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L. Gómez Chova, A. López Martínez, I. Candel Torres
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CONFERENCE SESSIONS

ORAL SESSIONS, 1st July 2019

Massive Open Online Courses (MOOC)
Effective Pedagogical Practices
ICT & Digital Skills for Educators (1)
Foreign Language Learning
Vocational Education
Ethical Issues in Education
Design Thinking and Creativity
Quality Assurance and Accreditation
Health Sciences Education

Virtual Reality and 3D Experiences
Flipped Learning (1)
ICT & Digital Skills for Educators (2)
Language Learning Technologies
Informal Learning
Gender Lensing in Academia
Team Based Learning
Internationalization in Higher Education
Nursing Educational Experiences

Virtual Learning Experiences in Higher Education
m-Learning & Personal Learning Environments
Professional Development of Teachers (1)
English for Special Purposes
Up2U, Learning from Learners
Sustainability in Higher Education
Project and Problem Based Learning
Entrepreneurship Education
Programming and Coding Skills (1)

Learning Analytics
Flipped Learning (2)
Pre-service Teacher Experiences
Language Learning Experiences
Student Support in Higher Education
Active Learning in Engineering Education
Active Learning
University-Industry Cooperation
Programming and Coding Skills (2)

POSTER SESSIONS, 1st July 2019

New Trends in Education and Research

Pedagogical Innovations and Educational Issues

ORAL SESSIONS, 2nd July 2019

21st Century Skills
Serious Games & Game-Based Learning (1)
Educational Management
Student Support & Wellbeing
Intercultural Issues in Education
Secondary Education Experiences
ICT Skills and Digital Literacy
Research on Higher Education
Pedagogical Innovations in Education

Next Generation Classroom & Learning Space Design
Serious Games & Game-Based Learning (2)
Technology-Enhanced Learning (1)
Professional Development of Teachers (2)
Inclusive Education (1)
Primary Education Experiences
Digital Competences and Virtual Learning Experiences
Links between Education, Research and Innovation
Videos for Learning

Augmented and Virtual Reality
Serious Games & Game-Based Learning (3)
Technology-Enhanced Learning (2)
Professional Development of Teachers (3)
Teacher Training for Inclusive Education
Teacher Training in STEM
Digital Literacy
Curriculum Design
e-Learning Experiences (1)

e-Learning Platforms and Learning Management Systems
Gamification
Technology Enhanced Experiences in Special Education
Mathematics Education
Student Support & Inclusive Education
STEM Outreach Activities
e-Assessment
Work Based Learning
e-Learning Experiences (2)

New Trends in Learning Analytics
Blended Learning
Technology in Primary and Secondary Education
Business Education
Inclusive Education (2)
STEM Education
Assessment in Higher Education
Internships and Workplace Learning
e-Tutoring and Intelligent Tutoring Systems

POSTER SESSIONS, 2nd July 2019

New Experiences in Education
Emerging Technologies in Education

VIRTUAL SESSIONS

21st Century Skills
Academic Research Projects
Augmented Reality
Barriers to Learning
Blended Learning
Collaboration Projects and Networks
Computer Supported Collaboration
Curriculum Design and Development
Design Thinking and Creativity
Distance Learning
Diversity Issues, Women and Minorities
E-content Management and Development
e-Learning Projects and Experiences
Early Childhood and Preschool Education
Education and Globalization
Educational Management
Educational Software & Serious Games
Educational Trends and Best Practice Contributions
Emerging Technologies in Education
Enhancing Learning and the Undergraduate Experience
Ethical Issues in Education
Evaluation and Assessment of Student Learning
Flipped Learning
Game Based Learning
Higher and Further Education
ICT skills and Digital literacy
Impact of Education on Development
Language Learning Innovations
Leadership in Education
Learning and Teaching Methodologies
Learning by doing & Experiential Learning
Learning Management Systems (LMS)
Lifelong Learning
Links between Education and Research
Massive Open Online Courses (MOOCs)
Mobile and Tablet Technologies
Mobile Learning
Multicultural Education
New Experiences in Education
New Learning/Teaching Models
New projects and Innovations
New Trends in Education and Research
Organizational, Legal, Policy and Financial Issues
Pedagogical Innovations and Educational Issues
Pre-service and In-service Teacher Experiences
Primary and Secondary Education
Problem and Project-Based Learning
Quality Assurance and Accreditation
Research Methodologies
Special Education & Inclusive Learning
STEM in Education
Student Support in Education
Team-Based and Collaborative Learning
Technology-Enhanced Learning
The 2030 Agenda for Sustainable Development
The Bologna Declaration and ECTS Experiences
The Impact of Web Technologies on Education
Transferring Skills and Disciplines
Virtual Learning Environments (VLEs)
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3. In the Index Selection dialog box, select an index, if the one you want to search is available, or click Add and then locate and select the index to be searched, and click Open. Repeat as needed until all the indexes you want to search are selected.
4. Click OK to close the Index Selection dialog box, and then choose Currently Selected Indexes on the Look In pop-up menu.
5. Proceed with your search as usual, selecting other options you want to apply, and click Search.

