITION AND EXPLORATORY
LEARNING IN DIGITAL AGE

CELDA 2019

PROCEEDINGS

Edited by
Demetrios G. Sampson
Dirk Ifenthaler
Pedro Isaias
Maria Lidia Mascia

iadis
international association for development of the information society

16th INTERNATIONAL CONFERENCE
on

COGNITION AND EXPLORATORY LEARNING IN THE DIGITAL AGE (CELDA 2019)

PROCEEDINGS OF THE 16th INTERNATIONAL CONFERENCE on COGNITION AND EXPLORATORY LEARNING IN THE DIGITAL AGE (CELDA 2019)

CAGLIARI, ITALY

NOVEMBER 7-9, 2019

Organised by

iadis
international association for development of the information society

Co-Organised by

As a member of Crossref (a non-profit membership organization for scholarly publishing working with the purpose to make content easy to find, link, cite and assess) each published paper in this book of proceedings will be allocated a DOI (Digital Object Identifier) number for its fast and easy citation and indexation.

Edited by Demetrios G. Sampson, Dirk Ifenthaler, Pedro Isaías and Maria Lidia Mascia

Associate Editor: Luís Rodrigues

ISBN: 978-989-8533-93-7

TABLE OF CONTENTS

SHORT PAPERS

REFLECTION PAPER

FOREWORD

These proceedings contain the papers of the 16th International Conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2019), held during 7 to 9 November 2019, which has been organized by the International Association for Development of the Information Society (IADIS) and co-organised by University Degli Studi di Cagliari, Italy.

The CELDA conference aims to address the main issues concerned with evolving learning processes and supporting pedagogies and applications in the digital age. There have been advances in both cognitive psychology and computing that have affected the educational arena. The convergence of these two disciplines is increasing at a fast pace and affecting academia and professional practice in many ways.

Paradigms such as just-in-time learning, constructivism, student-centered learning and collaborative approaches have emerged and are being supported by technological advancements such as simulations, virtual reality and multi-agent systems. These developments have created both opportunities and areas of serious concerns. This conference aims to cover both technological as well as pedagogical issues related to these developments. Main tracks have been identified. However innovative contributions that do not easily fit into these areas will also be considered as long as they are directly related to the overall theme of the conference – cognition and exploratory learning in the digital age.

The following areas are represented in the submissions for CELDA 2019:

- Acquisition of Expertise
- Assessing Progress of Learning in Complex Domains
- Assessment of Exploratory Learning Approaches
- Assessment of Exploratory Technologies
- Cognition in Education
- Collaborative Learning
- Educational Psychology
- Exploratory Technologies (Simulations, VR, i-TV, etc.)
- Just-in-time and Learning-on-Demand
- Learner Communities and Peer-Support
- Learning Communities & Web Service Technologies Pedagogical issues related with Learning Objects
- Learning Paradigms in Academia
- Learning Paradigms in the Corporate Sector
- Life-long Learning
- Student-centered Learning
- Technology and Mental Models
- Technology
- Learning and Expertise
- Virtual University

The CELDA 2019 Conference received 87 submissions from more than 25 countries. Each submission was reviewed in a double-blind review process by at least two independent reviewers to ensure quality and maintain high standards. Out of the papers submitted, 48 were accepted as full papers for an acceptance rate of 55%; 15 were accepted as short papers and 1 was accepted as reflection paper. Authors of the best

published papers in the CELDA 2019 proceedings will be invited to publish extended versions of their papers in a book from Springer.

In addition to the presentation of full, short and reflection papers, the conference also includes one keynote presentation from an internationally distinguished researcher. We would therefore like to express our gratitude to this year keynote speaker: Dr. Baltasar Fernández Manjón, Director of the e-Learning Research Group e-UCM, Complutense University of Madrid (UCM), Spain.

A successful conference requires the effort of many individuals. We would like to thank the members of the Program Committee for their hard work in reviewing and selecting the papers that appear in this book. We are especially grateful to the authors who submitted their papers to this conference and to the presenters who provided the substance of this meeting. We wish to thank all members of our organizing committee.

Last but not least, we hope that participants enjoy Cagliari and their time with colleagues from all over the world.

Pedro Isaías, The University of New South Wales (UNSW Sydney), Australia
Maria Lidia Mascia, University Degli Studi di Cagliari, Italy
Conference Co-Chairs

Demetrios G. Sampson, University of Piraeus, Greece & Curtin University, Australia
Dirk Ifenthaler, University of Mannheim, Germany & Curtin University, Australia
Program Co-Chairs

Cagliari, Italy
November 2019

PROGRAM COMMITTEE

CONFERENCE CO-CHAIRS

Pedro Isaías, The University of New South Wales (UNSW Sydney), Australia
Maria Lidia Mascia, University Degli Studi di Cagliari, Italy

PROGRAM CO-CHAIRS

Demetrios G Sampson, University of Piraeus, Greece & Curtin University, Australia
Dirk Ifenthaler, University of Mannheim, Germany & Curtin University, Australia

COMMITTEE MEMBERS

Ah-Choo Koo, Multimedia Univerisity, Malaysia
Alke Martens, University of Rostock, Germany
Anthony Y. H. Liao, Asia University, Taiwan
Aparna Lalingkar, International Institute of Information Technology, India
Arif Altun, Hacettepe University, Turkey
Baltasar Fernandez, Universidad Complutense de Madrid, Spain
Carol H. C Chu, Soochow University, Taiwan
ChanMin Kim, Penn State University, USA
Charalampos Karagiannidis, University of Thessaly, Greece
Chien Sing Lee, Sunway University, Malaysia
Chih-Hung Lai, National Dong Hwa University, Taiwan
Chun-Wang Wei, Kaohsiung Medical University, Taiwan
Davinia Hernandez-Leo, Universitat Pompeu Fabra, Spain
Farshad Badie, Aalborg University, Denmark
Flavio Manganello, National Research Council, Italy
Giuliana Dettori, National Research Council, Italy
Giuliana Guazzaroni, University Politecnica Delle Marche, Italy
I-Fang Liu, National Central University, Taiwan
Imran Zualkernan, American University of Sharjah, United Arab Emirates
Jirarat Sitthiworachart, King Mongkut Institute of Technology Ladkrabang, Thailand
Juan Felipe Calderon, Universidad Andres Bello, Chile
Katherine Sinitsa, Int. Res. Training Center for Info. Technologies and Systems, Ukraine
Kuo-Liang Ou, National Hsin-chu University of Education, Taiwan
Kyparisia Papanikolaou, School of Pedagogical and Technological Education, Greece
Lence Miloseva, Goce Delcev University, Macedonia
Luis Anido, University of Vigo, Spain
Maiga Chang, Athabasca University, Canada
Michael Verhaart, TANZ eCampus, EIT (Hawkes Bay), Open Polytechinc, New Zealand
Ming-Chi Liu, Feng Chia University, Taiwan
Ming-Puu Chen, National Taiwan Normal University, Taiwan
Minjeong Kim, Dankook University, Republic of Korea
Monica Landoni, University of Lugano, Switzerland
Ni Chang, Indiana University South Bend, USA

Norlaila Hussainn, Dhofar University, Oman
Patrick Blumschein, University of Education Freiburg, Germany
Radu Vasiu, Politehnica University of Timisoara, Romania
Richard Huntrods, Athabasca University, Canada
Sanghoon Park, University of South Florida, USA
Veronica Rossano, University of Bari, Italy
Vincent Barre, Le Mans University, France
Vivekanandan Kumar, Athabasca University, Canada
Yen-Ting Lin, National Pingtung University, Taiwan

UNIVERSITY TUTORING ACTIONS USING AN INTEGRATED ONLINE PLATFORM

Cecilia Fissore, Francesco Floris, Marina Marchisio and Sergio Rabellino
University of Turin, Italy

ABSTRACT

University tutoring consists of a set of heterogeneous actions aimed to support students, upon entering the University and throughout their academic life. The tutoring implements the resources needed to cope with possible difficulties in each phase of the training process. It also provides information and advice to better address the study course, prepares paths for the recovery of learning gaps, and provides assistance for the preparation of the thesis. Its main purpose is to remove any possible obstacles to a profitable attendance at courses, also through initiatives related to the attitudes and needs of individuals. The research group of University of Turin has designed and developed a model of online tutoring, carried out via an online Moodle platform integrated with a web conference service for the Disciplinary Tutoring of the University of Turin. The main aim of the project, called TutoratoOnline, is to reduce the number of students starting the second academic year with a low number of passed exams, by helping students with the lessons they find more difficult. Through the platform, various and many synchronous and asynchronous tutoring activities were offered to students. The aim of this paper is to discuss and analyze the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety is associated with a greater students engagement.

KEYWORDS

E-learning, Integrated Online Platform, Online Tutoring, University Tutoring, Virtual Learning Environment

1. INTRODUCTION

University tutoring involves a heterogeneous set of actions aimed to support students throughout their academic life, implementing the resources to face possible difficulties in each phase of the training process. The university tutoring must also give information and advice to better address the study course, prepare paths for the recovery of learning gaps, and provide assistance for the preparation of the thesis. Its main purpose is to remove any obstacles to a profitable attendance at courses, also through initiatives related to the attitudes and needs of individuals (Giuliani et al., 2015). Each University organizes their own tutoring model according to their needs and possibilities. New trends and challenges in the world of education invite to experiment with new learning paradigms based on blended and collaborative models, which involve active learning (Felder and Brent, 2009) and which stimulate the development of higher cognitive abilities indicated by the Bloom taxonomy (Krathwohl, 2002). These teaching approaches, such as Problem-Based Learning, Task-Based Learning, Project-Based Learning and Cooperative Learning, are the result of the characteristics and developments of the Information and Communication Age (Bozzo, 2012). At the same time, the use of ICT and computer networks to support training processes is constantly growing and a variety of educational approaches have emerged that uses the online tools as a virtual space capable of hosting a collaborative learning community. In particular, the evolution of online tutoring shows that success does not only depend on the tool selected to create the virtual learning environment, but also on the acquisition of a new culture that considers these practices as a further possibility and not in antagonism or as an alternative to face-to-face training (Trentin, 2003; Turrentine and Macdonald, 2006). In the academic year 2016/2017 the University of Turin enhanced the existing tutoring activities (disciplinary tutoring in attendance, reception activities for first year students, study assistance for enrolled students, advice on the training offer and study plans, support in finding information on international mobility) by offering students an online tutoring service. The main objective of this project, called "TutoratoOnline", is to reduce the number of students starting the second academic year with a low number of exams passed, helping students in the lessons which they may find more

difficult. The online tutoring model that the research group of University of Turin has designed and developed is based on a student-centered didactic and blended approach, which combines traditional face-to-face classroom tutoring with online platform activities. The tool we chose to offer all the tutoring activities is the Moodle Virtual Learning Environment. The University of Turin carried out multiple experiences in the field of tutoring and adaptive teaching (Barana et al., 2017b; Barana et al., in press 2019; Barana et al., 2019a; Barana et al., 2019b), e-learning (Brancaccio et al., 2016; Brancaccio et al., 2019; Marchisio et al., 2019a) and in the development of Virtual Learning Environments (Barana et al., 2017a; Bruschi et al., 2018; Marchisio et al., 2019b). The research group also designed and developed the online Moodle platform of the project (available at the link: https://tutoratoonline.orientamente.unito.it/) integrated with a web conference service for the Disciplinary Tutoring of the University of Turin. On the platform students are offered synchronous and asynchronous support for 55 courses of 25 different bachelor's degree courses, adopting a blended learning approach that combines traditional face-to-face classroom tutoring with online platform activities. The aim of this paper is to discuss an analyse the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety produces a greater engagement of students.

