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# OPEN EDUCATIONAL RESOURCES (OER) AND UNIVERSAL DESIGN FOR LEARNING (UDL): A WINNING COMBINATION TO ENHANCE HUMAN DIVERSITY AND UNIQUENESS

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## Abstract

Open Educational Resources (OER) for studying Latin language, literature and culture are rare. Even rarer are those created respecting the principles of the Universal Design for Learning (UDL), an educational framework attentive to the employment of methods, tools and strategies that offer everyone equal opportunities to learn. The UDL has inspired the ideation and creation of *Latin Fables* (see <https://www.oercommons.org/courses/latin-fables>), an OER for Latin didactics that makes it possible to discover Phaedrus's most notable fables. *Latin Fables* is a responsive web-app designed to set up a digital learning experience that is intrinsically inclusive, integrating and enhancing several strategies that are usually employed in a specific manner for people affected by learning disorders and disabilities. This paper presents *Latin Fables* as a didactic tool as well as a reference model for current and future teachers as they develop instructional design abilities and acquire digital skills in producing digital resources. This concept was tested during the *Lab of Instructional and Learning Technologies* for the degree course in *Primary Teacher Education* of the University of Turin, and was well-received by the students who engaged in active participation.

**Keywords** - Educational Technology, Universal Design for Learning, Open Educational Resources, Learn Latin, Phaedrus

## 1 INTRODUCTION

Planning universal education means ensuring equal learning opportunities for all individuals. It means taking into consideration the variability of learning styles, different action and expression abilities, and the different motivations of the learners. It means offering flexible and accessible solutions, avoiding dispensing measures, compensations and subsequent adapting interventions. It means eliminating classifications or labels that might undermine the very concept of inclusion.

### 1.1 Universal Design for Learning (UDL)

Universal Design for Learning (UDL) is a widely acknowledged framework that provides guidelines on how to create a learning experience that meets the needs of all learners. Its aim is to ensure that all learners can access learning opportunities and engage in purposeful, enriching and challenging activities. UDL is based on scientific insight into how humans learn, and was conceived by the CAST - Center for Applied Special Technology, an American nonprofit research and development organization (see <https://www.cast.org/impact/universal-design-for-learning-udl>).

According to the UDL methodology, it is not individuals who lack something that could otherwise enable their learning, but rather the curricula, tools and didactic activities that are not inclusive. In fact, they often overlook the actual needs of students with different abilities, motivations and behaviors. This situation underscores the need to plan a didactics that is no longer targeted towards a generic *standard learner*, but has a *mosaic target*, therefore not requiring any subsequent adaptations. In order to meet the needs of *all* students, the UDL relies on three principles, conceived on the basis of studies in the field of learning

sciences, including neuroscience, human development science and evidence-based education (CAST, 2021):

1. *Provide multiple means of representation*, working on what people learn. This means offering information in a variety of ways (e.g., auditory, text, visual, demonstrations) in order to guarantee equitable accessibility as well as to encourage clarity and comprehensibility across all learners. The neural network involved is the recognition network, which enables one to recognize, identify and understand concrete or abstract concepts.
2. *Provide multiple means of action and expression*, working on how people learn. This means offering the opportunity to plan and organize one's own learning process and to display one's knowledge in different and personalized ways, by developing strategic skills and by using a wide range of metacognitive strategies. The neural network involved is the strategic network, which is related to selective attention, planning, organization, and self-monitoring.
3. *Provide multiple means of engagement*, working on why people learn. This means considering the learners' different backgrounds of knowledge and experience, enabling them to make relevant connections between what they learn and what they already know. It is essential to propose different strategies to capture interest, support efforts and stimulate self-regulation.

The neural network involved is the affective network, which regulates interest, attention, motivation, and perseverance.