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OERS FOR SECONDARY EDUCATION: A CHANCE FOR TEACHERS TO BROADEN THEIR HORIZONS

M. Marchisio, S. Rabellino, M. Sacchet, D. Salusso

University of Turin (ITALY)

Abstract

For a teacher, secondary school periods are very short compared to the time necessary to help students acquire the key competences (knowledge, abilities and attitudes) in order to become aware global citizens. If wisely adopted, the use of digital technologies offers many advantages for both students and teachers: they improve engagement, knowledge retention, self-paced learning, and collaboration. In particular, OERs (Open Educational Resources) are a way for teachers to enhance course content and continually improve resources, personalize teaching according to their and their students' needs, customizing learning for each student's strengths, weaknesses and interests, and sometimes reduce textbook costs. However, do teachers know OERs, where to find them and how to use them? The aim of our research is to discuss teachers' knowledge of OER repositories and receive their opinion on how they integrated OERs in their didactics. As a case study, teachers are invited to discover our experience of collaboration between the University of Torino, with its open online university project *start@unito*, and some secondary school teachers who wish to use and adapt open higher education resources to their students' needs. The *start@unito* project has been designed precisely as a student-orientation programme, with the purpose of bridging the gap between secondary and higher education; it offers 20 courses in various academic disciplines held in Italian, and by the end of the academic year it will offer courses held in English as well. Since the main target of the project is specifically high school students, *start@unito* is a unique opportunity to introduce secondary school teachers to the world of OERs and their potential.

Keywords: OER, open educational resources, open university, secondary education, higher education, open online university.

1 INTRODUCTION

Open education does not require any fee or admission and is recognized to be useful at high school level and in general to all people wanting to learn. It is mainly delivered online. "Open" means that there is no obstacle in the link between learner and learning giving more hands-on and more responsibilities to learners. National institutions recognized the usefulness of Open Education, too; as an example, the Department of Education of the United States of America has an office of Educational Technology, which deals with Open Education [1]. In 2002 the UNESCO [2] coined the term Open Educational Resources (OER), to describe any learning material freely provided with any medium: OER is "The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes". Evoking the term Open Source used for software, Wiley [3] states properties of Open Contents that must allow the user to carry out the following 5R-activities:

- Retain: the right to download, duplicate, store, and manage;
- Reuse: the right to in a class or in other contexts;
- Revise: the right to adapt, adjust, modify;
- Remix: the right to combine different contents, for instance a mashup;
- Redistribute: the right to share copies of the content.

People are not always aware of the existence of OERs, though in the recent years, there was an increase in the number of Repository of OERs (ROER). Many researchers carried on analysis in order to develop an overview of the state and the features of such ROERs: according to [4], the production of OERs is essentially public funding, international projects and institutions, and the main feature is open licenses [5]. Other experiences developed directories to retrieve details of ROER, such as the OER World Map [6], thus facilitating the learners in finding online materials.

While some OERs are specific for higher education and others for secondary schools, this paper will focus on the second ones: we will cite some repositories in which Italian high school teachers, the main target of this research, found OERs. Many high school teachers joined a project called “Problem Posing & Solving” [7,8,9] financed by MIUR, the Italian ministry of education. This project aims at helping teachers in adopting technologies with their classes by providing them with a course in a Moodle LMS platform and continuous guidance and tutoring (both synchronous and asynchronous) in the use of such tools. It is mainly devoted to teachers in STEM disciplines (Science, Technology, Engineering and Mathematics); the platform was integrated with an Advanced Computing Environment (ACE) Maple [10] and an Automatic Assessment System (AAS) Möbius Assessment [11]. On Moodle the teachers are responsible of a course in which their class is enrolled. Taking care of this project was fundamental, because we saw the natural development of a community of secondary school teachers who shares difficulties, solutions and self-made online resources.