2. THEORETICAL FRAMEWORK

Student-centered learning is an educational approach focused on each student's interests, abilities and learning styles. According to this theory, learning is not so much the transmission of knowledge from the teacher to the student, as an active process of acquiring the most suitable principles and strategies to achieve one's goals. This knowledge process, in which the teacher acts as a facilitator of learning, can be carried out through a wide range of activities, including dialogue and experience (Bozzo, 2012). The characteristics of a constructivist learning environment are: the centrality of the student's role, the functionality of the teacher as a facilitator rather than a source of knowledge and the stimulation of motivation and autonomous investigation. Student-centered learning requires students to be active and responsible participants in their own learning. A pedagogical approach close to constructionism is an experiential learning. This approach is able to integrate the theoretical and practical elements of learning into a vision that emphasizes the importance of the student's active and responsible contribution and the value of direct experience. Constructivism, student-centered learning and experiential learning provide interesting guidelines for the creation of personalized and strongly located learning paths. Johnson et al. (2012) present the adaptation of pedagogical models to new forms of communication and research, as well as the production and publication of information, and the massive introduction of new media technologies in all disciplinary and professional fields as significant challenges for education. The analysis by Johnson et al. on third-level education perspectives identifies as key trends the growing expectation of a collaborative and delocalized use of information technologies, the proliferation of electronic resources, the increase in the establishment of contacts and mediated relations from computer, and consequently the revision of the roles of teacher and student. In the last years, the use of e-learning technologies has increased considerably, making possible new learning methodologies based mainly on Virtual Learning Environments, which are increasingly customizable (Impedovo et al., 2011). Virtual Learning Environments, such as the Moodle Learning Management System, allow to have a learning environment that fulfills the constructivist and experiential ideal: it allows students to create and publish their own works, immediately usable and shared within the community, to compare the work and to actively collaborate with the teacher or other students.

Historically, online tutoring began with emailing, but this model of tutoring, as well as the face-to-face lesson, suggested to the student that each question had to be answered with a direct answer. According to a constructivist perspective, the purpose of training should not be a mere communication of knowledge, but it should include a set of educational actions which ensure that each student can identify the knowledge they need. The same can be done for tutoring actions: we could include a review of theoretical contents but also reflection activities, group discussions, development of students' learning with the use of concept maps, correction of exercises, test simulations in preparation for the exam and discussions on concepts, principles and critical skills (Ferreira M., 2013). When students evaluate their own learning, learning becomes an incentive and they become active agents of their own learning. With the availability of new tools, new tutoring models can be used, in both asynchronous and synchronous formats, in which the student does not

only passively receive explanations but tests himself to evaluate its knowledge and skills. With online tutoring models, space and time problems can be solved (Turrentine and Macdonald, 2006). For example, we consider those cases where the space-time unity becomes a big obstacle to participating in a training event, or when e-learning methods prove to be more effective because they allow dismounting and separately playing the two components -"space" (I do as much as possible on my own, perhaps assisted remotely or involved in a learning group) and "time" (when the conditions on their border allow it). The online tutoring also allows to engage students who cannot take part to the face-to-face activities, as well as working students, thus involving a higher number of students and offering all students the same possibilities.

3. TUTORING THROUGH THE ONLINE PLATFORM

Basing on this theoretical framework, the research group of University of Turin has designed and implemented a model of tutoring for the Disciplinary Tutoring of the University of Turin, in the “Tutorato Online” project. The first experimental edition of the project (2017-2018) involved a small number of courses and included exclusively online tutoring activities (Barana et al., 2018). The activities were in synchronous form – upon agreeing the day and time with the tutor, students had the possibility to fix an online appointment to have explanations on a specific topic and they could also connect to online tutorials requested by other students to listen to explanations; moreover, in asynchronous form, students had the possibility to ask questions and doubts in a forum and to submit writing, exercises or problems and have them corrected. In the second edition of the project (2018-2019), tutoring activities were activated for 55 courses of 25 different disciplines, for a total of 81 collaborations carried out by 77 tutors. The tutors were mainly graduates, and in some cases undergraduates, of the Master Degree. The small gap between the age of tutors and students helps in the action of tutoring and in achieving these objectives, since students are much closer in age to the tutors than to the teachers (Giraudo et al., 2014). The tutors followed a 3 hours course on the use of the Moodle Learning Virtual Environment and on the use of the Adobe Connect web conferencing service, so that they were able to work independently with the students creating their virtual learning communities. The tutors also received a 2 hours pedagogical training on the role of the tutor. In this second edition, we chose to use a blended learning approach also including face-to-face tutoring, in order to develop a model that could adapt to the different types of teaching involved (in which students are not used to using technologies during their studies) and in order to support and encourage students to use the platform. All the tutoring activities (face-to-face or online) were carried out using the platform, so as to take advantage of all its potential and have a complete tracking of the participation of the students. All the students of the University of Torino can access the platform with their UniTo credentials, then check if the course they are interested in is on the platform and, if so, register for the tutoring. A special dashboard was designed and developed by the research group in order to facilitate the search for the course (Barana et al., 2018). When students enrol in a course, they are asked to fill in a short questionnaire. The questions in the initial questionnaire are: Name and surname, Degree courses, Which year are you registered? (first/second/third/supplementary years), Have you already tried to take this exam? (Yes No), If yes, how many times? (One, Two, Three, More than three times).

Since all the courses on the platform belong to the first year of the three-year degree courses, but are in fact accessible to all students independently of the year, the initial questionnaire allows an overview of the students enrolled in the various tutoring courses. The format of tutoring courses is composed of an introduction to the course, where information is given about the teaching, the initial questionnaire, a forum for tutor communications and a forum for student requests. Each course has four sections, one for each type of activity: face-to-face tutoring, online tutoring, task delivery, teaching material.

Synchronous activities:

- **Face-to-face tutoring**: the tutor gives a lesson to a group of students according to a shared calendar, or offers a private consultation upon request. The platform is used to publish the tutoring calendar and to remind students of the appointment, to alert them of program changes or to request an appointment from the tutor through the forums. In addition, students are required to book their face-to-face tutoring, through the Moodle "Reservation" activity. In this way the tutor can know how many students will there be in the classroom, thus planning the teaching activity accordingly, and use the list of students to prepare the signature sheet.

- **Online tutoring**: similar to the face-to-face tutoring, but it takes place entirely online via the Adobe Connect web conference tool, through which the tutor has the possibility to share the screen of his PC and the audio with the participants during the online meetings.

Asynchronous activities:

- **Online tutoring through forums**: the tutor answers the questions asked by the students, requests for further information or assistance with the use of the platform.
- **Task submission**: in this section there is an assignment activity, always open, which enables a teacher to communicate tasks, collect work and provide grades and feedback. The tutor can decide to set up tutoring activities through exercises to perform and submit and therefore use more delivery tools with specific availability. Students can submit exercises or papers and have them corrected by the tutor.
- **Test/Teaching material**: in this section the tutor makes available to the students tests for the consolidation of knowledge in preparation for the exam, as well as teaching material of his own creation, validated by the teaching professor before publication.

Each tutor, together with the teaching professor, was able to choose which tutoring activity to carry out (choosing only one, more than one or all of them) based on the characteristics of the teaching, the needs of the students and the type of final exam. They could also choose to carry out tutoring activities in parallel with the lessons, at the end of the lessons, before the exams or after the exams, to help the students who did not pass the exam. At the beginning of the project they had to present the program of tutoring actions but, in case of need, they could modify it during the project. The platform also hosts a community of tutors who, within the training course, can talk to each other about the activities carried out and refer to the managers of the platform for any doubts on the use of the Moodle platform. This course is also used for monthly reporting of tutors and monitoring of student attendance at tutoring activities. To access the platform, any mobile devices (tablet, smartphone) or a PC can be used. Lastly, the platform has an integrated HelpDesk service managed and monitored by the research group, to offer support to all its users (for example access problems, questions on how to use the platform, etc.). The helpdesk service is always active.

4. METHODOLOGIES

The platform currently counts 4899 registered users. In this paper we have considered only the second edition of the project, in which 3329 students enrolled in a tutoring course. Several data were used to study the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety is linked to greater student engagement: subdivision of the number of students enrolled in the 55 tutoring courses on the platform, answers to the initial questionnaire in each course completed by the students, activities carried out by students at the courses registered through the Moodle logging system and tutoring activities carried out in the various courses. To classify the activities carried out by tutors in the various tutoring courses, the Excel summary file of all the activities reported by the 77 tutors in the 81 collaborations was analysed. The reported activities were compared with the activities present in the course. The classification of the courses was made after the project ended. To derive the number of students enrolled in each course and the number of each student's logs the block "Configurable Reports" was used, a Moodle custom reports builder suitable for admins or teachers. This block allows the creation of custom reports, such as courses reports - with information regarding courses - users reports - with information regarding users and their activity in a course - and custom SQL Reports to create your own type of reports. The R software was used to analyze the 3329 students responses to the initial questionnaire and to perform statistical tests.

5. RESULTS

Each Study Course of the University of Turin has identified the courses in which the students had the most difficulty in taking the final exam. 55 courses of 25 different Study Courses were identified, belonging to 5 different Departments. There were 55 tutoring courses, one for each teaching. The types of teaching involved (Figure 1) can be divided into 3 macro-categories: linguistic (7), scientific (21) and humanistic (27).

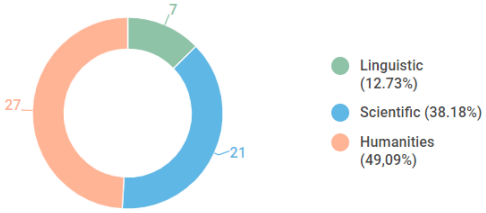

Figure 1. Types of courses involved for tutoring

To get an overview of which tutoring activities were used, we classified each course according to the four types of tutoring activities: face-to-face tutoring, online tutoring, task submission, test/teaching material. In the overview shown in table 1, there is an "X" when an activity has been carried out and for each case the number of tutoring courses is reported. This first classification shows that in most courses more than one tutoring activity was used. Most courses have chosen to have face-to-face tutoring but in blended mode, alternating it with online activities. A good number of courses also carried out online tutoring. Ten courses held exclusively face-to-face tutoring and three courses held exclusively online tutoring.

Table 1. Overview of the type of tutoring activity proposed in the tutoring courses

Type of tutoring activity				Number of tutoring courses
Presence tutoring	Online tutoring	Task submission	Test/Teaching material	
X			X	15
X		X	X	10
X				11
X	X	X	X	5
X		X		6
X	X	X		2
X	X		X	2
	X	X	X	2
X	X			1
	X		X	1

The analysis of the data of the initial questionnaire compiled by the 3329 students enrolled in a platform course (Figure 2) shows that, as expected, most of the students are enrolled in the first year, but there are also, students of the following years and students of supplementary years. All students completed the questionnaire only once, so no student enrolled in more than one tutoring course. Out of 3329 students, 796 students have already tried to take the exam of the chosen tutoring course: 447 once, 194 twice, 67 three times and 88 more than three times.