The UDL's roots can be found in Universal Design, a principle of architectural design formulated by the American architect Ronald Lawrence Mace during the 1970s. Mace, founder of the Center for Universal Design at North Carolina State University, aimed to promote barrier-free architecture, accessible to all people. The idea is that a building that allows a disabled person to enjoy a space also benefits a person who is pushing his/her child in a stroller or a worker who is transporting items in a cart. Diversity becomes a resource and is an opportunity for improvement. Furthermore, planning for an accessible space at the beginning is more effective than attempting to retrofit an inaccessible space. Additional ethical origins can certainly be found in those special education legislations that underlined the right of all students to a free and adequate public education (Hitchcock *et al.*, 2005).

## 1.2 Universality, Accessibility, Digital Openness

Universal digital design refers to the adoption of resources and tools, mostly web applications, that provide a series of functionalities and strategies that guarantee all individuals equal opportunities of access. These features and strategies, selected at the design stage, are often precisely aimed at addressing the needs of specific individuals (*assistive technologies*) and are considered functional for the creation of "separate solutions". However, from a universal perspective their implementation not only ensures access to a wider audience but also enhances the learning experience of any learner.

A key requirement for creating a universal digital resource is compliance with the Web Content Accessibility Guidelines (WCAG) designed by the World Wide Web Consortium (W3C). Providing text-to-speech, inserting alternative text for images and links, adopting a good chromatic contrast and organizing content using headings increase the possibility of enjoying digital content (Coolidge *et al.*, 2018). It is clearly a good basis for working on multiple means of representation (Ableser and Moore, 2018). To validate the accessibility of a web application it is possible to use tools such as Wave (see <https://wave.webaim.org>).

In order to provide different means of action, expression and engagement, it is essential to include interactive content that has a high rate of personalization and offers diversified feedback. Its production can rely on frameworks that pay attention to accessibility and user experience, such as H5P (see <https://h5p.org>). H5P guides the user in the creation of HTML5 content and is integrated in the most popular Content Management Systems (CMS) and Learning Management Systems (LMS), such as Wordpress, Drupal, Moodle, Blackboard and Canva. The more than 50 types of interactive content have been designed to be in line with WCAG 2.1 (level AA) and are tested at each update with various screen readers, keyboard navigation, zooming, code inspection and more (see <https://documentation.h5p.com/content/1290410474004879128>). H5P is open source.

The design of universal digital tools fosters an open learning culture and supports the fundamental right of every human being to benefit from free information and education. People of different origins, ages and backgrounds can learn more about the world around them through free access to tools and resources that enhance their daily experience.

This principle of inclusivity rather than exclusivity and the focus on eliminating barriers connects the Universal Design for Learning to the Open Educational Resources (OER) (Coleman and Snoek-Brown, 2019). OERs are “teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions” (UNESCO, 2017). For these reasons, the “universal OERs” offer a chance to develop flexible learning experiences by also contributing to the construction of online shared knowledge. It should also be noticed that the learning material that cannot be altered, remixed, or redistributed cannot be considered “open”.

It is difficult to classify digital educational resources and tools in a binary manner as *universal* or *non-universal*. Rather, it is possible to place them on a continuum of universality, ranging from less inclusive to solutions that are increasingly able to meet the needs of any individual. Traces of universal design can be found in the platforms used daily by educational institutions and universities. One example is the *Immersive Reader* feature in Microsoft Office tools, such as Word or Teams. *Immersive Reader* improves reading comprehension and writing abilities for all people and provides multiple features. These include: picture dictionary; text-to-speech with multiple speed levels and text highlighted simultaneously; text options such as spacing, font, themes and size; grammar options such as syllable division and highlighting of parts of speech.

## 2. A UNIVERSAL OER: *LATIN FABLES*

The UDL inspired the ideation of *Latin Fables* (see <https://fables.lingualatina.education>). *Latin Fables* is an OER for Latin didactics that makes it possible to discover Phaedrus’s most notable fables. The goal is to create a digital learning experience that is intrinsically inclusive, integrating and enhancing several strategies that are usually employed in a specific manner for people affected by speech-language impairments, learning disorders and disabilities (Iannella, 2020).

The project was created for free, during the *Assistive Technologies in Education* course at the University of Pisa (I semester, autumn/winter 2017), held by professors Susanna Pelagatti and Maria Claudia Buzzi. It was created from an idea of Alessandro Iannella and Sofia Ghisellini and developed thanks to the expertise of Sara Marani and the contribution of Margherita Matellini, Nicola Giannini, Clizia Cavaglioni, Camilla Commodaro and Benedetta Viti.

