CHAPTER 3:
A Case Study of Open Educational Resource Implementation at Notre Dame University-Louaize, Lebanon

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Abstract
Considering the recent paradigm shift in education brought about by the Covid-19 pandemic, educational institutions have shifted to optimizing the use of technology for distance teaching and learning. This shift has propelled educational institutions worldwide to experiment with innovative teaching and learning methods—a de facto measure employed to ensure educational continuation previously disrupted by pandemic-related closures. Lebanon is not an atypical case; in addition to the pandemic, closures have been inflicted on the education sector by the events of October 17, 2019, and the unprecedented economic meltdown. Against this backcloth, the current chapter reports the findings obtained from a case study conducted at Notre Dame University-Louaize (NDU) in Lebanon on the use of Open Educational Resources (OER) as a depository of open content provision for creating a course amalgamating synchronous and asynchronous teaching, communication, and collaboration via the university's Learning Management System (LMS). The proposed course involved transforming OER content into interactive SCORM placed on the LMS to widen students' active learning, engagement, and interactivity, with an eye to having the learners gain 21st-century competencies. The perceived learning experience of 60 students enrolled in Introduction to Computers (CSC201) at NDU is documented below, reflecting on the utility of the proposed course model in enhancing student learning. The study concludes with highlights on the usefulness of this OER-based model in reducing textbook costs and providing students with equal opportunities for access to learning.

Keywords:
e-Learning, OER, technology, NDU, LMS, SCORM, Covid-19 pandemic, distance learning, active learning, synchronous learning, asynchronous learning, creative commons.

3.1 Introduction

The post-Covid-19 educational system should be radically reshuffled by integrating innovative tools, ideas, and initiatives. Post-pandemic learning requires innovative solutions, and thus, at the November 2021 conference, UNESCO posed the following questions: "Shall the World get back to normal? Which wasn't really normal in terms of Human and Basic rights?" (UNESCO, 2021). Academic institutions should not go back to the “old” normal, but should follow visions redefining and refining a future for our young generations that respects basic human needs and fundamental rights.

A 2021 study entitled "The Transformation of Higher Education After the COVID Disruption: Emerging Challenges in an Online Learning Scenario" focused on education. It claimed that "[h]igher education institutions are undergoing radical transformations driven by the need to digitalize education and training processes in record time with academics who lack innate technological capabilities for online teaching" (García-Morales et al., 2021). In other words, one of the core problems higher education institutions faced because of the COVID disruption was the paradigm shift in pedagogy and delivery methods, to which academia had to respond efficiently within a very short period.

During the shift from traditional to online pedagogy, discussions arose concerning the nature of online learning. Online learning should not emphasize delivering content online only, nor should it be considered a tool used separately from pedagogical approaches. Online learning has been conceived as an expertise that requires competencies in teaching (Branch & Dousay, 2015) with an eye for 21st-century skills, including critical thinking and problem-solving. Subsequently, if online pedagogical approaches are to be a common teaching method in academic institutions, virtual teaching methodologies will have to be reconceived to optimize the usage of the dedicated platforms.

In Lebanon, the initial process of adapting to online teaching was encumbered by the country's lacking infrastructure. According to Kamal Abouchedid (2020), power outages, poor connectivity, and limited bandwidth frequently disrupted online sessions. The complex situation thus necessitated the use of asynchronous teaching

methods, such as pre-recorded sessions and Learning Management Systems, in our case Blackboard or Moodle. Technology has thus provided faculty members the opportunities to overcome debilitating hurdles, enriching the teaching and learning experience.

Despite the abrupt shift to online learning shift and the various economic and political difficulties countries such as Lebanon were facing, institutions and faculties' efforts elevated the standards of teaching. From asynchronous, pre-recorded lessons to live classroom sessions and independent projects, the current teaching curriculum has acquired diverse methodologies that may have existed before the pandemic but were previously not implemented. According to Dian Schaffhauser, the rapid use of online classrooms during the COVID-19 pandemic has led to an increased adoption of online resources (Schaffhauser, 2020). In the article entitled "Teaching with OER during pandemics and beyond," Jennifer Van Allen and Stacy Katz observed that the potential of OER to improve equity in learning beyond the pandemic is compelling. They also referred to the Creative Commons blog notes which stated that "[o]pen education is not a short-term fix to a passing problem, it is a long-term solution to ensuring equitable, inclusive access to effective educational resources and learning opportunities" (Van Allen & Katz, 2020). To achieve this type of access, Van Allen and Katz urge educators to adapt, reuse, or adopt OER to increase student access to learning materials and maximize their engagement and learning experiences.

In this chapter, the OER movement at the regional, national and international level is highlighted. Then the methodology adopted, research question & steps for proper OER implementation within Notre Dame University-Louaize are examined. Finally, some recommendations are shared based on findings and analysis.