A valuable experience at the University of Turin is the start@unito project [12,13]. The project aims to support the start of students’ university careers and to reduce the abandonment and dispersion rate. It provides learners with a Moodle LMS, available at [14], which delivers freely available, self-paced, online courses on different topics (scientific, human, economics, law and linguistic areas). Anyone can follow these university modules although not enrolled at the university: social network credentials mediate access to the platform. There are no time restrictions on course attending, thus the pace of study is autonomous; in each course there are many practice self-assessment tests and many multimedia contents to explore. Users can download all the resources, which are provided under a Creative Commons license, and allows reuse for non-commercial use, requiring attribution and no derivative works (CC BY-NC-ND). After completing the course, students can attend the exam as soon as they enroll in a university degree course and obtain the corresponding European Credit Transfer and Accumulation System (ECTS). Though the courses enable students to prepare themselves for a university exam, they were expressly designed for high school students, and are also useful to orientate in the choice about which career to start and to let them attend a course in advance, with respect to the standard student path. So, in start@unito the focus remains on high school and their teachers are the main actors. We asked a group of Italian teachers to fill a questionnaire about generic OERs and start@unito ones. In section 2, we will describe the methodology we adopted and, in section 3, we will analyze the results in detail.

2 METHODOLOGY

We started asking ourselves four main research questions:

- 1 Do teachers know OERs?
- 2 How do OERs facilitate their didactics and how do teacher use such resources?
- 3 Which are the preferred ROERs and why?
- 4 Do the online resources provided by the project start@unito help teachers in their teaching?

To answer to these questions, we carried out the following activities:

- Two meetings in presence with secondary school teachers from Piedmont (the Italian region in which Turin is);
- A questionnaire submitted to secondary school teachers of different disciplines.

During the two meetings, we explained the project start@unito: teachers were enthusiast, because the initiative is new and unique in the Italian panorama. All teachers have shown interest in easily usable materials for in-depth activities, for student orientation and for broadening their horizons. They were invited to explore the online resources to autonomously understand which OERs can be useful in their teaching contexts. Finally, they were asked to spread the project to colleagues and especially to their students.

Our second activity, the questionnaire, was distributed via e-mail to our network of teachers, asking them to pass the questionnaire to their colleagues, in order to get more responses from different teachers and subjects. There are many difficulties in reaching a large number of teachers: many of them are not easy to contact, because they have many commitments. Another difficulty is that teachers, in order to fill in the answers, need to take quite a long time to look at the online resources (it takes weeks to students in order to complete a course). The questionnaire answers were left anonymous, we just asked a few details about the provenience and the age of the teachers in order to slightly profile the

responses. We used different kind of questions: multiple choice, multiple selection to Likert scale and free text. The population of respondents work in a high school in Italy and the sample size is 133. Three parts compose the questionnaire: in the first part, teachers were asked about their knowledge and use of OERs, in the second part about their experience with a start@unito course, in the third part about which use of the materials they would adopt with students. The third part mainly contains open-ended questions. The appendix shows all the questions, numbered and recalled in the text of the paper.

3 RESULTS

In the following subsections, we will discuss our overview of OER repositories and the analysis of high school teachers' opinion.

3.1 Teacher profiles

During our survey, we collected answers from 133 high school teachers. Most of them are female (70.7%). Teachers who filled the questionnaire are on average 51 years old, with an average of 24 years of teaching on their shoulders. We tried to involve all kind of high schools: we had 54.5% of answers from teachers in scientific high school as depicted in Fig. 1. The main region of Italy involved is Piedmont (the region of the University of Turin) with 68% of the answers. The rest is from other regions of Italy. Most of them are Math teachers (62%), many teaching Physics, too (34%). There is also a notable presence of human subjects like History (15%) and Italian (12%), with a non-empty intersection between the two topics (8%). Fig. 1 illustrates the subjects of teachers who answered the questionnaire, too.