*Latin Fables* is developed in the form of a responsive web application. Its storytelling process is structured in four steps: *Watch*, *Listen*, *Read* and *Act*. The navigation can take place in a free or sequential order. The featured fables are *The Fox and The Grapes*, *The Fox and The Stork*, and *The Fox and the Crow*.

*Latin Fables* is designed to promote not only the knowledge of the narrative content, but also the acquisition of phono-morphological abilities in Latin, Italian and English. The user interface displays the constant pairing of text with pictograms (Fig. 1), taking a cue from the logic of Augmentative Alternative Communication (Cafiero, 2009; Beukelman and Mirenda, 2014).

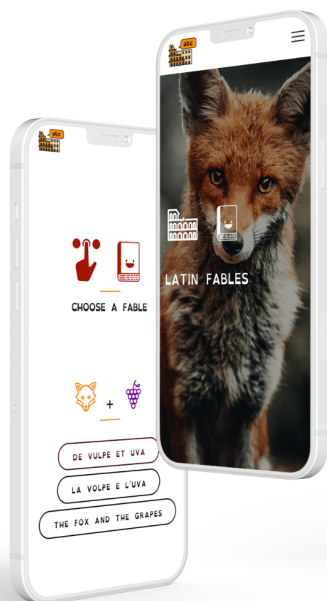


Figure 1 - *Latin Fables: Home page (mobile version)*

The first section, *Watch*, presents an animated version of the fable, paired with a translation in Italian Sign Language (LIS).

The second section, *Listen*, presents a reading by human voice and one by vocal synthesis, paired with the text of the fable. The audio tracks are downloadable.

The third section, *Read*, shows the entire text of the fables paired with pictograms, either created specifically or selected from an open source symbol system, the Aragonese Portal of Augmentative and Alternative Communication (ARASAAC; see <https://arasaac.org>). The parts of speech can be filtered in such a way as to help practice vocabulary and specific morphological abilities, or to reduce the complexity of the symbolization. This feature allows personalization based primarily on the user's age, language proficiency or functional performance (Fig. 2).

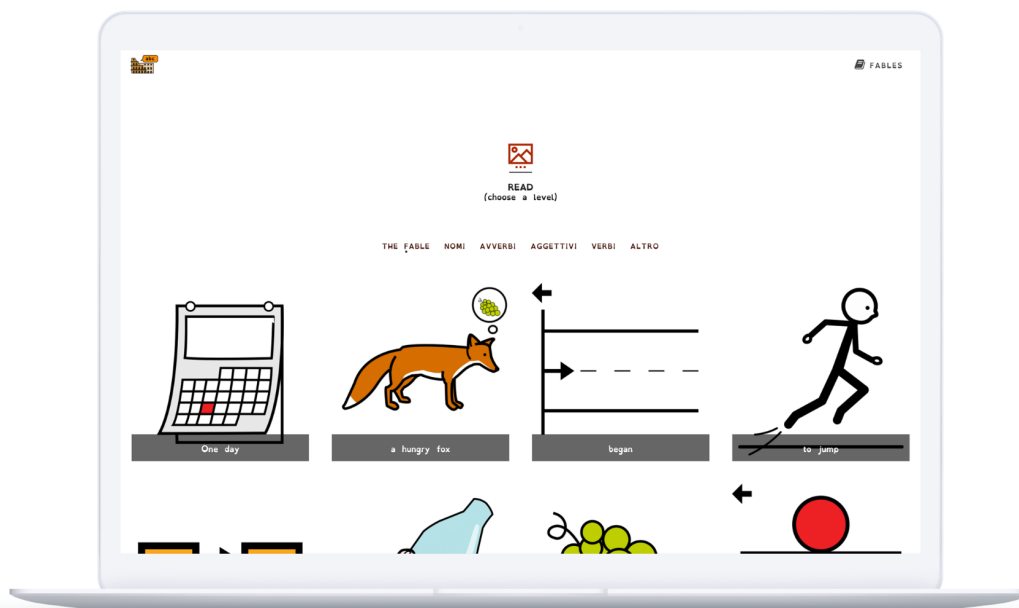


Figure 2 - *The Fox and The Grapes: Read section*

The fourth and last section, *Act*, gives learners the opportunity to interact with the text content, through games and activities realized with the open source tool H5P. Among the interactive content offered: an interactive version of the animated fable with additional content and branching; a memory game to associate words, images and definitions; an exercise based on vocal recognition; an image with hotspots (Fig. 3).