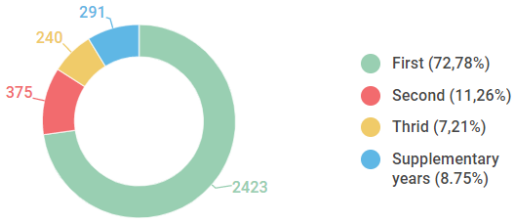

Figure 2. Students' answer to the question "Which year are you registered in?" of the initial questionnaire

Table 2 shows the connection between the two questions "Which year are you registered in?" and "Have you already tried to take this exam?", in each cell the absolute frequency, percentage, row percentage and column percentage are addressed. It emerges that a good number of first-year students enrolled in the tutoring course after failing the exam. Second and third year students are equitably split between those who had already taken the exam and those who had not yet taken the exam. It is interesting to note that there is a good percentage of supplementary years students who have never taken the exam.

Table 2. Connection between the questions "Which year are you registered?" and "Have you already tried to take this exam?"

	Already taken the exam		
Year of course enrollment	No	Yes	Total
Fist year	2130	293	2423
	87,9	12,1	
	84,1	36,8	
Second year	194	181	375
	51,7	48,3	
	7,7	22,7	
Third year	101	139	240
	42,1	57,9	
	4,0	17,5	
Supplementary years	108	183	291
	37,1	62,9	
	4,3	23,0	
Total	2533	796	3329

To analyze the engagement of students in the tutoring activities and the use of the platform, for each student registered on the platform we extracted the activities logs within the tutoring course. The tutors had a total of 40 hours (in the case of graduates) and 100 hours (in the case of students of the master's degree). They could use these hours for the whole duration of the one-year project. In some cases, the activities were concentrated only in some months of the academic year (close to the exams or in parallel with the lessons of the first or second semester) in other cases, tutors carried out activities for the entire duration of the project. The duration of the activities varies considerably, on average the tutoring face-to-face lessons lasted 2 hours but for the online activities the duration of the activities depended on the participation and the request of the students. As shown in Table 3, the range of Logs of 3329 students is very wide: there are students who have logged in very few times and have therefore hardly used the platform and students who have logged in many times and thus really took advantage of the platform. On average, a student logged in 95 times and the interquartile range - that is the width of the range of values containing the "central" half of the observed values - is 76. The first aspect we have studied is whether there is a correlation between the number of logs and the year of enrolment of the students previously analyzed. Since the Log distributions for the four groups "first year", "second year", "third year", "supplementary years" are not normal, we performed the non-parametric Kruskal-Wallis test to verify the equality of the medians. The value of the p-value is 0.005 and therefore there is sufficient statistical evidence to reject the hypothesis that the medians are equal for each group. Then we considered only two groups dividing students between "first year" and "subsequent years" and we studied if there is a correlation between the group and the number of Logs. With the Wilcox test we got a p-value of 0.6433. The test therefore leads us to state that the median of the first year student logs is not statistically different from the median of the student log of the other years. This result confirms that, even if the courses were exclusively designed for the first year students, the students of the first year and subsequent years equally benefited of the tutoring service.

Table 3. Summary of Logs of course activity of all students

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
7	31	55,5	94,79	107	1975

A second aspect that we have studied is whether the number of student Logs depends on the type of activities carried out during the tutoring course. We started from the subdivision of the courses into the four

categories, shown in Table 1, grouping the last two cases into a single "online activity" case and creating the following new subdivision with the respective course numbers: "Only face-to-face and online without activity" (1), "face-to-face and online activities" (9), "only online with activities" (3), "face-to-face only with activities" (31) and "face-to-face only" (11). For each category we then divided the number of Logs of students enrolled in a course in that category into two classes "a few logs" and "many logs" depending on whether the value is less or more than the median of the Logs of that category (Table 4).

Table 4. Log classification in the various sub-categories of types of activities performed

	Presence and online no activity	Presence and online with activity	Online with activity	Presence with activity	Only presence
Few Logs	1	1	1	15	9
Many Log	0	8	2	16	1

To see if there is a correlation between the student logs and the use of online activities we have grouped these five categories into the two macro categories "online" (44) and "face-to-face" (11), where in the "face-to-face" category courses were included that only provided face-to-face tutoring. For the "online" category there are 26 courses in "many logs" and 18 courses in "a few logs", for the "face-to-face" category there are 10 courses in "a few logs" and a course in "many logs". The value of the p-value of the Fischer Test equal to 0.005 leads us to reject the independence between the type of course and the number of activities logs. This result confirms that in the courses in which we have a posteriori observed that only face-to-face tutoring was performed - without the use of online tutoring or platform activities -, the use of the platform was limited to make appointment with tutors and students were thus not encouraged to use the platform to ask questions in the forum or ask for corrections, meaning they did not take full advantage of its potential.

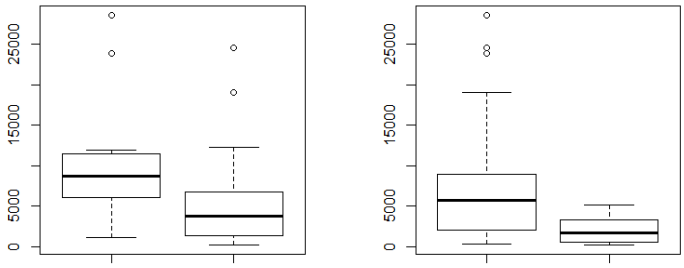

Figure 3. Boxplots of student Logs divided into the two categories: the 1st (left) and the 2nd (right)

We performed a new analysis with the two new macro categories "online2" (13) and "face-to-face2" (41), entering in the "online2" category all the courses that used the online tutoring (synchronous and asynchronous) and in the other all the courses that have not used it. We ran the Fisher test again to check the independence between the new course category and the number of activities logs. With this subdivision the value of the p-value greater than 0.05 indicates that the test does not provide any evidence against the assumption of independence. Comparison tests were then performed for the mean of the logs (Figure 3) between the two macro categories of courses for both classifications previously mentioned. In both cases there is statistical evidence that the average of the logs in courses classified as "online" is greater than the one of “face-to-face”. This result shows, in the first case, that the use of online activities tailored to and at the request of the student stimulates the active engagement of the students. In the second case, since there is online activity in both categories, synchronous online tutoring seems to take on greater weight in the engagement of students.

6. CONCLUSION

The disciplinary tutoring carried out using the online platform made possible a blended tutoring, which alternated tutors, face-to-face or online, (synchronous and asynchronous) to asynchronous platform activities. The platform is used for all tutoring activities: synchronous activities (face-to-face tutoring and online tutoring) and asynchronous activities (online tutoring through forums, task submission, test/teaching material). In this way, a learning based on the needs and engagement of the student is promoted. The platform also made it possible to monitor the attendance of students in tutoring activities and that of the

activities carried out by the tutors. 3329 students enrolled in a tutoring course. The analysis shows that all students, both in the first year and in the following years, actively participated in the tutoring activities and used the platform. It also emerged that student participation may depend on the type of activity performed, differentiating between online and non-online activities. At the end of the academic year an evaluation of the tutoring activities will also be conducted in relation to passing the final exams, using also psychological variables to explore the differences between users and non-users of the platform. The analysis of this paper shows the potential of tutoring activity through an online platform integrated with a web conference service.

REFERENCES

Barana, A., Bogino, A., Fioravera, M., Marchisio, M., Rabellino, S., 2017a. 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* 13, pp. 109–119.

Barana, A., Boffo, S., Gagliardi, F., Garuti, R., Marchisio, M., Empowering Engagement in a Technology Enhanced Learning Environment, in press 2019.

Barana, A., Fioravera, M., Marchisio, M., Rabellino, S., 2017b. Adaptive Teaching Supported by ICTs to Reduce the School Failure in the Project "Scuola Dei Compiti". *Proceedings of 2017 IEEE 41st Annual Computer Software and Applications Conference (COMPSAC)*. IEEE, pp. 432–437.

Barana, A., Fissore, C., Marchisio, M., Rabellino, S., 2018. Online Tutoring to Enhance University Success. *Exploring the Micro, the Meso and the Macro. Proceedings of the European Distanceand E-Learning Network 2018 Annual Conference*. Genova, Italia, pp. 755–763.

Barana, A., Marchisio, M., Rabellino, S., 2019a. Empowering Engagement through automatic formative assessment. *Proceedings of 2019 IEEE 43st Annual Computer Software and Applications Conference (COMPSAC)*, pp. 216-225

Barana A., Marchisio M., Sacchet M., 2019b. Advantages of Using Automatic Formative Assessment for Learning Mathematics. *Draaijer S., Joosten-ten Brinke D., Ras E. (eds) Technology Enhanced Assessment. TEA 2018. Communications in Computer and Information Science*, 1014. Springer, Cham, pp. 180-198.

Bozzo, L., 2012. Il blended learning all'Università: sperimentazione di un paradigma di apprendimento esperienziale costruttivista. *Atti di Didamatica 2012*.

Brancaccio, A., Esposito, M., Marchisio, M., Pardini, C., 2016. L'efficacia dell'apprendimento in rete degli immigrati digitali. L'esperienza SMART per le discipline scientifiche. *MONDO DIGITALE* 15, 10.

Brancaccio, A., Esposito, M., Marchisio, M., Sacchet, M., Pardini, C., 2019. Open professional development of math teachers through an online course. *Proceedings of 13th International Conference on e-Learning.* Porto, Portugal, pp. 131-138.

Bruschi, B., Cantino, V., Cavallo Perin, R., Culasso, F., Giors, B., Marchisio, M., Marello, C., Milani, M., Operti, L., Parola, A., Rabellino, S., Sacchet, M., Scomparin, L., 2018. Start@unito: a Supporting Model for High School Students Enrolling to University. *Presented at the IADIS International Conference Cognition and Exploratory Learning in Digital Age 2018*, pp. 307–312.

Felder, R.M., Brent, R., 2009. Active Learning: An Introduction. *ASQ Higher Education Brief*. Vol. 2, No. 4, pp. 1-5.

Giraudo, M.T., Marchisio, M., Pardini, C., 2014. Tutoring con le nuove tecnologie per ridurre l'insuccesso scolastico e favorire l'apprendimento della matematica nella scuola secondaria. *Mondo Digitale* 13, pp. 834–843.

Giuliani, A., Moretti, G., Morini, A., 2015. Servizi di tutorato didattico e Obblighi Formativi Aggiuntivi, un'indagine empirica esplorativa: il caso del Dipartimento di Scienze della Formazione dell'Università Roma Tre.

Impedovo, S., Campanella, P., Facchini, G., Pirlo, G., Modugno, R., Sarcinella, L., 2011. Learning Management Systems: un'analisi comparativa delle piattaforme open-source e proprietarie. *Atti di Didamatica 2011.*

Johnson, L., Adams, S., Cummins, M., 2012. *The NMC Horizon Report: 2012 Higher Education Edition*. The New Media Consortium, Austin, Texas.

Krathwohl, D.R., 2002. A Revision of Bloom's Taxonomy: An Overview. *Theory Into Practice*. Vol. 41, No. 4, 212–218.

Marchisio, M., Operti, L., Rabellino, S., Sacchet, M., 2019a. Start@unito: Open Online Courses for Improving Access and for Enhancing Success in Higher Education. *Proceedings of the 11th International Conference on Computer Supported Education (CSEDU 2019),* pp. 639–646.

Marchisio, M., Sacchet, M., Salusso, D., 2019b. Instructional design to "train the trainers": the Start@unito project at the university of turin. *Proceedings of 13th International Conference on e-Learning.* Porto, Portugal, pp. 195-202.