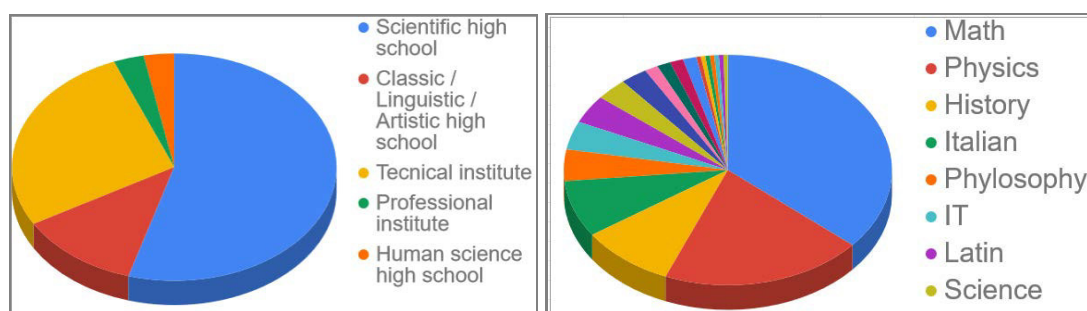


Figure 1. School provenience and subject of teacher who filled the questionnaire.

3.2 Teachers preferred ROERs

The first questions asked to teachers is about their knowledge of OERs; in this section we will briefly describe an overview on ROERs that teachers know and use. We explored the mostly used repositories suggested by teachers in question (4) and provided the reader with remarks.

3.2.1 Khan academy

It is one of the most famous repositories, reported by 25% of the teachers who already use OERs. A non-profit organization provide the online resources and exercises. Lessons, mainly videos, are free, and you need to sign up via social networks to save your progress. According to the overview of courses, there are mainly math lessons, followed by scientific disciplines and humanities. A very good feature of this repository is that there are many languages available. In this way, it is suitable for high school students (our main language of teaching is Italian). Their term of use states that users may not download, distribute, sell, lease, modify, or otherwise provide access to the Licensed Educational Content to any third party.

3.2.2 Moodle

It is not actually a repository. Moodle is one of the most adopted Learning Management System (LMS), designed to provide educators, administrators and learners with a system to create personalized learning environments. 12% of the teachers who use OERs knows and use Moodle. It is open source, and any person in the world can freely download it but is an empty environment: specific online contents need to be built and uploaded. University of Turin adopted Moodle for its e-learning activities, projects, courses and exams. Though it is not a repository, the Moodle Headquarters provided a tool to search online courses (www.moodle.net), but unluckily it is by now quite empty of approved courses. Math and

IT high school teachers in Italy know Moodle because it was part of the national project “Problem Posing & Solving”. The project was cited as a local repository of OERs by 10% of teachers who uses OERs.

3.2.3 Maple

Maple is a powerful Advanced Computing Environment (ACE), a math software that combines a math engine with an interface that enables users to analyze, explore, visualize, and solve mathematical problems. It allows numeric and symbolic computations, geometric visualizations in two and three dimensions and realization of interactive worksheets with embedded components. ACE are ideal tools not only for scientific disciplines, but also for every subject with a scientific approach. Explorative and interactive materials show students applications and tools that are close to the world of work. MapleNet is the online worksheet player. University of Turin developed an integration with Moodle, in order to transform a Maple worksheet file into a Moodle resource for their students and for people involved in its projects. Maple was reported by 8% of teachers who uses OERs.

3.2.4 Coursera

Coursera is an online learning platform that offers courses, specializations, and degrees. It collaborates with many universities all over the world. Many courses are provided, covering all disciplines. There are both courses with a starting date, with classes of users, and courses on-demand, in which users see the materials all at once and attend at their own pace. Sign up is required to attend any course. Coursera was reported by 8% of teachers who uses OERs.

3.2.5 YouTube

YouTube is the most famous video-sharing website. YouTube allows users to upload and view videos, leave comments, and subscribe to users’ channel. It hosts billions of videos. Among all of them, there are many institutional channels with videos provided by universities and other educational institutions, covering all possible disciplines. As an example, since we cited them, Khan academy, Coursera, Maplesoft and University of Turin have their own channel on YouTube. YouTube was reported by 8% of teachers who uses OERs.

3.2.6 Other repositories

The Table 1 reports the ROERs reported by teacher.

Table 1. ROERs reported by teachers.