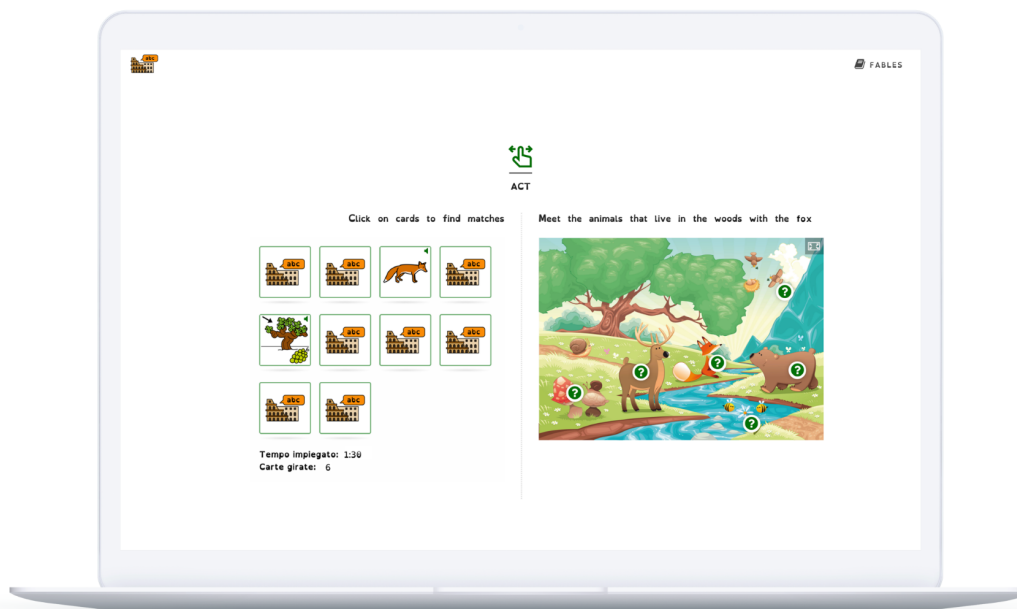


Figure 3 — *The Fox and The Grapes: Act section*

Text readability and legibility are optimized thanks to the employment of the open source font OpenDyslexic (see <https://www.opendyslexic.org>). Some accessibility standards in accordance with WCAG 2.1 have also been adopted, with the aim of facilitating integration with some assistive technologies and the needs of specific individuals. Examples are the addition of alternative texts for images and links, the setting of decorative elements, the presence of headings and the use of a color contrast that respects the principles of the Color Universal Design (CUD). The website is responsive and can be accessed from any device.

### 3. A MODEL OF ACTIVITY TO DEVELOP DIGITAL SKILLS

The recent COVID19 pandemic is an appropriate context in which to consider and examine the digital proficiency of teachers and educators. This has been emphasized for years by the European Framework for the Digital Competence of Educators (DigCompEdu), which describes what it means for educators to be digitally competent. The DigCompEdu framework is “directed towards educators at all levels of education, from early childhood to higher and adult education, including general and vocational education and training, special needs education, and non-formal learning contexts” (Redecker, 2017). The DigCompEdu considers six different competence areas which can be useful for guiding policy and adapting training programs (Fig. 4):

- area 1 regarding the professional environment;
- area 2 on sourcing, creating and sharing digital resources;
- area 3 on managing and orchestrating the use of digital tools in teaching and learning;
- area 4 on digital tools and strategies to enhance assessment;

- area 5 on the use of digital tools to empower learners;
- area 6 on facilitating learners' digital competence.