Trentin, G., 2003. Gestire la complessità dei sistemi di e-learning. *Atti del Convegno Didamatica 2003*. Genova, pp. 1–8.

Turrentine, P., Macdonald, L., 2006. Tutoring Online: Increasing Effectiveness with Best Practices. *NADE Digest* Vol. 2, No. 2, pp. 9–18.

UNIVERSITY TUTORING ACTIONS USING AN INTEGRATED ONLINE PLATFORM

Cecilia Fissore, Francesco Floris, Marina Marchisio and Sergio Rabellino
University of Turin, Italy

ABSTRACT

University tutoring consists of a set of heterogeneous actions aimed to support students, upon entering the University and throughout their academic life. The tutoring implements the resources needed to cope with possible difficulties in each phase of the training process. It also provides information and advice to better address the study course, prepares paths for the recovery of learning gaps, and provides assistance for the preparation of the thesis. Its main purpose is to remove any possible obstacles to a profitable attendance at courses, also through initiatives related to the attitudes and needs of individuals. The research group of University of Turin has designed and developed a model of online tutoring, carried out via an online Moodle platform integrated with a web conference service for the Disciplinary Tutoring of the University of Turin. The main aim of the project, called TutoratoOnline, is to reduce the number of students starting the second academic year with a low number of passed exams, by helping students with the lessons they find more difficult. Through the platform, various and many synchronous and asynchronous tutoring activities were offered to students. The aim of this paper is to discuss and analyze the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety is associated with a greater students engagement.

KEYWORDS

E-learning, Integrated Online Platform, Online Tutoring, University Tutoring, Virtual Learning Environment

1. INTRODUCTION

University tutoring involves a heterogeneous set of actions aimed to support students throughout their academic life, implementing the resources to face possible difficulties in each phase of the training process. The university tutoring must also give information and advice to better address the study course, prepare paths for the recovery of learning gaps, and provide assistance for the preparation of the thesis. Its main purpose is to remove any obstacles to a profitable attendance at courses, also through initiatives related to the attitudes and needs of individuals (Giuliani et al., 2015). Each University organizes their own tutoring model according to their needs and possibilities. New trends and challenges in the world of education invite to experiment with new learning paradigms based on blended and collaborative models, which involve active learning (Felder and Brent, 2009) and which stimulate the development of higher cognitive abilities indicated by the Bloom taxonomy (Krathwohl, 2002). These teaching approaches, such as Problem-Based Learning, Task-Based Learning, Project-Based Learning and Cooperative Learning, are the result of the characteristics and developments of the Information and Communication Age (Bozzo, 2012). At the same time, the use of ICT and computer networks to support training processes is constantly growing and a variety of educational approaches have emerged that uses the online tools as a virtual space capable of hosting a collaborative learning community. In particular, the evolution of online tutoring shows that success does not only depend on the tool selected to create the virtual learning environment, but also on the acquisition of a new culture that considers these practices as a further possibility and not in antagonism or as an alternative to face-to-face training (Trentin, 2003; Turrentine and Macdonald, 2006). In the academic year 2016/2017 the University of Turin enhanced the existing tutoring activities (disciplinary tutoring in attendance, reception activities for first year students, study assistance for enrolled students, advice on the training offer and study plans, support in finding information on international mobility) by offering students an online tutoring service. The main objective of this project, called "TutoratoOnline", is to reduce the number of students starting the second academic year with a low number of exams passed, helping students in the lessons which they may find more

difficult. The online tutoring model that the research group of University of Turin has designed and developed is based on a student-centered didactic and blended approach, which combines traditional face-to-face classroom tutoring with online platform activities. The tool we chose to offer all the tutoring activities is the Moodle Virtual Learning Environment. The University of Turin carried out multiple experiences in the field of tutoring and adaptive teaching (Barana et al., 2017b; Barana et al., in press 2019; Barana et al., 2019a; Barana et al., 2019b), e-learning (Brancaccio et al., 2016; Brancaccio et al., 2019; Marchisio et al., 2019a) and in the development of Virtual Learning Environments (Barana et al., 2017a; Bruschi et al., 2018; Marchisio et al., 2019b). The research group also designed and developed the online Moodle platform of the project (available at the link: https://tutoratoonline.orientamente.unito.it/) integrated with a web conference service for the Disciplinary Tutoring of the University of Turin. On the platform students are offered synchronous and asynchronous support for 55 courses of 25 different bachelor's degree courses, adopting a blended learning approach that combines traditional face-to-face classroom tutoring with online platform activities. The aim of this paper is to discuss an analyse the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety produces a greater engagement of students.

2. THEORETICAL FRAMEWORK

Student-centered learning is an educational approach focused on each student's interests, abilities and learning styles. According to this theory, learning is not so much the transmission of knowledge from the teacher to the student, as an active process of acquiring the most suitable principles and strategies to achieve one's goals. This knowledge process, in which the teacher acts as a facilitator of learning, can be carried out through a wide range of activities, including dialogue and experience (Bozzo, 2012). The characteristics of a constructivist learning environment are: the centrality of the student's role, the functionality of the teacher as a facilitator rather than a source of knowledge and the stimulation of motivation and autonomous investigation. Student-centered learning requires students to be active and responsible participants in their own learning. A pedagogical approach close to constructionism is an experiential learning. This approach is able to integrate the theoretical and practical elements of learning into a vision that emphasizes the importance of the student's active and responsible contribution and the value of direct experience. Constructivism, student-centered learning and experiential learning provide interesting guidelines for the creation of personalized and strongly located learning paths. Johnson et al. (2012) present the adaptation of pedagogical models to new forms of communication and research, as well as the production and publication of information, and the massive introduction of new media technologies in all disciplinary and professional fields as significant challenges for education. The analysis by Johnson et al. on third-level education perspectives identifies as key trends the growing expectation of a collaborative and delocalized use of information technologies, the proliferation of electronic resources, the increase in the establishment of contacts and mediated relations from computer, and consequently the revision of the roles of teacher and student. In the last years, the use of e-learning technologies has increased considerably, making possible new learning methodologies based mainly on Virtual Learning Environments, which are increasingly customizable (Impedovo et al., 2011). Virtual Learning Environments, such as the Moodle Learning Management System, allow to have a learning environment that fulfills the constructivist and experiential ideal: it allows students to create and publish their own works, immediately usable and shared within the community, to compare the work and to actively collaborate with the teacher or other students.

Historically, online tutoring began with emailing, but this model of tutoring, as well as the face-to-face lesson, suggested to the student that each question had to be answered with a direct answer. According to a constructivist perspective, the purpose of training should not be a mere communication of knowledge, but it should include a set of educational actions which ensure that each student can identify the knowledge they need. The same can be done for tutoring actions: we could include a review of theoretical contents but also reflection activities, group discussions, development of students' learning with the use of concept maps, correction of exercises, test simulations in preparation for the exam and discussions on concepts, principles and critical skills (Ferreira M., 2013). When students evaluate their own learning, learning becomes an incentive and they become active agents of their own learning. With the availability of new tools, new tutoring models can be used, in both asynchronous and synchronous formats, in which the student does not

only passively receive explanations but tests himself to evaluate its knowledge and skills. With online tutoring models, space and time problems can be solved (Turrentine and Macdonald, 2006). For example, we consider those cases where the space-time unity becomes a big obstacle to participating in a training event, or when e-learning methods prove to be more effective because they allow dismounting and separately playing the two components -"space" (I do as much as possible on my own, perhaps assisted remotely or involved in a learning group) and "time" (when the conditions on their border allow it). The online tutoring also allows to engage students who cannot take part to the face-to-face activities, as well as working students, thus involving a higher number of students and offering all students the same possibilities.

3. TUTORING THROUGH THE ONLINE PLATFORM

Basing on this theoretical framework, the research group of University of Turin has designed and implemented a model of tutoring for the Disciplinary Tutoring of the University of Turin, in the “Tutorato Online” project. The first experimental edition of the project (2017-2018) involved a small number of courses and included exclusively online tutoring activities (Barana et al., 2018). The activities were in synchronous form – upon agreeing the day and time with the tutor, students had the possibility to fix an online appointment to have explanations on a specific topic and they could also connect to online tutorials requested by other students to listen to explanations; moreover, in asynchronous form, students had the possibility to ask questions and doubts in a forum and to submit writing, exercises or problems and have them corrected. In the second edition of the project (2018-2019), tutoring activities were activated for 55 courses of 25 different disciplines, for a total of 81 collaborations carried out by 77 tutors. The tutors were mainly graduates, and in some cases undergraduates, of the Master Degree. The small gap between the age of tutors and students helps in the action of tutoring and in achieving these objectives, since students are much closer in age to the tutors than to the teachers (Giraudo et al., 2014). The tutors followed a 3 hours course on the use of the Moodle Learning Virtual Environment and on the use of the Adobe Connect web conferencing service, so that they were able to work independently with the students creating their virtual learning communities. The tutors also received a 2 hours pedagogical training on the role of the tutor. In this second edition, we chose to use a blended learning approach also including face-to-face tutoring, in order to develop a model that could adapt to the different types of teaching involved (in which students are not used to using technologies during their studies) and in order to support and encourage students to use the platform. All the tutoring activities (face-to-face or online) were carried out using the platform, so as to take advantage of all its potential and have a complete tracking of the participation of the students. All the students of the University of Torino can access the platform with their UniTo credentials, then check if the course they are interested in is on the platform and, if so, register for the tutoring. A special dashboard was designed and developed by the research group in order to facilitate the search for the course (Barana et al., 2018). When students enrol in a course, they are asked to fill in a short questionnaire. The questions in the initial questionnaire are: Name and surname, Degree courses, Which year are you registered? (first/second/third/supplementary years), Have you already tried to take this exam? (Yes No), If yes, how many times? (One, Two, Three, More than three times).

Since all the courses on the platform belong to the first year of the three-year degree courses, but are in fact accessible to all students independently of the year, the initial questionnaire allows an overview of the students enrolled in the various tutoring courses. The format of tutoring courses is composed of an introduction to the course, where information is given about the teaching, the initial questionnaire, a forum for tutor communications and a forum for student requests. Each course has four sections, one for each type of activity: face-to-face tutoring, online tutoring, task delivery, teaching material.

Synchronous activities:

- **Face-to-face tutoring**: the tutor gives a lesson to a group of students according to a shared calendar, or offers a private consultation upon request. The platform is used to publish the tutoring calendar and to remind students of the appointment, to alert them of program changes or to request an appointment from the tutor through the forums. In addition, students are required to book their face-to-face tutoring, through the Moodle "Reservation" activity. In this way the tutor can know how many students will there be in the classroom, thus planning the teaching activity accordingly, and use the list of students to prepare the signature sheet.

- **Online tutoring**: similar to the face-to-face tutoring, but it takes place entirely online via the Adobe Connect web conference tool, through which the tutor has the possibility to share the screen of his PC and the audio with the participants during the online meetings.

Asynchronous activities:

- **Online tutoring through forums**: the tutor answers the questions asked by the students, requests for further information or assistance with the use of the platform.
- **Task submission**: in this section there is an assignment activity, always open, which enables a teacher to communicate tasks, collect work and provide grades and feedback. The tutor can decide to set up tutoring activities through exercises to perform and submit and therefore use more delivery tools with specific availability. Students can submit exercises or papers and have them corrected by the tutor.
- **Test/Teaching material**: in this section the tutor makes available to the students tests for the consolidation of knowledge in preparation for the exam, as well as teaching material of his own creation, validated by the teaching professor before publication.