3.2 Literature Review

UNESCO defines Open Educational Resources (OER) as "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, 2021). Those resources have gained worldwide attention in recent years as means of providing free and accessible educational materials. UNESCO's UNESCO on OER

built on the Ljubljana OER Action Plan 2017[30] to mainstream these resources in order to help all Member States to create inclusive knowledge societies and achieve the 2030 Sustainable Development Goals (SDGs). The main SDGs that OER has the potential to help achieve are: SDG 4 (Quality education), SDG 5 (Gender equality), SDG 9 (Industry, innovation, and infrastructure), SDG 10 (Reduced inequalities within and across countries), SDG 16 (Peace, justice and strong institutions) and SDG 17 (Partnerships for the goals) (UNESCO, 2019). According to the 2020 EDUCAUSE Horizon Report on Teaching and Learning, OER is rapidly expanding far beyond the traditional textbook boundaries (O'Brien, 2020). Within the framework of this expansion, OER initiatives have been launched by governments, educational institutions, and non-profit organizations.

Daniel Otto complimented UNESCO's declaration in his article entitled "Adoption and Diffusion of Open Educational Resources (OER) in Education: A Meta-Analysis of 25 OER-Projects" (Otto, 2019). In his article, he presented the findings of a meta-study that critically reviewed 25 state-funded OER projects located in Germany. Based on his findings, he declared that OERs are frequently being used in all areas of education, and they cannot be disregarded in the context of teaching and learning. In parallel, in the EDUCAUSE report referred to previously, John O'Brien stated that, despite an increase in available resources, most students and faculty remain unaware of OER. He added that, although those numbers are gradually improving, institutions still have the duty of educating faculty and students on the use of OER (O'Brien, 2020). Assaf et al. (2022) also raised this issue in their article entitled "Promoting the full potential of Open Educational Resources (OER) in the Lebanese educational community" (Assaf et al., 2022). They observed that, although a number of the surveyed instructors had previous knowledge of OER, they misunderstood the concept of OER due to their lack of awareness of open licenses.

In a recent study entitled "Current state of open educational resources in the Arab region: an investigation in 22 countries," the analysis of the obtained results showed that OER progress is inconsistent within the Arab countries, several of which still lack behind in incorporating these resources in their education systems (Tlili et al., 2020). The quality of the available OER is also an issue, as reported by Maha Bali, associate professor of practice at American University in Cairo, who mentions that Egyptian students generally lack access to high-quality textbooks, and those that are

[30] https://www.oercongress.org/woerc-actionplan/

available are usually expensive and written in English, not Arabic (Koenig, 2020). Furthermore, O'Brien considered that the cost savings generated from OER use are significant. He stated that students spend roughly $82 to $100 per textbook, and textbook purchases are sometimes delayed due to their prices. Moreover, some students elect not to purchase textbooks, while others consider textbook prices as the deciding factor for choosing a major, and others still choose to drop their courses due to their inability to fund the necessary materials (O'Brien, 2020).

On the Lebanese national level, according to the National Educational Technology Strategic Plan (2012)[31], one of the recommended actions to be executed during the period between 2012 and 2017 was to adopt a concerted approach towards developing, procuring, and using high-quality digital content. It was also suggested to build a national repository for educational resources, which are either produced or curated in alignment with the Lebanese curriculum. The strategic plan also advised classifying those resources according to specific metadata and making them accessible to the educational community; nevertheless, these plans were not executed until March 2020 when they were implemented as a response to COVID-19. Moreover, few resources were published and made openly accessible - for a limited time only - and this excluded the possibility of downloading or sharing them (Assaf et al., 2022).

In recent years, Lebanese education institutions have become increasingly interested in OER, though it was not until the US State Department's initiative that actions started to solidify. The program, entitled "On-Demand Exchange Program Promoting the Development of Open Educational Resources in the Middle East and North Africa (MENA)," invited MENA region experts to learn about the Open Book Project, after which a non-governmental organization, OER Lebanon, was launched. Its mission is to promote the benefits of OER to local universities, seeing it as a reliable and accomplished alternative that provides equal opportunities to students regardless of racial, religious, and economic backgrounds.