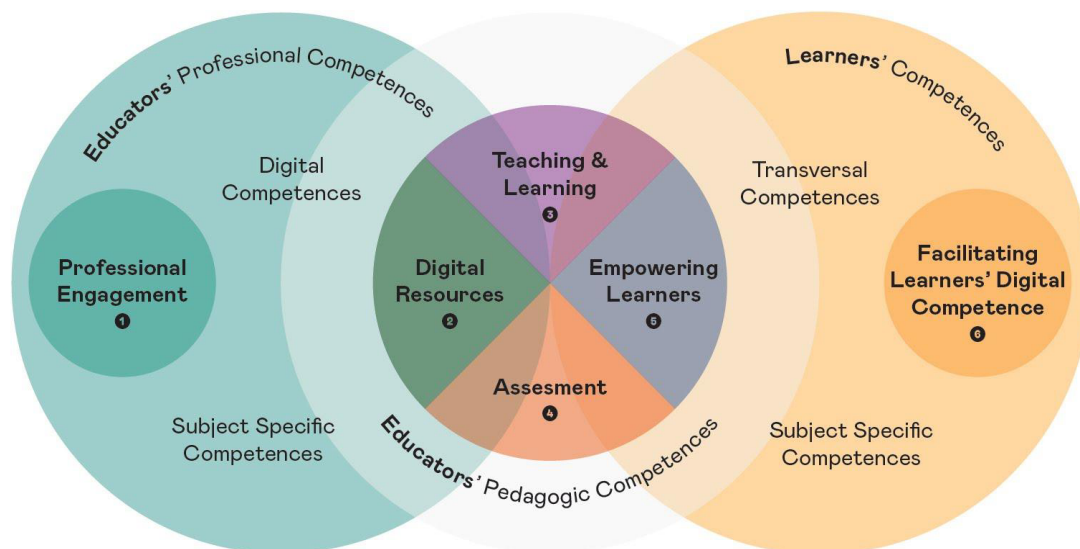


Figure 4 — *The European Framework for the Digital Competence of Educators (DigCompEdu)*

The digital skills of the teacher and the educator are also the focus of several training models. Among them, the Technology, Pedagogy and Content Knowledge (TPACK) model illustrates how a teacher must be competent in the intersection of three types of knowledge: pedagogy, disciplinary content, and technology (Koehler and Mishra, 2005; Fig. 5). Its roots lie in the studies of educational psychologist Lee Shulman (1986), who was attentive to the need to train teachers to combine knowledge related to the teaching discipline with appropriate pedagogical strategies. The TPACK model argues that in today's teaching-educational context, technology should not be perceived as a stand-alone element but as a key component of a larger picture. Therefore, its use must be versatile and dynamic, adapting to different factors such as the individual educator, the specific grade level, the peculiarities of the discipline, the class demographics and the technical and financial means available. In Italy, the TPACK model seems to be contemplated in the qualification process of teachers, known as *Formazione Iniziale e Tirocinio (FIT)* and introduced by DL n. 5929 of April 13, 2017 (Di Blas, Fabbri and Ferrari, 2017).