Each tutor, together with the teaching professor, was able to choose which tutoring activity to carry out (choosing only one, more than one or all of them) based on the characteristics of the teaching, the needs of the students and the type of final exam. They could also choose to carry out tutoring activities in parallel with the lessons, at the end of the lessons, before the exams or after the exams, to help the students who did not pass the exam. At the beginning of the project they had to present the program of tutoring actions but, in case of need, they could modify it during the project. The platform also hosts a community of tutors who, within the training course, can talk to each other about the activities carried out and refer to the managers of the platform for any doubts on the use of the Moodle platform. This course is also used for monthly reporting of tutors and monitoring of student attendance at tutoring activities. To access the platform, any mobile devices (tablet, smartphone) or a PC can be used. Lastly, the platform has an integrated HelpDesk service managed and monitored by the research group, to offer support to all its users (for example access problems, questions on how to use the platform, etc.). The helpdesk service is always active.

4. METHODOLOGIES

The platform currently counts 4899 registered users. In this paper we have considered only the second edition of the project, in which 3329 students enrolled in a tutoring course. Several data were used to study the multiple tutoring activities carried out through the platform and the multiple teaching strategies used, and to discuss how their variety is linked to greater student engagement: subdivision of the number of students enrolled in the 55 tutoring courses on the platform, answers to the initial questionnaire in each course completed by the students, activities carried out by students at the courses registered through the Moodle logging system and tutoring activities carried out in the various courses. To classify the activities carried out by tutors in the various tutoring courses, the Excel summary file of all the activities reported by the 77 tutors in the 81 collaborations was analysed. The reported activities were compared with the activities present in the course. The classification of the courses was made after the project ended. To derive the number of students enrolled in each course and the number of each student's logs the block "Configurable Reports" was used, a Moodle custom reports builder suitable for admins or teachers. This block allows the creation of custom reports, such as courses reports - with information regarding courses - users reports - with information regarding users and their activity in a course - and custom SQL Reports to create your own type of reports. The R software was used to analyze the 3329 students responses to the initial questionnaire and to perform statistical tests.

5. RESULTS

Each Study Course of the University of Turin has identified the courses in which the students had the most difficulty in taking the final exam. 55 courses of 25 different Study Courses were identified, belonging to 5 different Departments. There were 55 tutoring courses, one for each teaching. The types of teaching involved (Figure 1) can be divided into 3 macro-categories: linguistic (7), scientific (21) and humanistic (27).

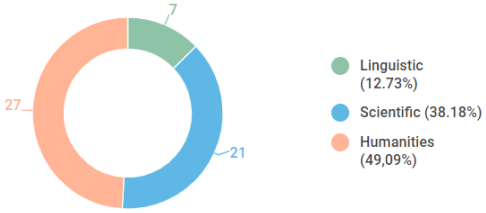

Figure 1. Types of courses involved for tutoring

To get an overview of which tutoring activities were used, we classified each course according to the four types of tutoring activities: face-to-face tutoring, online tutoring, task submission, test/teaching material. In the overview shown in table 1, there is an "X" when an activity has been carried out and for each case the number of tutoring courses is reported. This first classification shows that in most courses more than one tutoring activity was used. Most courses have chosen to have face-to-face tutoring but in blended mode, alternating it with online activities. A good number of courses also carried out online tutoring. Ten courses held exclusively face-to-face tutoring and three courses held exclusively online tutoring.

Table 1. Overview of the type of tutoring activity proposed in the tutoring courses

Type of tutoring activity				Number of tutoring courses
Presence tutoring	Online tutoring	Task submission	Test/Teaching material	
X			X	15
X		X	X	10
X				11
X	X	X	X	5
X		X		6
X	X	X		2
X	X		X	2
	X	X	X	2
X	X			1
	X		X	1

The analysis of the data of the initial questionnaire compiled by the 3329 students enrolled in a platform course (Figure 2) shows that, as expected, most of the students are enrolled in the first year, but there are also, students of the following years and students of supplementary years. All students completed the questionnaire only once, so no student enrolled in more than one tutoring course. Out of 3329 students, 796 students have already tried to take the exam of the chosen tutoring course: 447 once, 194 twice, 67 three times and 88 more than three times.

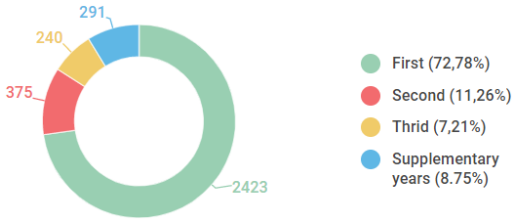

Figure 2. Students' answer to the question "Which year are you registered in?" of the initial questionnaire

Table 2 shows the connection between the two questions "Which year are you registered in?" and "Have you already tried to take this exam?", in each cell the absolute frequency, percentage, row percentage and column percentage are addressed. It emerges that a good number of first-year students enrolled in the tutoring course after failing the exam. Second and third year students are equitably split between those who had already taken the exam and those who had not yet taken the exam. It is interesting to note that there is a good percentage of supplementary years students who have never taken the exam.

Table 2. Connection between the questions "Which year are you registered?" and "Have you already tried to take this exam?"

	Already taken the exam		
Year of course enrollment	No	Yes	Total
Fist year	2130	293	2423
	87,9	12,1	
	84,1	36,8	
Second year	194	181	375
	51,7	48,3	
	7,7	22,7	
Third year	101	139	240
	42,1	57,9	
	4,0	17,5	
Supplementary years	108	183	291
	37,1	62,9	
	4,3	23,0	
Total	2533	796	3329

To analyze the engagement of students in the tutoring activities and the use of the platform, for each student registered on the platform we extracted the activities logs within the tutoring course. The tutors had a total of 40 hours (in the case of graduates) and 100 hours (in the case of students of the master's degree). They could use these hours for the whole duration of the one-year project. In some cases, the activities were concentrated only in some months of the academic year (close to the exams or in parallel with the lessons of the first or second semester) in other cases, tutors carried out activities for the entire duration of the project. The duration of the activities varies considerably, on average the tutoring face-to-face lessons lasted 2 hours but for the online activities the duration of the activities depended on the participation and the request of the students. As shown in Table 3, the range of Logs of 3329 students is very wide: there are students who have logged in very few times and have therefore hardly used the platform and students who have logged in many times and thus really took advantage of the platform. On average, a student logged in 95 times and the interquartile range - that is the width of the range of values containing the "central" half of the observed values - is 76. The first aspect we have studied is whether there is a correlation between the number of logs and the year of enrolment of the students previously analyzed. Since the Log distributions for the four groups "first year", "second year", "third year", "supplementary years" are not normal, we performed the non-parametric Kruskal-Wallis test to verify the equality of the medians. The value of the p-value is 0.005 and therefore there is sufficient statistical evidence to reject the hypothesis that the medians are equal for each group. Then we considered only two groups dividing students between "first year" and "subsequent years" and we studied if there is a correlation between the group and the number of Logs. With the Wilcox test we got a p-value of 0.6433. The test therefore leads us to state that the median of the first year student logs is not statistically different from the median of the student log of the other years. This result confirms that, even if the courses were exclusively designed for the first year students, the students of the first year and subsequent years equally benefited of the tutoring service.

Table 3. Summary of Logs of course activity of all students

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
7	31	55,5	94,79	107	1975

A second aspect that we have studied is whether the number of student Logs depends on the type of activities carried out during the tutoring course. We started from the subdivision of the courses into the four

categories, shown in Table 1, grouping the last two cases into a single "online activity" case and creating the following new subdivision with the respective course numbers: "Only face-to-face and online without activity" (1), "face-to-face and online activities" (9), "only online with activities" (3), "face-to-face only with activities" (31) and "face-to-face only" (11). For each category we then divided the number of Logs of students enrolled in a course in that category into two classes "a few logs" and "many logs" depending on whether the value is less or more than the median of the Logs of that category (Table 4).

Table 4. Log classification in the various sub-categories of types of activities performed

	Presence and online no activity	Presence and online with activity	Online with activity	Presence with activity	Only presence
Few Logs	1	1	1	15	9
Many Log	0	8	2	16	1

To see if there is a correlation between the student logs and the use of online activities we have grouped these five categories into the two macro categories "online" (44) and "face-to-face" (11), where in the "face-to-face" category courses were included that only provided face-to-face tutoring. For the "online" category there are 26 courses in "many logs" and 18 courses in "a few logs", for the "face-to-face" category there are 10 courses in "a few logs" and a course in "many logs". The value of the p-value of the Fischer Test equal to 0.005 leads us to reject the independence between the type of course and the number of activities logs. This result confirms that in the courses in which we have a posteriori observed that only face-to-face tutoring was performed - without the use of online tutoring or platform activities -, the use of the platform was limited to make appointment with tutors and students were thus not encouraged to use the platform to ask questions in the forum or ask for corrections, meaning they did not take full advantage of its potential.

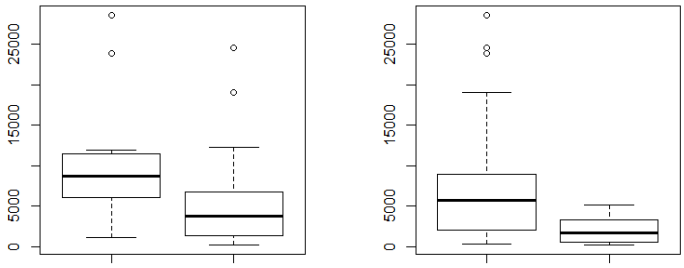

Figure 3. Boxplots of student Logs divided into the two categories: the 1st (left) and the 2nd (right)

We performed a new analysis with the two new macro categories "online2" (13) and "face-to-face2" (41), entering in the "online2" category all the courses that used the online tutoring (synchronous and asynchronous) and in the other all the courses that have not used it. We ran the Fisher test again to check the independence between the new course category and the number of activities logs. With this subdivision the value of the p-value greater than 0.05 indicates that the test does not provide any evidence against the assumption of independence. Comparison tests were then performed for the mean of the logs (Figure 3) between the two macro categories of courses for both classifications previously mentioned. In both cases there is statistical evidence that the average of the logs in courses classified as "online" is greater than the one of “face-to-face”. This result shows, in the first case, that the use of online activities tailored to and at the request of the student stimulates the active engagement of the students. In the second case, since there is online activity in both categories, synchronous online tutoring seems to take on greater weight in the engagement of students.

6. CONCLUSION

The disciplinary tutoring carried out using the online platform made possible a blended tutoring, which alternated tutors, face-to-face or online, (synchronous and asynchronous) to asynchronous platform activities. The platform is used for all tutoring activities: synchronous activities (face-to-face tutoring and online tutoring) and asynchronous activities (online tutoring through forums, task submission, test/teaching material). In this way, a learning based on the needs and engagement of the student is promoted. The platform also made it possible to monitor the attendance of students in tutoring activities and that of the

activities carried out by the tutors. 3329 students enrolled in a tutoring course. The analysis shows that all students, both in the first year and in the following years, actively participated in the tutoring activities and used the platform. It also emerged that student participation may depend on the type of activity performed, differentiating between online and non-online activities. At the end of the academic year an evaluation of the tutoring activities will also be conducted in relation to passing the final exams, using also psychological variables to explore the differences between users and non-users of the platform. The analysis of this paper shows the potential of tutoring activity through an online platform integrated with a web conference service.

REFERENCES

Barana, A., Bogino, A., Fioravera, M., Marchisio, M., Rabellino, S., 2017a. 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* 13, pp. 109–119.