At the 2015 Creative Commons (CC) Summit, representatives of OER Lebanon, Dr Fawzi Baroud and Dr George Abdelnour, explained that the organization was devised to address pressing problems in the Lebanese educational sector, the first of which is the steep cost of higher education due to its nature as a primarily private

[31] https://tech.ed.gov/files/2017/01/NETP17.pdf

sector. Due to the difference in quality between the private and public education systems, the latter became a minority rarely sought after amongst the citizens. However, private primary, secondary, and higher education tuition fees are relatively expensive compared to the average Lebanese household's income; considering that this cost is on a rising curve, alternative resources such as OER aid in managing this increase. Another problem that OER Lebanon seeks to address is the need for Arabic language resources; as such, it sought to tailor established resources to the needs of the region. Thus, higher education institutions (HEIs) formulated ways to implement OER throughout faculties and included it in their strategic plans. In parallel, IT departments conducted workshops for faculty members, students, and librarians to introduce them to CC and OER. At a later stage, advanced seminars and workshops were conceived to help diverse attendees learn how to create and curate resources. Committees dedicated to the initiative also drafted policies and strategic reports that standardized OER usage in private and public education. Likewise, OER advocates such as Dr. Fawzi Baroud held meetings with the Ministry of Education and Higher Education (the MEHE) to discuss plans concerning the OER initiative. Furthermore, HEIs formed clubs that brought together students and faculty members alike that worked alongside committees to raise awareness.

OER Lebanon initiatives were nevertheless met with resistance at the faculty, administrative, and ministry levels due to the misconceptions concerning the quality of the resources. HEIs feared that, due to the reduced cost of OER, the quality would not be up to par. Thus, OER Lebanon scheduled discussions concerning quality control and student performance in courses that implemented these resources. The strategic document helped alleviate these concerns, as it covered sets of policies and procedures that would govern the integration and adaptation of a broad range of OER resources.

3.3 Methodology

The case study conducted in this paper sought to share the implementation and delivery of OERs to CSC201 students. Subsequently, the findings analyzed are based on student perceptions, feedback, and preferences about online learning via OER. The case study’s aim is to validate the research question by testing the effectiveness of those resources and the delivery method used to overcome the obstacles related to the pandemic and the economic crisis.

The research followed the quantitative method in collecting and analyzing data. Only one open-ended question was included in the Microsoft Forms survey that catalogued the students' remarks about their experience. The questionnaire consisted of seven sections, with the first section targeting students' feedback about online learning and OER. In the second section, the students were asked to evaluate their attitude toward the use of OER in the course on a Likert scale from 1 to 5, where 1 designated "strongly disagree" and 5 meant "strongly agree." In the third section, they were asked to rate their experience with the presentation of OER in SCORM format on Blackboard. In the fourth and fifth sections, they had to rate the quality of the resources, as well as the effectiveness of the methods of instruction and assessment used in the course. As for the sixth section, there they were asked to rate how likely they would choose a course that adopted OER over one that used a printed textbook in the future. Finally, in the seventh section, we collected personal and general information about the students, to provide context to their answers. The data was downloaded from MS Forms to Excel, which was then organized and sorted by question, then subjected to statistical analysis in Excel.

The survey was first shared with 3 faculty members from different backgrounds and a statistician to check its validity pedagogically and statistically. Subsequently, the survey was amended accordingly and disseminated online in the diverse sections of the course on the university Learning Management System (Blackboard). 51 out of 60 students registered in the two sections of the course responded to the survey.

3.4 Research question and objectives

The present case study aimed to highlight an initiative to implement OER at Notre Dame University-Louaize, Lebanon, specifically in the course entitled "Introduction to Computers" (CSC201). Through this study, we sought to answer the following research question: Will OER provide opportunities to faculty and students to overcome debilitating hurdles caused by the Covid-19 pandemic, especially during an economic and financial crisis, and help them to ensure teaching and learning continuation?

Various related questions arose from our initial question:

- Will online learning expand the students' scientific knowledge via access to OER?
- Will the use of OER improve the quality of the learning experience?

- Will online learning positively affect students' self-paced learning by presenting OER in the SCORM format?
- Will the presentation of the OER in the SCORM format serve as a substitute for other resources provided such as the printed textbook, pdf files, videos, and online resources?

Although OERs reside in the public domain, an open license makes it possible for educators to use the work of others, as well as to share their own work freely and legally; these are known as Creative Commons licenses. More details about those licenses can be found on the Creative Commons website[32], where they also provide a license chooser tool for users to build their own licenses (Creative Commons, 2021). Examples of alternatives to Creative Commons are GNU General Public License[33], Mozilla Public License[34], and WTFPL[35].

Furthermore, the use of OERs is framed by the following 5R activities: Retain, reuse, revise, remix, and redistribute (Wiley, 2014). The details relating to the 5Rs will be discussed later in this chapter. We profited from the characteristics of these resources to create the course content and present it to students on our Blackboard Learning Management System (Blackboard Learn[36]). Our main objective was to ensure education was not disrupted by closures related to the pandemic and the unprecedented economic meltdown. For this purpose, we decided to find and adopt OER with specific open licenses to help meet the following objectives:

a) Fit OER within the context of the course and align them to the course learning objectives. Learning objectives describe learners' capabilities upon the completion of the course and are already defined in the course syllabus. All course activities and assessment methods are chosen to help learners meet those objectives.
b) Curate the content and ensure expanded access to learning. The main objective of curating content is to organize, update, and maintain information for access and consumption. By curating OER on Blackboard, we provided students with opportunities to access their courses anywhere and at any time.