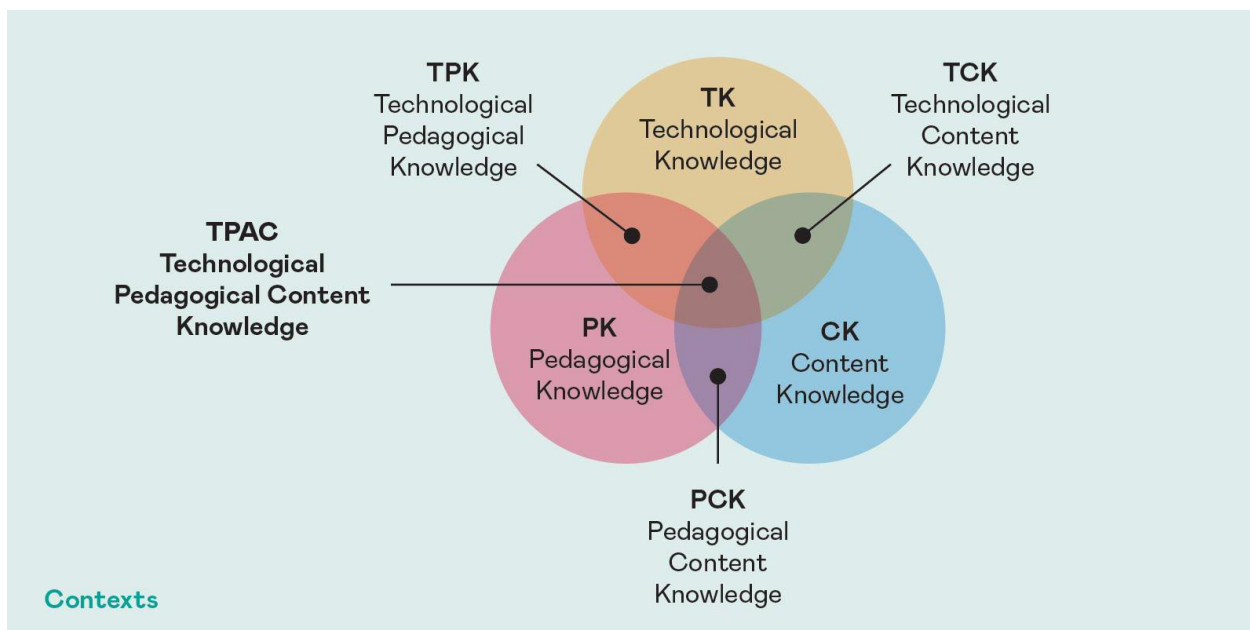


Figure 5 — *The Technology, Pedagogy and Content Knowledge (TPACK) Model*

Creating a universal web application on the model of *Latin Fables* is a good strategy for practicing universal instructional design skills and acquiring digital skills in the field of digital resource production. This proposal, in line with the frameworks presented, has been adopted within the single-cycle degree course in *Primary Teacher Education* at the University of Turin, during the *Lab of Instructional and Learning Technologies* (third trimester, winter-spring 2021). The degree program is for future teachers in Italian preschools and elementary schools.

The *Lab of Instructional and Learning Technologies* was held in three rounds, entirely via distance learning. Each round was organized in four lessons of 4 hours each. To carry out the lessons in synchronous mode, we used the Cisco WebEx Meetings web conferencing platform and, in particular, the *breakout rooms* feature, able to facilitate group work. A dedicated e-learning course, within the Moodle platform of the University, was used to access the didactic material and to perform some activities.

The 121 students, divided into groups of three to four components, learned how to create an OER in accordance with the principles of UDL, i.e., usable by an audience as diverse as possible and dedicated to a specific textual content, collectively determined. Ten groups chose to focus on songs from Disney films (see <https://sites.google.com/view/le-canzoni-dei-film-disney>), eleven groups on nursery rhymes by Italian writer and pedagogue Gianni Rodari (see <https://sites.google.com/view/le-filastrocche-di-rodari>) and ten groups on songs and nursery rhymes from Melevisione, an Italian children's television program (see <https://sites.google.com/view/la-melevisione>). Group activities were both collaborative and cooperative in nature (Bruffee, 2010).

The first lesson included an introduction to Universal Design for Learning and Open Educational Resources. Students were able to interact with some tools developed specifically for teachers — such as checklists and self-assessment rubrics — and observed a set of digital resources aligned to UDL standards. Next, the Augmentative Alternative Communication was introduced and students were shown how the ARASAAC symbolization tool works. In groups, students converted the chosen text into symbols, employing qualifiers useful for characterizing specific parts of speech (e.g., symbols for past and future tenses, plurals, pronouns, negations, comparative adjectives).