Barana, A., Boffo, S., Gagliardi, F., Garuti, R., Marchisio, M., Empowering Engagement in a Technology Enhanced Learning Environment, in press 2019.

Barana, A., Fioravera, M., Marchisio, M., Rabellino, S., 2017b. Adaptive Teaching Supported by ICTs to Reduce the School Failure in the Project "Scuola Dei Compiti". *Proceedings of 2017 IEEE 41st Annual Computer Software and Applications Conference (COMPSAC)*. IEEE, pp. 432–437.

Barana, A., Fissore, C., Marchisio, M., Rabellino, S., 2018. Online Tutoring to Enhance University Success. *Exploring the Micro, the Meso and the Macro. Proceedings of the European Distanceand E-Learning Network 2018 Annual Conference*. Genova, Italia, pp. 755–763.

Barana, A., Marchisio, M., Rabellino, S., 2019a. Empowering Engagement through automatic formative assessment. *Proceedings of 2019 IEEE 43st Annual Computer Software and Applications Conference (COMPSAC)*, pp. 216-225

Barana A., Marchisio M., Sacchet M., 2019b. Advantages of Using Automatic Formative Assessment for Learning Mathematics. *Draaijer S., Joosten-ten Brinke D., Ras E. (eds) Technology Enhanced Assessment. TEA 2018. Communications in Computer and Information Science*, 1014. Springer, Cham, pp. 180-198.

Bozzo, L., 2012. Il blended learning all'Università: sperimentazione di un paradigma di apprendimento esperienziale costruttivista. *Atti di Didamatica 2012*.

Brancaccio, A., Esposito, M., Marchisio, M., Pardini, C., 2016. L'efficacia dell'apprendimento in rete degli immigrati digitali. L'esperienza SMART per le discipline scientifiche. *MONDO DIGITALE* 15, 10.

Brancaccio, A., Esposito, M., Marchisio, M., Sacchet, M., Pardini, C., 2019. Open professional development of math teachers through an online course. *Proceedings of 13th International Conference on e-Learning.* Porto, Portugal, pp. 131-138.

Bruschi, B., Cantino, V., Cavallo Perin, R., Culasso, F., Giors, B., Marchisio, M., Marello, C., Milani, M., Operti, L., Parola, A., Rabellino, S., Sacchet, M., Scomparin, L., 2018. Start@unito: a Supporting Model for High School Students Enrolling to University. *Presented at the IADIS International Conference Cognition and Exploratory Learning in Digital Age 2018*, pp. 307–312.

Felder, R.M., Brent, R., 2009. Active Learning: An Introduction. *ASQ Higher Education Brief*. Vol. 2, No. 4, pp. 1-5.

Giraudo, M.T., Marchisio, M., Pardini, C., 2014. Tutoring con le nuove tecnologie per ridurre l'insuccesso scolastico e favorire l'apprendimento della matematica nella scuola secondaria. *Mondo Digitale* 13, pp. 834–843.

Giuliani, A., Moretti, G., Morini, A., 2015. Servizi di tutorato didattico e Obblighi Formativi Aggiuntivi, un'indagine empirica esplorativa: il caso del Dipartimento di Scienze della Formazione dell'Università Roma Tre.

Impedovo, S., Campanella, P., Facchini, G., Pirlo, G., Modugno, R., Sarcinella, L., 2011. Learning Management Systems: un'analisi comparativa delle piattaforme open-source e proprietarie. *Atti di Didamatica 2011.*

Johnson, L., Adams, S., Cummins, M., 2012. *The NMC Horizon Report: 2012 Higher Education Edition*. The New Media Consortium, Austin, Texas.

Krathwohl, D.R., 2002. A Revision of Bloom's Taxonomy: An Overview. *Theory Into Practice*. Vol. 41, No. 4, 212–218.

Marchisio, M., Operti, L., Rabellino, S., Sacchet, M., 2019a. Start@unito: Open Online Courses for Improving Access and for Enhancing Success in Higher Education. *Proceedings of the 11th International Conference on Computer Supported Education (CSEDU 2019),* pp. 639–646.

Marchisio, M., Sacchet, M., Salusso, D., 2019b. Instructional design to "train the trainers": the Start@unito project at the university of turin. *Proceedings of 13th International Conference on e-Learning.* Porto, Portugal, pp. 195-202.

Trentin, G., 2003. Gestire la complessità dei sistemi di e-learning. *Atti del Convegno Didamatica 2003*. Genova, pp. 1–8.

Turrentine, P., Macdonald, L., 2006. Tutoring Online: Increasing Effectiveness with Best Practices. *NADE Digest* Vol. 2, No. 2, pp. 9–18.

AUTOMATIC ASSESSMENT TO ENHANCE ONLINE DICTIONARIES CONSULTATION SKILLS

Carla Marello, Marina Marchisio, Marta Pulvirenti and Cecilia Fissore
University of Turin, Italy

ABSTRACT

We live in a digital world and our students are surrounded by technologies: it is essential that they learn how to use the digital tools available for education purposes. As for language teaching, among the most recent technologies we can find online dictionaries. They could play a key role to foster language competences, and yet they are not very popular in schools. In order to increase the use of online dictionaries among students, the University of Turin has promoted the nation-wide project 'Esplorare (con) i Dizionari Digitali'. This project makes the most of a Learning Management System (https://esploradizionari.i-learn.unito.it/) that allowed the creation of a student-centered environment. The integration of the platform with an Automatic Assessment System allowed the design and creation of tests to be carried out through the consultation of online dictionaries. In this paper, we analyze the answers given by almost 600 students in 5 different tests on different languages, and we try to understand whether the methodologies and technologies adopted have been influential in making students "meta-linguistic aware" and researchers "meta-design aware". The results obtained show in a statistically significant way that the students who made a larger use of online dictionaries performed better in the tests.

KEYWORDS

Automated Assessment System, Digital Dictionary, Online Digital Lexicography, Reference Skills, Virtual Learning Environment

1. INTRODUCTION

Nowadays, students live in a technology-rich environment and quickly learn how to use different apps and technologies; their way of communicating with teachers and peers, interacting with learning materials, and demonstrating their knowledge have changed over the last years. For what concerns language teaching, among the various technologies that have spread since the advent of internet there are online dictionaries, i.e. monolingual or bilingual dictionaries (free or paid) that can be consulted via any mobile device. Online dictionaries could be a key tool to foster language competences, but they are not popular in schools. How can we motivate our students to use them? Teaching itself is not always enough, except for those languages (e.g. Latin) for which translation is still often practiced in class. The motivation should come directly from the layout of dictionaries, since they are always and easily available on a smartphone. One of the reasons why online dictionaries are not frequently used can be that they still need improvements in some of their search functions. At the same time, Italian lexicography market is not broad enough to justify a significant investment on it. Studying the use of digital dictionaries by students (Marello, 2014), we asked ourselves the following research question: *how to increase the use and the circulation of online dictionaries between students?* To answer to this question, two years ago the University of Turin has developed and promoted the nation-wide research project “Esplorare (con) i Dizionari Digitali”, that is ‘To Explore (with) Digital Dictionaries’, with the goal of helping students understand how online dictionaries are structured so that they can be consulted. The project makes the most of a Virtual Learning Environment (https://esploradizionari.i-learn.unito.it/) that allowed the creation of a student-centered environment, so that students can easily approach online dictionaries and be trained on their use. The integration of the platform with an Automatic Assessment System has allowed the creation of tests with exercises, integrated with the consultation of online dictionaries, grouped by difficulty levels that allow to verify lexical knowledge. The project was made possible thanks to a fruitful cooperation with some high school teachers, who voluntarily chose to participate with their classes. Our research group designed interactive exercises to stimulate the use of online dictionaries. Teachers gave us feedback on how to

refine them and chose which way to give the test to their students, whether at home or at school, in a computerized classroom supervised by teachers and researchers.

In this paper, we analyze the answers given by almost 600 students in 5 different tests of different languages to understand whether the methodologies and technologies adopted have been influential in making students "meta-linguistic aware" and researchers "meta-design aware".

2. TECHNOLOGIES AND ONLINE DICTIONARIES TO FOSTER LANGUAGE COMPETENCES

With the succession of new approaches and methods, suggested by the evolution of the psychology of education and theories of linguistic acquisition, but also by changing needs for new political, economic and social conditions, language teaching has resorted to various technological tools. Today, most linguists and language teachers consider unthinkable to teach and learn a language without using any technology (Betti & Garelli, 2010). With the advent of the Internet (1989), computers have definitively been established as an unavoidable tool for teaching and learning languages, as they are able to offer authentic materials of various types that could be far more stimulating than those created ad hoc by teachers and authors that are more interested in grammar rules than in the context of use of the language. In addition to a new way of considering languages, seen as a tool to communicate in the most diverse situations and contexts, other circumstances have favored the use of the computer, such as the theory of social constructivism. According to this theory, a person, in his cognitive, social and affective aspects of behavior, is not a product of the environment, nor the simple result of his internal dispositions, but a personal construction that is produced, day by day, in the interaction of these two factors.

The most significant reflection of constructivism in the teaching and learning of foreign languages is undoubtedly the recognition of the learner as an autonomous individual. The knowledge of a language is defined in terms of ability, of a "know-how", and the learner is considered as an autonomous and self-aware individual who works for the construction of his own future. Since 1976, the European Community has encouraged the use of technology in language teaching, implementing a real linguistic policy that emphasized the need to use multimedia, as recommended in the White Book of Education and Training (1995). More recently, in 2004-2006, the CoE drew up an Action Plan aimed at promoting language learning and linguistic diversity, thus giving everyone the opportunity to learn an L2 during the course of their lives, and improving their teaching through new technologies, as there are still teachers who are struggling to abandon traditional teaching techniques. Both teachers and students need to be taught how to efficiently use existing online resources, and students should be trained to a constant and more proficient autonomous use of such tools through specific tasks, so that they can expand their knowledge.

Online dictionaries are a key tool to learn new languages and to deepen the knowledge of one's mother tongue. Unfortunately, their use is not so widespread, as reports by the researchers cooperating in the European Network of e-Lexicography (ENeL) and in the European survey of dictionary use have shown that, in many countries, dictionaries and dictionary use have even been excluded from the curricula of high schools (Kosem et al., 2019). The cause of it could be seen in their design or their cost, which make them not accessible to everyone. In order to make them an exploited tool by students, it would be important to improve their layout, and to make them so useful, appealing, intuitive and self-explanatory that no training on their use should be necessary (Carr, 1997; De Schryver & Prinsloo, 2001; Klosa & Müller-Spitzer, 2018; Lew, 2011; Lew, 2015; Tarp, 2012).

The English Vocabulary Profile EVP is perhaps one of the closest achievements to this idea. It offers reliable information about which words (and importantly, which meanings of those words) and phrases should be known and used by learners at each level of the Common European Framework (CEF). There are the British and the American English versions, and an audio pronunciation for all entries. It is quite appealing, and it is designed for smartphone. However, experiments performed with university students demonstrate that they tend to use even the best digital dictionaries as if they were traditional dictionaries, which means they choose the first meaning listed, without taking advantage of all the features available within such dictionaries (Dziemianko, 2012).