<i>Repository</i>	<i>Teachers</i>
TED (an organization that posts free talks and conferences online)	8%
Wikipedia (free online encyclopedia)	6%
Treccani (Italian encyclopedia of science, literature and arts)	6%
BBC (British television)	6%
PhET (didactical interactive simulations)	6%
Project Gutenberg (producer of free e-books)	4%

3.3 Usage of OERs

The first question we asked is “(1) Have you ever heard of OERs?” and the majority of teachers answered “Yes” (57%). After this question, we briefly explained what OERs are. The second question is “(2) Have you ever used them in your didactics?” and in this case 40% of teachers stated “Yes”. It looks like no teachers who never heard about OERs use them: data confirm this, because all teachers who answered “No” to question (1) answered “No” to question (2), too. Indeed, there are teachers who already heard about OERs, but did not actually use them (17%). We asked teachers who already used OERs about which resources they use (question (3), with detailed answers in Table 2, and question (4), which we already discuss) and what was the evaluation of their experience (question (5)).

Table 2. Typologies of OERs used by teachers.

Learning environments	75%
Learning paths online	52%
Audio and video resources	73%
Software	38%
Text and publications	46%

Most teachers make use of learning environments of different kind (like online platforms, forum, blog, social media), audio and video resources. This is coherent with the previous experiences the project “Problem Posing & Solving” [7,8,9] as described in the introduction. We evaluated teacher experience about different features of OERs: easiness in the use, relevance to educational objectives, usefulness, accuracy, reusability, accessibility. In all these areas the median of the responses is 4, stating that the overall experience with OERs is good.

3.4 Start@unito OERs

Start@unito is a quite recent project, born in 2018. Thus, question (6) provided us a feedback about the spreading of the project: 76% of the teachers knew nothing about the project before the news of our research. Teachers consulted almost all the active open online courses in start@unito platform. We restrict the selection of courses to those one-year old. We operated this choice because the new open online courses are brand new. Most of the chosen courses are taught in Italian and that is why we delivered our questionnaire only to Italian teachers. Question (8) asked about the agreement with different statements, all of them about the online resources provided by start@unito platform. The answers, reported in Table 3, are very promising, even better than the one about general OERs. However, we must remind that in this case the entire teacher sample is included, even the one who did not know and never used OERs. Probably they recognize the great potentialities of Open Education. It is worthwhile to notice that the median of the sentences “The course materials are interesting” and “The course materials are easily navigable” is 5, while for other statements is 4.

Table 3. Agreement with statements about start@unito resources (1 = Disagree, 5 = Fully agree).

Statement	Average
The course materials are interesting	4.3
The course materials are reusable	4.2
The course materials are suitable for secondary school students	3.8
The course materials are suitable for teacher self-training	4.2
The course materials are suitable to facilitate the enhancement of excellence	3.9
The course materials are suitable for the student's independent study	3.6
The course materials are suitable for the integration of classroom teaching	3.8
The course materials meet the criteria of accessibility for students with Specific Learning Disorders and / or Special Educational Needs	3.6
The course materials help to understand the practical applications of the discipline	3.8
The course materials are easily navigable	4.2

In the course visited by the teacher, not all the resources have the same impact on specific objectives (objectives of the course and objectives of the project). This was the topic of question (9): which resources can help students in achieving specific goals? The overall result shows that, according to teachers, videos are the best resource for achieving in general goals, while on specific goals videos represent the top only on 5 over 11 objectives, most of them regarding students, see Table 4.

Table 4. Which resource is the best for students in achieving these specific goals?

<i>Goal</i>	<i>Best resource</i>
Encourage student involvement	Interactive Lessons and presentations
Encourage review by students	Automatically evaluated tests
Encourage student recovery	Automatically evaluated tests
Encourage students to learn more	Links and external resources
Encourage the presentation of topics in the classroom	Video
Improve teacher training	Links and external resources
Promote excellent students	Links and external resources
Help students with disabilities	Video
Help students with Specific Learning Disorders	Video
Help students with Special Educational Needs	Video
Help students with other difficulties	Video

Finally, we asked teachers an overall judgment on the course they viewed (question (13)) on a 5- point Likert scale. The answer is very positive, with an average of 4.3 (median 4). Moreover, we asked if they think they are going to use these resources for classroom didactics (question (14)): 87% of positive answers. The reason of this relies on the fact that, according to question (15), teachers want to integrate their didactics (81%) and to complement their lessons with further readings (70%).