During the second lesson, students became familiar with the structure and features of a web page. They acquired concepts such as *layout* and *template* and were introduced to the minimum accessibility requirements for web pages according to WCAG 2.1. These included: organization of page content and use of headings; adding and managing links; color contrast for text and images; images with functional or decorative purpose; legibility and readability. Next, they were shown how to create a website with Google Sites (see <https://sites.google.com>) taking into account the accessibility requirements mentioned above. In groups, students created a one-page website with Google Sites dedicated to the chosen text, using the



*Latin Fables* model and structuring the layout in four sections (*Watch, Listen, Read, Act*). The graphic choices were made freely, but still in line with WCAG 2.1. They inserted the previously symbolized text, paying attention to set the different images as functional or decorative. Finally, they took care of the *Watch* section by choosing an appropriate video from the web or creating one specifically.

In the third lesson, students learned how to produce three types of interactive content using the H5P framework: an audio player, a memory game, and an image with hotspots. In groups, they produced such content based on the chosen text. The audio player was used to insert into the website a text reading with human voice and voice synthesis, previously produced using recording devices and free text-to-speech tools. The memory game and image with hotspots were placed in the *Act* section. Some students preferred to create different types of interactive content than those proposed, such as *flashcards*, dictation activities, and drag-and-drop exercises.

During the last lesson, students presented their web pages to their colleagues, justifying the choices made during the design and implementation phases. Using the Moodle *workshop* activity, they filled out an evaluation rubric produced by the teacher in order to carry out an anonymous peer evaluation of the works. In addition to the evaluation rubric, the students added a free commentary to motivate their choices and highlight strengths and weaknesses. Members of each group evaluated those of two other groups. Note that the evaluation rubric was shared at the beginning of the lab in order to correctly direct the design and production activities.

Students received a rating for their work (/15), the result of the average of the ratings expressed by peers, and a rating for the objectivity of their judgment (/15), calculated on the basis of comparison with a hypothetical absolutely fair assessment (see [https://docs.moodle.org/310/en/Using\\_Workshop](https://docs.moodle.org/310/en/Using_Workshop)). Ratings for the papers (118) and ratings with respect to objectivity of judgment (116) were overall positive (mean 13.6, median 13.75; mean 13.14, median 13.59). In both cases, the distribution was slightly negatively skewed, concentrated on lower but still more than fair values. None of the ratings for the works was below 10.3/15, while five ratings with respect to objectivity of judgment were below the threshold of sufficiency (9/15). Three of these are obvious outliers, presumably due to carelessness in completing the assessment rubric. There is no linear correlation between ratings for the work and those for the objectivity of the judgment. Some differences were noted between the different laboratory rounds: the students of one round stood out for a greater dispersion of assessments with respect to the objectivity of the judgment, centered on lower values (four of the five total outliers were in this round).

The evaluation had simply a formative/meta-cognitive purpose since the lab only provides a pass/fail assessment. Regarding the proposed activities, the feedback from the students was overall positive. Students especially appreciated the possibility of combining theory and practice and being able to independently create digital content that could be used during their internships or future teaching career. Many of them remarked that they were able to learn while having fun. Some pointed out that they felt subjected to a strong cognitive load, due to a too-fast approach to teaching methodologies and new digital tools. The above judgments were not collected through a questionnaire but are the result of the opinions expressed by the students during a concluding wrap-up session, and via e-mail, in the days following the last lesson — the goal being not to collect data, but to encourage a dynamic and fruitful conversation.

#### 4. CONCLUSIONS

This paper promotes a didactic-operational approach aimed at identifying and eliminating possible weaknesses in teaching tools, resources and curricula. The reader is invited to reverse their perspective regarding the traditional way of looking at instructional design and methodological proposals for specific learners. Thanks to the centrality given to the Universal Design for Learning and to the concept of Open Educational Resource, we attempted to encourage a revolution in the way of thinking, centered on flexibility and openness, thus shaping a truly inclusive paradigm.

The universal OER *Latin Fables* was presented as both an educational tool and a reference model for developing instructional design skills and digital proficiency. Initial testing, as part of the training of future teachers, was quite successful.

In the context of the COVID-19 pandemic, it is even more important to renew the invitation, previously expressed on a different occasion (Iannella, 2020), to create content and tools that set the conditions for a didactic and organizational intervention on a wider scale, with no need for adjustments and no categorizations. Collaboration in order to create universal OERs is the first step.

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