Freely available Italian online dictionaries might be largely improved; just to mention three easy ways to make them more user-friendly, we might deal with display of homonyms, a 'did-you-mean' function, somewhat like a spellchecker (Lew & Mitton, 2013) and a lemmatizer. The visualization of homonyms should

be improved, for example, typing "schifo" in the very good monolingual De Mauro on line it is not immediately clear that this word has two entries, the first one that means 'small rowing boat" and the second one (which is actually the most common one) that means "sense of nausea, disgust". The numbers used to distinguish them are so small that they are difficult to notice. Italian online dictionaries do not feature a 'did-you-mean' function "guessing" the correct spelling of words misspelled by users. In Garzanti, if you type the non existing entry coglio, they suggest ciglio, caglio, cogli; but if you type simbol instead of simbolo (i.e. symbol) no results are shown. Finally, a powerful lemmatizer is important above all in order to forward from inflected forms to the verb in its base form under which it is lemmatized and explained.

The starting point to improve dictionaries is to know which aspects of the dictionary microstructure are the most difficult, according to the different types of users. Eye-tracking studies and log files analysis were carried out to achieve this goal (Lew, 2015; Töpel, 2014; section V in Gouws et al., 2013), but in Italy these techniques are still to be applied in the field of online lexicography. In fact, the Italian dictionary market is not sizeable enough to justify a significant investment by publishing companies to further improve the online layout of dictionaries and to fund experimental research on online testing. The consequence is that Italian university researchers and teachers associations are taking the initiative to address the gap in their skills, to try to make the most of the tools that already exist and to train students to use online dictionaries as they are at present (Marello, 2014).

3. METHODOLOGY OF EXERCISE DELIVERY

The groundwork of the project "Esplorare (con) i Dizionari Digitali" has been influenced by the experience of our research group in the use of an Automatic Assessment System (AAS) in order to develop skills and competences of STEM disciplines (Science, Technology, Engineering, Mathematics). Moodle, a Virtual Learning Environment (VLE), was used, integrated with the AAS Möbius Assessment (Barana et al., 2015). This integration has proven to be effective for the teaching of Mathematics (Barana et al., 2019b) and in open online courses (Marchisio et al., 2019a; Marchisio et al., 2019b) as it exploits the mathematical engine behind it: the Advanced Computing Environment (ACE) Maple. It also allowed the creation of a model of formative automatic assessment and interactive feedback for STEM (Barana et al., 2018). This is why the same technologies and methodologies were adopted, at first, for an experimentation in the creation of new typologies of language questions (Barana et al., 2019a) and then for the realization of the project "Esplorare (con) i Dizionari Digitali". In 2016, a pilot project about the use of online dictionaries started; it used paper questionnaires while the use of computers and smartphones was limited to the consultation of online dictionaries. In 2017, we decided to improve the project with the use of the VLE and the AAS in order to allow the development of more exercises, to reach more students, and to better record their answers. The use of a VLE also allows to take more into consideration attitudes and needs of individuals and to foster the active learning (Felder & Brent, 2009).

The e-learning Moodle platform we opened for the project has a collection of exercises in monolingual and bilingual dictionaries accessible through the AAS, which is available also for tablets and mobile devices. The platform is divided into three area. The first one is open and it can be accessed freely through the credentials of a social network. It contains a demo to learn how monolingual and bilingual online digital dictionaries are structured. The second area is where each teacher has their course dedicated to their class, with tests available for students. The third section is a teacher community where they can exchange best practices, discuss, create materials and receive support from university researchers.

One of the main goals of the project is to train students to access online dictionaries and learn how to get information from them. We focused on maintaining a certain amount of exercises that foster skills and are not merely search options in free online tools, which are severely limited. This was particularly important, as teachers tend to favor lexical or reading comprehension exercises that reveal very little to nothing about the students' practical skills in using and understanding dictionaries and the data they contain. To understand if students used online dictionaries and how they used them, at the beginning of our project we were always asking students at the end of each question which parts of the dictionary, if any, they used in order to solve some tasks we assigned through the platform. We collected many answers to these questions, but some turned out to be inconclusive. In fact, from the execution time recorded it was evident that some students did not use a dictionary at all, but they declared they had, probably only to please the researchers. In some other cases,

they affirmed they had not used it in order to impress their school teacher and to show that they already knew the correct answer without consulting the dictionary. After these results, we decided not to ask such metacognitive questions and we prepared other exercises instead, which could not be correctly carried out without knowing how to use dictionary microstructure. In order to increase the use and the circulation of online dictionaries among students, we found some search features that we thought important to make students work on and we designed exercises which make them learn how to overcome them. So far, "Esplorare (con) i Dizionari Digitali" has seen two editions, involving in total more than 600 students, mainly from Piemonte but also from Puglia and Trentino-Alto Adige (Table 1 reports all the numbers of the project). All the classes involved belonged to the upper secondary school, but in the 17/18 edition also undergraduate and postgraduate students were involved. Results present in this paper belong to both edition of the project while the 19/20 edition will start soon.

Table 1. Numbers of "Esplorare (con) i Dizionari Digitali"

	2017/2018 edition	2018/2019 edition
Classes	**9** (+ **3** university courses)	**15**
Students	**207** (+ **305** university students)	**335**
Teachers	**8**	**16**
# exercises carried out	**125**	**200**

Each teacher can select the set of exercises among our collections in order to fit students' needs and choose whether to have them do the exercises in the classroom or at home (according to the "flipped classroom" methodology), entering the activity in the normal school planning. Tests are set in a slightly different way according to this decision. When the test was carried out in class, teachers and researchers were checking on students in order to avoid cheating behavior and try to keep students focused on the test without distractions, without any time or attempts restrictions. When the test was carried out at home, they had an attempt limit (i.e. each student could attempt the test only once) and a time limit; in this way, students could choose when to do the test and hopefully they did it only when they had time to properly focus on it.

The VLE and the AAS allow to record a lot of information about users' logs, as well as the time and attempts for each test, and they automatically compute statistical data about the success rate of each question. Moreover, the AAS records all answers given by students and it allows their automatic evaluation with the exception of open answers (which were rarely used for this project). The AAS provides some tools that are useful after the tests, but also other tools that are quite important for their very creation. AAS gives the possibility to choose among many kinds of response-areas, and to set different options according to the goal of the exercise. Therefore, the AAS allowed to only use automated procedures for both parts of the study (data collection and evaluation). In addition, SPSS, a software package for batched statistical analysis, was used for most part of the analysis of results (explained in the following chapter).

4. RESULTS

4.1 When the Researcher Becomes "Design Aware"

The AAS we used had several advantages: the main one was recording all answers given. This allows the designer to understand what students exactly did and to learn from results. Accessing online dictionaries is facilitated through the AAS: each question that requires the use of a dictionary has a specific pop-up link that directly sends the user to the dictionary entry to be consulted, and this speeds up the process, if compared to having the general dictionary consultation window. In addition, also the pop-up link to the consultation window speeds the process. To use pop-up links through Moodle, it was not possible to use the appropriate option to insert pop-ups designed by the creators of the AAS; it was necessary to design a special way in order to make it possible. Links were inserted as html-type answers to which students must not give an answer: the first time this was tested, the AAS saw the pop-up links as answers left empty, but we solved this problem by inserting the code "function getResponse() { return 1; };". The html solution could still be further improved as the link disappears in the pdf version of the test and the pop-up poses (small) problems in the layout of the exercise, because it tends to create too much space between the parts of the question; these aspects are still under study.

The use of the AAS allows to set some options useful to control the way in which the test is done. Two options we set in every test were the rotation of questions inside the test and the rotation of possible answers to choose from: these decrease the probability of cheating, especially when students take the test in class. In some cases, to reduce the probability of cheating even more, we fully exploited the possibilities of the AAS of using algorithms: thanks to the command "switch", we created three or four equivalent tests with different lemmas. Fig. 1 shows all the features listed above, and it is a pop-up case with the use of both the English dictionary (Collins) and the American one (Heritage). In this question, students have to look up in the online dictionary the plural forms of nouns written in red and select the correct form. For each attempt, nouns in red are different and the related possible answers rotate.

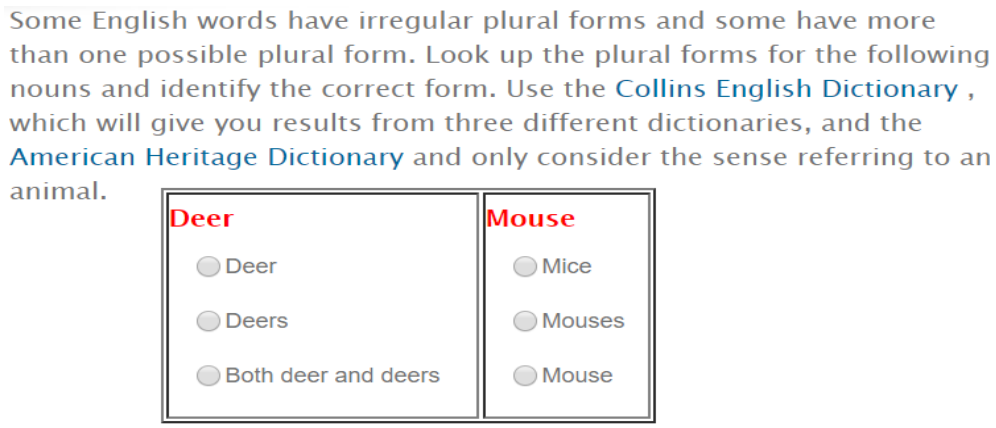

Figure 1. English and American dictionaries pop-up links in AAS question

Each test consisted of 7-10 questions and also had a time limit (usually thirty minutes) and a limit of attempts: these were especially useful in the flipped classroom modality. Despite this, some teachers did not want to adopt the flipped classroom modality because they feared that parents would do the homework instead of their children. Obviously, when students do exercises at home we have less control, but if there is a constructive discussion at home between students and family members for the resolution of the exercises, which is also welcomed. When designing exercises, we tried to create many different types. Not every question has a pop-up link: some suggest students to use the dictionary they want instead. Another typology of exercise did not require the consultation of an online dictionary as we integrated part of the dictionary entry in the body of the question. For example, in one exercise we inserted the modified dictionary entry "campo" from the Italian online dictionary De Mauro where we deleted a part of it and we also deleted the four labels from where they were placed. Students had to reintegrate them properly choosing among the different options proposed in the drop-down menu and associating for each definition the correct label associated to it. Students could choose between the following shortened definitions of four labels: FO fundamental, CO common usage, TS specialistic term, OB obsolete meaning. It is clear that, if we had inserted a pop-up link, students would have easily seen the labels associated with each item and the exercise would have become trivial copying. The goal of the exercise was instead to test sociolinguistic awareness of native speakers and to reach it the consultation of an online dictionary was not required at all.

4.2 Are "Esplora-Students" Really Exploring Online Dictionaries?

Students carried out 581 tests during the two editions of the project (the first one in the school year 17/18 and the second one in 18/19). In detail, 53 students took the "English level B1" test, 25 took the "German" test, 244 took the "Italian: Grammar and Synonyms" test, 199 took the "Italian for the 9th grade" test, 60 took the "Italian for the 10th grade" test. The goal was to understand how much time each student spent consulting the online dictionary and if that influenced the performance of the test. At present, it is not possible for us to automatically track the activity of students while consulting the online dictionary, nor to understand whether the pop-up link has been opened, so we do not know how much time students actually spent consulting the dictionary or what exactly they were looking at. What we did was therefore to analyze data on response times. Students performed tests in a "protected environment" as they did them either at school supervised by teachers

and tutors or at home with some automatic restriction of the AAS. For this reason, we assumed that "taking more time in carrying out the test" implies "having spent more time in the consultation of the dictionary" and we tried to understand if there was a correlation between response times and success in the answers given, for each test performed. Data were analyzed with SPSS in order to understand to what extent the use of the AAS (that allowed the use of online dictionaries) helped the students. Statistically results are significant when the bilateral asymptotic significance of the chi-square test (the so-called "p-value") is less than 0.05 and the ETA is greater than 0.3. Table 2 shows some general results regardless of the test done. These are statistically significant as the p-value is lower than 0.001 and ETA is equal to 0.323. Best results were obtained when students spent between 16 and 20 minutes taking the test. In this table (and in the next ones) there will always be the label "U = undefined time" as it is not rare that students start the test but do not close it correctly, losing data about the exact amount of time spent on the test.