[32] https://creativecommons.org/licenses/
[33] https://alternativeto.net/software/gnu-general-public-license/about/
[34] https://alternativeto.net/software/mozilla-public-license/about/
[35] https://alternativeto.net/software/wtfpl/about/
[36] Blackboard Learn is an application for online teaching, learning, community building, and knowledge sharing.

c) Assure quality, completion rates, and increased performance. Research has proven that providing resources of good quality to learners increases their performance, improves end-of-course grades, and completion rates (Murphy, 2021). Hence, one of our main concerns while searching for OERs was to make sure the resources were of good quality.
d) Meet students' educational and financial needs. Research shows that many higher education students do not purchase the required textbooks and even defer certain subjects due to the high cost of teaching/learning materials (Kramer, 2018). In Lebanon, the financial and economic crisis complicated students' purchasing power, which may have affected their educational performance.
e) Lower the cost of creation, use, and maintenance for faculty. Faculty members have greater freedom in selecting and customizing course materials by opting for the use of OERs framed by the above-mentioned 5Rs. Moreover, they will copy and reuse this digital content on Blackboard.

3.5 Implementation at Notre Dame University-Louaize

Among the higher education initiatives in Lebanon, the OER process was institutionalized at Notre Dame University-Louaize (NDU) and a dedicated committee was formed. The university IT department held training sessions for top administrators, such as deans and vice presidents, as well as staff and faculty members. In the spring of 2016, a pilot was administered by NDU's Department of English and Translation in the Faculty of Humanities, with close to 500 students enrolled in a freshman English composition course. Students' feedback reveals overwhelming satisfaction and engagement levels when using OER. Given the success of the pilot course, the university planned to expand the use of OER in other disciplines in the future. The publication is shown in Box 3.1 below.

Box 3.1. Notre Dame University-Louaize Adopts OER under CC Licenses (Zarif, 2016)

Notre Dame University-Louaize Adopts Open Educational Resources under CC Licenses

"Currently, NDU students across three campuses are taking part in the university's first pilot English course fully based on open educational resources (OER). Following the university's strategic decision to integrate

OER in teaching and learning, students enrolled in Sophomore Rhetoric, the university's core English requirement, are the first cohort to pilot the use of open educational resources in the classroom, reducing textbook costs while promoting a culture of sharing and sustainability on campus.

"Students have been demanding innovation in the classroom for a long time now," Department chairperson George Abdelnour explained, "and by blending digital technology and high-quality academic resources that are freely and openly available online, we are trying to make the learning of writing more effective and engaging." The piloting takes place in 25 sections of English Rhetoric with a total student enrollment of 500.

The adoption of OER follows NDU's signing of an Affiliate Agreement with Creative Commons, the non-profit organization providing copyright licenses for the free use and sharing of academic and creative resources. OER used in the pilot course has been licensed by Creative Commons and is thus freely available to students and faculty, thus avoiding any copyright infringements. As an institutional affiliate of Creative Commons, NDU is leading the way among higher education institutions in Lebanon to promote open education and open access.

The development of this new, OER-based course was the product of collaboration between the Department of English and Translation at the Faculty of Humanities and the Division of Computing Services under the leadership of Assistant Vice-President for Information Technology, Dr Fawzi Baroud. A committee of three faculty members from the Department of English and Translation led efforts to identify, integrate, and redesign the course, namely Drs. Sandra Doueiher and Ena Hodzik, both Assistant Professors of English and Applied Linguistics, and adjunct faculty member in English Nathalia Geha".

In line with the university's vision and its strategic decision to support the OER movement by expanding the use of OER in various disciplines, the committee decided to implement OER in the CSC201 course as an attempt to overcome the challenges faced during the pandemic and the economic crisis.

CSC201 is among the Liberal Arts Curriculum courses required at NDU. A description of the course can be found in the syllabus: "CSC201 is an undergraduate course that exposes students to a broad view of computer literacy by examining computer fundamentals, the system unit, input/output and storage, system and application software, the Internet and the WWW, networks, computer ethics, and security. In addition, the course aims to provide students with skills in managing data, word processing, electronic spreadsheets and presentations, web browsing, and e-learning" (NDU, 2017). Below are the nine chapters that cover the course's main topics:

- Chapter 1: Introduction to Computers
- Chapter 2: Hardware
- Chapter 3: Software
- Chapter 4: Networks and the Internet
- Chapter 5: Computers and Society
- Chapter 6: Windows
- Chapter 7: Microsoft Word
- Chapter 8: Microsoft Excel
- Chapter 9: Microsoft PowerPoint

The course's main resource is an imported print textbook covering the first five chapters in the previous list. The remaining four chapters are explained by the instructor and are accompanied by lab practice. Students must buy the textbook, as it is their only reference for the first five chapters.