3.4.1 *Start@unito for teachers and students*

Teachers are the main support for students, and it is very important for a learner to receive adequate support. Question (16) underlines that almost all teachers (99%) would support a student's decision to attend a course in the start@unito project, and the reasons for this are very different, as we saw from remarks (question (17)):

- to broaden students' horizon;
- to improve university guidance;
- to interact with experts;
- to improve students' curricula and obtain the corresponding ECTS;
- to favor digital skills.

All these reasons are mainly related to the transitions to the university world (19% of teachers reported), but there are other remarks about a deeper knowledge of students (15%), an increased interest in the subject (11%) and the usefulness of the project (14%). All these remarks reported by teachers are in line with the objectives of the project.

4 CONCLUSIONS

Our work brought to answers to our research questions. With respect to the first one, Italian high school teachers are not familiar with OERs. They generally do not use them in their daily teaching, even though they recognized the high potentialities that OERs can bring to education. Secondly, teacher who uses OER mix this concept with other ones, like LMS and ACE, too. On the third hand, there is a large need of OERs in schools, it is important to connect teachers with repositories and increase the number of online resources from time to time, according to different learning requirements and to fast development of technologies. On the fourth hand, start@unito contains many useful resources to fulfill the need of OERs, because the answers we obtained from the questionnaire are positive and it seems that in the close future many users are going to access our platform: teachers to download and share resources, students to improve, deepen and expand their knowledge planning their start of the university career. Because OERs repository are very well developed for English speakers, another important key feature of start@unito OERs is the language as in most high schools the teaching language is Italian. On the other side, we recognize the importance of internationalization, also developing new courses entirely taught in English. There is still a lot to do, and the field of Open Education is very fertile.

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APPENDIX

The questionnaire

- (1) Have you ever heard of OERs? (Yes/No)
- (2) Have you ever used them in your didactics? (Yes/No)
- (3) [If Yes to (2)] Which typology of OERs do you use? (Multiple selection)

- (4) [If Yes to (2)] Can you write down some examples of OERs? (Free text)
- (5) [If Yes to (2)] How do you evaluate your experience with OER in the following areas? (Easiness in the use, relevance to educational objectives, usefulness, accuracy, reusability, accessibility) (1 = poor, 5 = excellent)
- (6) Before you were asked to complete this questionnaire, did you already know about the start@unito project? (Yes/No)
- (7) Which online course of the start@unito project has consulted? (Multiple choice)
- (8) On a 5-point scale, how much do you agree with the following statements regarding the course materials? (The course materials are interesting, the course materials are reusable, the course materials are suitable for secondary school students, the course materials are suitable for teacher self-training, the course materials are suitable to facilitate the enhancement of excellence, the course materials are suitable for independent study of the student, the course materials are suitable for the integration of classroom teaching, the course materials meet the criteria of accessibility for students with Specific Learning Disorders and / or Special Educational Needs, the course materials help to understand the practical applications of the discipline, the course materials are easily navigable) (1 = Disagree, 5 = Fully agree)
- (9) What resources of the course you visited could help you achieve the following educational goals? (Multiple grid selection) (Encourage student involvement, encourage review by students, encourage student recovery, encourage students to learn more, encourage the presentation of topics in the classroom, improve teacher training, promote excellent students, help students with disabilities, help students with Specific Learning Disorders, help students with Special Educational Needs, help students with other difficulties) (Videos, interactive Lessons and presentations, texts, exercises, automatically evaluated tests, links and external resources, none of the resources)
- (10) What additional goals can be achieved through the use of online course materials? (Free text)
- (11) How would you use the online course materials? (Free text)
- (12) On a 5-point scale, how much do you agree with the following statements regarding the course objectives? (The course favors university orientation, the course encourages the learning of an independent study method, the course favors the transition from secondary school to university, the course helps the student to anticipate the university career) (1 = Disagree, 5 = Fully agree)
- (13) Overall assessment of the usefulness of the course viewed. (5-point Likert)
- (14) Do you plan to use the materials of the course you have viewed for classroom teaching? (Yes/No)
- (15) What is your goal of using the materials of the course you have viewed for classroom teaching? (Multiple selection)
- (16) Would you support a student's decision to attend a course in the start@unito project? (Yes/No)
- (17) For what reason? (Answer both in the affirmative and in the negative case) (Free text)
- (18) [If Yes to (16)] How would you support your student in taking a course in the start@unito project? (Free text)
- (19) Comments and remarks on the browsing experience within the start@unito project. (Free text)