Table 2. Correlation between duration and performance of all 581 tests

Duration	Performance	# of students	% of students
between 1 minute and 9 minutes	52.56%	90	15,49%
between 10 minut and 15 minutes	63.05%	99	17,04%
between 16 minut and 20 minutes	71.08%	94	16,18%
between 21 minut and 24 minutes	66.00%	100	17,21%
between 25 minut and 50 minutes	66.05%	91	15,66%
undefined time	26.26%	107	18,42%
Total	**56.93%**	**581**	**100%**

Results of Table 2 do not take into consideration length and difficulty of tests. In order to analyze in a more critical way the data collected, we divided them into two different categories of "classes" according to the time spent in performing the test:

- Table 3 shows results divided in classes A, B, C, D, E, F, G, U where we tried to keep the number of minutes constant (about 5 minutes per class);
- Table 4 shows results divided in classes P, Q, R, S, T, U where we tried to keep the number of students constant (about 97 students per class regardless of the test).

Both tables record for each test which "class of time" performed better and in specific which was the mean of the results of the mentioned class (e.g. in table 3 it is written that 199 students carried out the test "Italian for the 9th grade", the best result was obtained by 38 of them who spent between 16 and 20 minutes to carried it out and on average scored 70.72%).

Table 3. Classes with number of minutes constant

Classes with constant number of minutes: about 5 minutes per class.
A = 1-5 minutes, B = 6-10 minutes, C = 11-15 minutes, D = 16-20 minutes, E = 21-25 minutes, F = 26-35 minutes, G = 36-50 minutes, U = "undefined time"

Test	# of students who carried it out	Class with the best performance	Performance of the mentioned class	# of students in the mentioned class	P value	ETA squared value
English level B1	53	E = 21-25 minutes	80.64%	2	<0.001	0.669
Italian: Grammar and Synonyms	244	D = 16-20 minutes	74.52%	33	<0.001	0.481
Italian for the 9th grade	199	D = 16-20 minutes	70.72%	38	<0.001	0.352
Italian for the 10th grade	60	D = 16-20 minutes	58.83%	7	<0.001	0.702
German	25	D = 16-20 minutes	79.80%	8	0.252	0.226

It turned out that, no matter the category of classes analyzed, the results found were the same. We have not considered results given by the "German" test (as it is not statistically significant) but we want to show it anyway in this paper. All the other results are statistically significant as they all have p-value <0, 001 and ETA value > 0.3. Table 3 shows that students who spent between 21 and 25 minutes had the best performance in the "English level B1" test, although there were only two of them. For all the other Italian tests, the best results were achieved by those students who spent between 16 and 20 minutes.

Table 4. Classes with number of students constant

Classes with constant number of students: about 97 students per class, regardless of the test. P = 1-9 minutes, Q = 10-15 minutes, R = 16-20 minutes, S = 21-24 minutes, T = 25-50 minutes, U = "undefined time"						
Test	**# of students who carried it out**	**Class with the best performance**	**Performance of the mentioned class**	**# of students in the mentioned class**	**P value**	**ETA squared value**
English level B1	53	S = 21-24 minutes	80.64%	2	<0.001	0.624
Italian: Grammar and Synonyms	244	R = 16-20 minutes	74.52%	33	<0.001	0.479
Italian for the 9th grade	199	R = 16-20 minutes	70.72%	38	<0.001	0.343
Italian for the 10th grade	60	R = 16-20 minutes	58.83%	7	<0.001	0.701
German	25	R = 16-20 minutes	79.80%	8	0.252	0.226

Results showed in Table 4 reflect the ones of Table 3 and they both show that:

- for the 3 Italian tests, students who had a better performance were in the D or R class, that means it took them between 16 and 20 minutes to do the test;
- for the English test, students who had a better performance were in the E or S class, that means it took them between 21 and 25 minutes.

We can conclude that, for Italian tests Italian-speaking students were able to have a good performance even without spending too much time consulting the dictionary while for the English test consulting the dictionary made the difference, resulting in better results for those students who consulted it more. Moreover, exercises in these tests were specifically designed in such a way that they could not be correctly carried out without knowing how to use dictionary microstructure: for this reason, we can conclude that it is likely that students who performed better learned more how to use the online dictionary.

5. CONCLUSION AND FURTHER STUDIES

The integration of a VLE with an AAS for the consultation of online dictionaries allowed researchers to become "design aware" and students to become "meta-linguistically aware". In fact, the AAS records all answers given, allowing more studies about how to improve both the content and the layout of exercises. The AAS also records the time spent on each test. Assuming that "taking more time in carrying out the test" implies "having spent more time in the consultation of the dictionary", we concluded that, not surprisingly, for an Italian test Italian-speaking students were able to have a good performance even without spending too much time consulting the dictionary. On the contrary, for the English test, consulting the dictionary made the difference, resulting in better results for Italian speaking students who consulted it more. This also answers our first research question, that is how to increase the use and the circulation of online dictionaries among students: thanks to the project "Esplorare (con) i Dizionari Digitali", students were encouraged to use them and trained on how to, especially when foreign languages tests were involved. However, at present it is not possible for us to automatically track the activity of students while consulting the online dictionary, so a further study would be interesting in order to know whether the pop-up link has been opened or not, and which specific part of the online dictionary has been consulted; the eye-tracking technology could help with this. In addition, we had really positive feedback on the project from students and teachers who took part in it. For further studies, we want to ask them to fill a final questionnaire in order to see the increment of motivation and interest of students and to better measure the meta-cognitive impact of the project. In this way, we could add some qualitative

analysis to this purely quantitative one. “Esplorare (con) i Dizionari Digitali” showed us that development of competences for languages and STEM disciplines does not differ as much as it seems; thus, it would be interesting to fully exploit and implement the adaptive formative model of STEM disciplines to the teaching of languages, too.

REFERENCES

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

Barana, A., Floris, F., Marchisio, M., Marello, C., Pulvirenti, M., Sacchet, M. & Rabellino, S. (2019a). Adapting STEM Automated Assessment System to Enhance Language Skills. In *Proceedings of the 15th International Scientific Conference eLearning and Software for Education - eLSE 2019, pp.403-410.* Bucharest, Romania. 11–12/04/2019.

Barana, A., Marchisio, M. & Sacchet, M. (2019b). Advantages of using automatic formative assessment for learning mathematics. In *Communications in Computer and Information Science*, vol. 1014, pp. 180-198.

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

Betti, S. & Garelli, P. (2010). *Nuove tecnologie e insegnamento delle lingue straniere*. Milano: FrancoAngeli.

Carr, M. (1997). Internet Dictionaries and Lexicography. *International Journal of Lexicography*, 10(3), pp. 209–230.

Collins English. Accessed at: https://www.collinsdictionary.com/dictionary/english. (5 September 2019).

De Mauro. Accessed at: https://dizionario.internazionale.it/. (5 September 2019).

Commissione Europea. Libro bianco: *Insegnare e apprendere*. Verso la società della conoscenza. 1995.

De Schryver, G.-M. & Prinsloo, D.J. (2001). Fuzzy SF: Towards the ultimate customised dictionary. *Studies in Lexicography*, 11(1), pp. 97–111.

Dziemianko, A. 2012. On the Use(fulness) of Paper and Electronic Dictionaries. In Granger S., Paquot M. (eds.) 2012 *Electronic Lexicography*. Oxford: Oxford U.P.

Felder, R.M. & Brent, R., 2009. Active Learning: An Introduction. *ASQ Higher Education Brief*. Vol. 2, No. 4, pp. 1-5.

Garzanti. Accessed at: http://www.garzantilinguistica.it/. (5 September 2019).

Gouws R. H., Heid, U., Schweickard, W. & Wiegand, H. E. (2013). Dictionaries. An International Encyclopedia of Lexicography. Supplementary Volume: *Recent Developments with Focus on Electronic and Computational Lexicography*. Series: Handbücher zur Sprach- und Kommunikationswissenschaft/Handbooks of Linguistics and Communication science (hsk) 5/4. The Hague, De Gruyter Mouton.

Heritage American. Accessed at: https://www.ahdictionary.com/. (5 September 2019).

Kosem, I., Lew, R., Müller-Spitzer, C., Ribeiro Silveira, M.R. & Wolfer, S. (2019). ‘The Image of the Monolingual Dictionaries Across Europe. Results of the European Survey of Dictionary use and Culture’. *International Journal of Lexicography*, Oxford: Oxford University Press. Vol.32, number 1 March 2019, 92-114.

Lew. R. & Mitton, R. (2013) Online English Learners’ Dictionaries and Misspellings: One Year On, In *International Journal of Lexicography*, vol. 26-2, 219–233.

Lew, R. (2015). Research into the use of online dictionaries. In *International Journal of Lexicography*, vol. 28-2, pp. 232-253.

Lew, R. (2011). Online dictionaries of English. In P.A. Fuertes-Olivera & H. Bergenholtz (eds.) *e-Lexicography: The Internet, Digital Initiatives and Lexicography*. London/New York: Continuum, pp. 230–250.

Klosa, A. & Müller-Spitzer, C. (eds.) (2018). *Internetlexikografie. Ein Kompendium*. Berlin/Boston, De Gruyter.

Marchisio, M., Operti, L., Rabellino, S., & Sacchet, M. (2019a). Start@unito: Open online courses for improving access and for enhancing success in higher education. In *CSEDU 2019 - Proceedings of the 11th International Conference on Computer Supported Education*. Vol. 1, pp. 639-646.

Marchisio, M., Sacchet, M. & Salusso, D. (2019b). Instructional Design To “Train The Trainers”: The Start@Unito Project At The University Of Turin. In *Proceedings of the international conference e-learning 2019*. Pp. 195-202.

Marello, C. (2014). Using Mobile Bilingual Dictionaries in an EFL Class. In A. Abel, C.Vettori, N. Ralli (eds.), *Proceedings of the 16th EURALEX International Congress,* Bolzano: EURAC Research, pp. 63-83.

English Vocabulary Profile. Accessed at: https://www.englishprofile.org/wordlists?. (5 September 2019).

Tarp, S. (2012). Theoretical challenges in the transition from lexicographical p-works to e-tools. In S. Granger & M. Paquot (Eds.), *Electronic lexicography*, Oxford: Oxford University Press, pp. 107-118.

Töpel, A. (2014). Review of research into the Use of Electronic Dictionaries. In Müller-Spitzer C. (ed.)(2014), *Using online dictionaries* (Lexicographica Series Maior 145), Berlin/Boston, De Gruyter, pp. 13-54.

Zingarelli, N. (2019). *Lo Zingarelli 2020. Vocabolario della lingua italiana*. Cannella&Lazzarini(eds.),Bologna: Zanichelli.

AUTHOR INDEX