However, due to the textbook’s price in United States dollar, the cost proved to be a hurdle to students due to Lebanon’s economic situation. In addition to the financial issues, the pandemic resulted in border closures, and Lebanon’s economic status and unstable infrastructure caused unreliable power supply and internet unavailability. With all these challenges at hand, the course lecturers were obliged to find a suitable solution to ensure the continuation of the course; hence, the adoption of OER.

3.6 Planning the use of Open Educational Resources

Various options are available to include OER in teaching and learning materials, amongst which is the educators’ adoption of high-quality resources with no need for modification. Other options included the creation and licensing of their own materials, the adaptation of existing materials, or merging multiple resources and

tailoring them to the course topics (Shumway, 2021). The process followed by the instructors echoes the path followed by the Community College Consortium for Open Educational Resources (CCCOER), which “promotes the awareness and adoption of open educational policies, practices, and resources" (CCCOER, 2021). CCCOER defines the following five steps for OER adoption:

- Step 1: Review the Materials
- Step 2: Modify the OER (if necessary)
- Step 3: Attribution of OER
- Step 4: Curriculum Approval (if needed)
- Step 5: Delivery of OER to Students

In our case, we chose to adapt or adopt existing materials depending on the quality of the resources and their alignment with the course topics and objectives. We followed the five-step process illustrated in Figure 3.1 below: Find OER, Review, Adapt and License, Deliver OER, and Evaluate the Delivery. Those steps are based on those of the CCCOER, though some steps were combined, and others were added. We list each step below and explain its application in the coming sections.

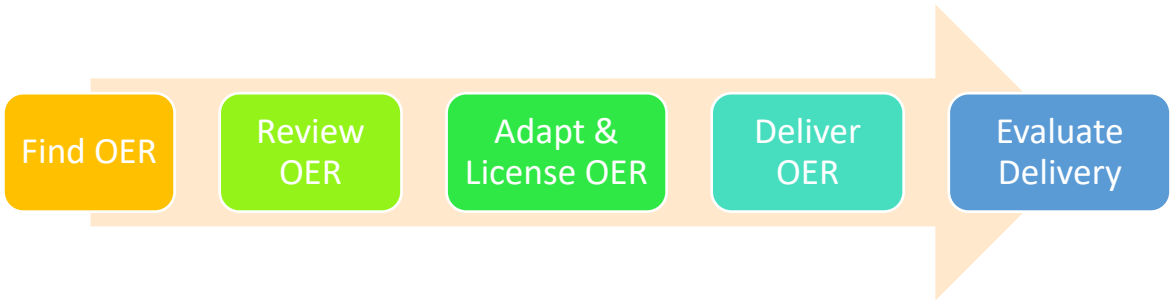

Figure 3.1. Planning the use of OER

3.6.1 Finding Open Educational Resources

OER can be found by using search engines or by browsing OER-dedicated repositories. Resources can include complete courses or books, and may contain several types, such as text, images, videos, audio, etc. BC3 Library at the Butler County Community College[37] divides the search methods used to find OER into the following categories: Open Textbooks, Complete Courses, Searching the Commons, Open Access Collections and Repositories, OER Content from Publishers, OER Search Engines, and Google Advanced Search (Shumway, 2021). Despite trying

[37] https://bc3.edu/

some of the search engines listed under those categories, we did not find suitable resources for our CSC201 course. However, using Google Advanced Search, we found the open book entitled "Introduction to Computer Information Systems" on WIKIBOOKS (WIKIBOOK, 2017). WIKIBOOKS is an open-content textbooks collection that anyone can edit, search, and view the history, as resources residing on WIKIBOOKS are available under the Attribution-ShareAlike Unported (CC BY-SA 3.0) shown in Figure 3.2 below. According to this license, "users can share, copy, and redistribute the material in any medium or format, just as they can also adapt, remix, transform, and build upon the material for any purpose, even commercially" (Creative Commons, 2021). Subsequently, the OER committee at NDU decided to adopt the textbook, as it matched the criteria required to form the CSC201 curricula.

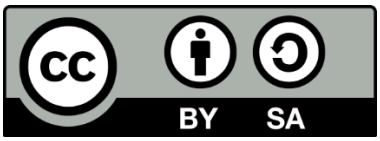

Figure 3.2. Creative Commons Attribution-ShareAlike Unported (CC BY-SA 3.0)

3.6.2 Reviewing Open Educational Resources

The above cited book is divided into six parts, covering most of the topics discussed in CSC 201. The first five parts that could be tailored to the first five topics/chapters were shared with the four course instructors for review, which was done using the rubric in Table 3.1 below. We built this rubric based on six OER Evaluation Criteria published by Affordable Learning Georgia (Gallant, 2015). As for the quality of the resources, we evaluated the criteria on a scale between 0 and 4 (Bad, poor, fair, good, excellent), where 0 is Bad, and 4 is excellent.

Table 3.1. OER Evaluation Rubric

Criteria/Quality		Bad	Poor	Fair	Good	Excellent
1	Clarity, Comprehensibility & Readability					
2	Content Accuracy and Technical Accuracy					
3	Adaptability and Modularity					
4	Appropriateness					
5	Accessibility					

6	Supplementary Resources					

In general, the evaluation of the resources was deemed more than satisfactory. The content is clear, comprehensible, readable, and appropriate to the course topics. Moreover, according to the book version history, the content was published for the first time in 2013, and the last updated chapters are dated between 2018 and 2020, which marks the content as recent. Although the topics constantly evolve due to their nature as being computer- and technology-based, we considered the resources accurate and up to date, since the course targets a general audience. Furthermore, the resources are organized by topic, facilitating their adaptation and organization in a modular design consistent with the course structure.

Additionally, at the end of each chapter, there are supplementary resources such as a glossary, the definition of the key terms, some review questions with their answers in the form of true/false, multiple-choice and fill-in-the-blank questions, as well as a list of references for the topics covered in each chapter. As for accessibility, the e-book content design meets most of the standards defined by WCAG 2.1[38] (Web Content Accessibility Guidelines). Following these guidelines enabled us to make the content more accessible to a wider range of people, including people living with a disability (WCAG, 2017).

3.6.3 Adapting and licensing Open Educational Resources

As the Creative Commons license attached to the book allows for adaptation, and seen that users described the resource to be of good quality, we decided to modify the information and present it to students in a simpler, interactive, and well-organized method on Blackboard. We collected the essential information related to the chapter topics and organized this in a PowerPoint presentation for each chapter. We applied the same template and design on the presentation slides and followed the Web Content Accessibility Guidelines. In addition, we recorded the presentation script, saved it in mp3 format, and distributed the recordings with the presentation slides. We also added some animations and interactively presented the content. Moreover, we used a PowerPoint-based authoring tool to create interactive quizzes between the slides and at the end of the presentation. The quiz questions were selected from the review questions provided at the end of each chapter. By submitting the quizzes,

[38] Web Content Accessibility Guidelines (WCAG) 2.1 covers a wide range of recommendations for making Web content more accessible. https://www.w3.org/TR/WCAG21/

students could test their knowledge about the chapter topics using an unlimited number of attempts. The results of those attempts were saved in Blackboard Grade Center, which enabled us to monitor student progress and performance in the course.

Note that the original text was organized by topics and saved in PDF format to provide alternative resources to students on Blackboard. We also provided the URL to the original resources for each chapter. As for licensing the adapted resources, there was no need, since the original text is available under the Creative Commons Attribution-ShareAlike Unported (CC BY-SA 3.0), we can reuse it under the terms shown in Figure 3.3 below.

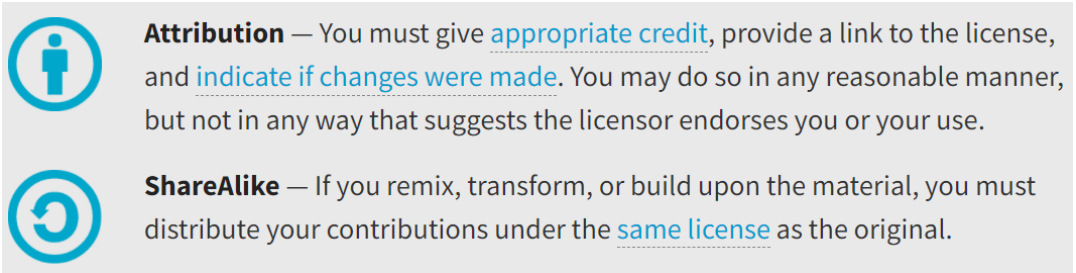

Figure 3.3. Licensing OER

By respecting the author's original license of the content, we kept the same license as shown previously in Figure 3.2, which is the Attribution-ShareAlike Unported (CC BY-SA 3.0).

Figure 3.4 below is a screenshot taken from PowerPoint that shows how the attribution to the original author was added to the content of chapter 3 after adaptation, and how the new license was added.

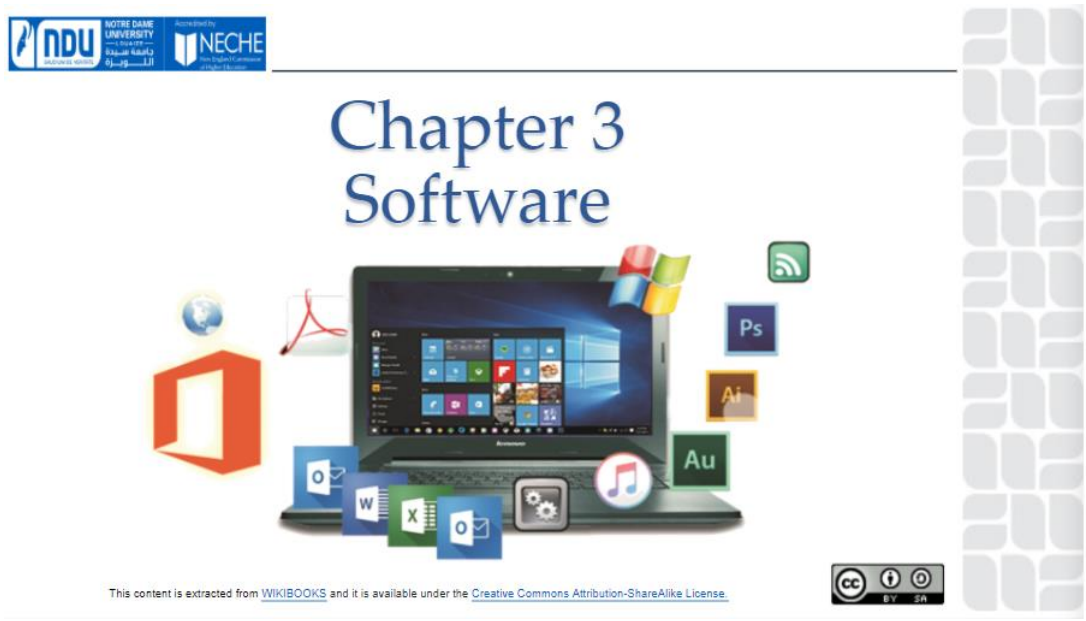

Figure 3.4. Chapter 3

3.6.4 Delivering Open Educational Resources

At this level, some instructors decided to deliver the resources on Blackboard in PDF format, while we chose to deliver it in the SCORM format (Sharable Content Object Reference Model). SCORM is an international standard for e-courses, allowing simple integration of content in Learning Management Systems. SCORM has many advantages such as interoperability, flexibility, reusability, consistency, and compatibility. Moreover, it allowed to save user progress, provide feedback, and helps in designing a clear course structure (Colman, 2020). We used the iSpring[39]authoring tool to create a SCORM package for each of the five chapters. In some cases, we divided the chapters into sections and created a SCORM package for each section. Sectioning content is efficient and increases learners' engagement, acts as a checklist focusing the learners on a particular topic, speeds up curriculum development and updating, improves learner outcomes, and helps trainers create more engaging assessments (Firmwater, 2021). The course structure on Blackboard is modular, and the module duration is one week on average. We uploaded the corresponding SCORM packages to each module and restricted access by date.

[39]https://www.ispringsolutions.com/?utm_source=google&utm_medium=cpc&utm_campaign=fr_en_ispring_general&utm_term=ispring%20website&utm_content=137047004531&ad_group=ispring_general&gclid=CjwKCAjw_YShBhAiEiwAMomsELdDxw5YraXfd6X-xcs07exZ-4wRI_sVI3alWVgKn1-C6vRKQcjT9RoCC8kQAvD_BwE

Furthermore, we added supplementary resources to each module, such as the original OER chapters we saved as PDF, the URL of each online chapter, and relevant YouTube videos. Figure 3.5 below shows the structure of Week 4 on Blackboard, including the SCORM of the two sections of chapter 3 and the folder containing additional resources related to this chapter.

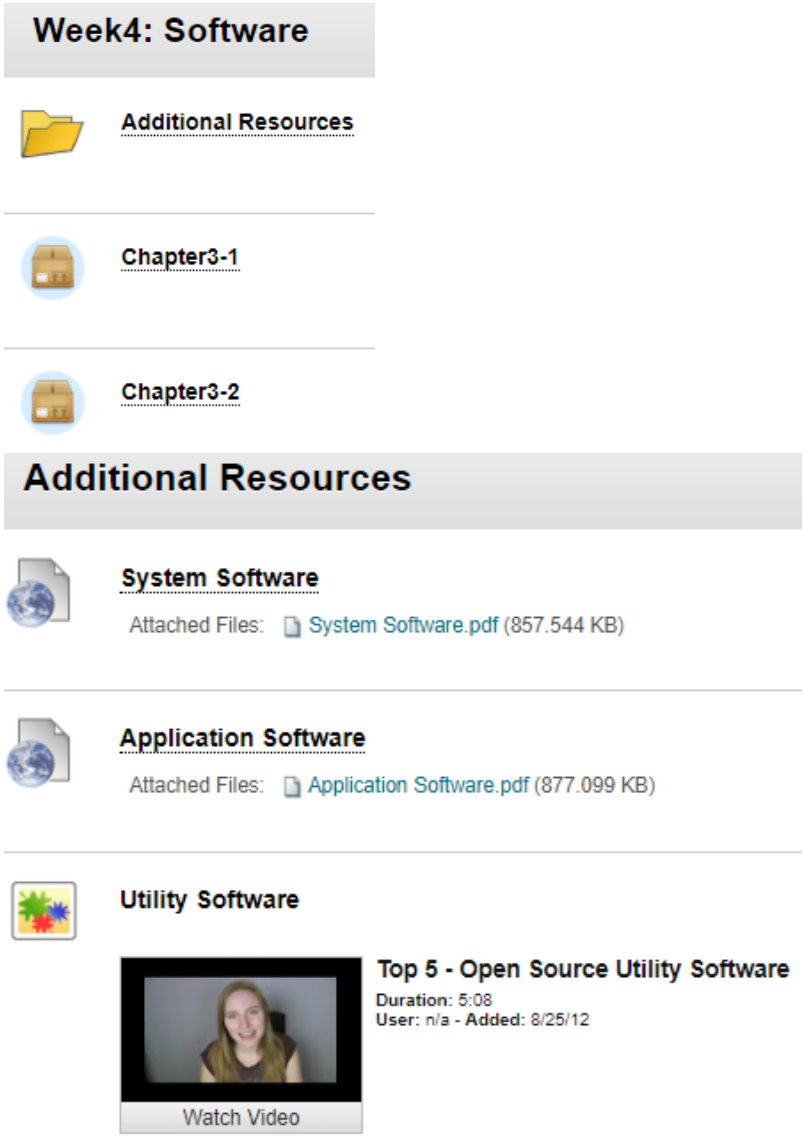

Figure 3.5. Course Structure on Blackboard

More details about the course structure and the delivery model are shown in Table 3. below. For example, during week 1, we organized three synchronous sessions to explain the basics of OER, introduce the course structure on Blackboard, and

demonstrate how the students should participate in the synchronous and asynchronous sessions according to the course plan. Additionally, as shown in the course plan, the duration of chapters 1, 2, 3, 8, and 9 was one week. Those chapters contained the OER we transformed to SCORM, including the self-test, and were delivered asynchronously. Students had one week to read each chapter's content and profit from an unlimited number of attempts to test their knowledge. Each week, a synchronous session was scheduled to summarize the chapter topics, answer students' questions, and organize individual and group activities. Throughout Weeks 2, 3, and 4, students had to participate in Blackboard discussion forums about the first three chapters and reply to their peers. For the remaining chapters, all sessions were delivered synchronously on MS Teams, and the duration of each chapter was two weeks, with a total of 3 hours per week. At the end of each chapter, the students had to submit an assignment as proof of understanding of the chapter topic. Three main assignments were given, one at the end of each MS Office chapter: MS Word, MS Excel, and MS PowerPoint. Test 1 was scheduled during Week 6, covering the content delivered during the first five weeks. Meanwhile, the final exam was scheduled at the end of the semester and covered the content delivered during weeks 13 and 14.

The marking scheme is shown in Table 3. below. To widen students' active learning and engage them in the learning process, we assigned a total weight of 10% of the final grade to reading and completing the five SCORM-based chapters (2% per chapter). We also assigned 5% to the discussion and 10% to each assignment. The remaining 55% were distributed on test 1 (20%) and the final exam (35%).

The course structure, especially the content and its presentation on Blackboard, should be evaluated, updated, and improved periodically. In the next section, we explain the evaluation process we applied after delivery to students on Blackboard.

Table 3.2. Course structure and delivery model

	From	To	Chapter	Delivery mode	Activity
Week1	06/09/2021	12/09/2021	Introduction	Synchronous sessions (3)	
Week2	13/09/2021	19/09/2021	Chapter 1	Content and Self Test	Discussion
	15/09/2021			Synchronous session (1)	
Week3	20/09/2021	26/09/2021	Chapter 2	Content and Self Test	
	22/09/2021			Synchronous session (1)	
Week4	27/09/2021	03/10/2021	Chapter 3	Content and Self Test	
	29/09/2021			Synchronous session (1)	
Week5	04/10/2021	10/10/2021	MS Windows	Content and Quiz	
	06/10/2021			Synchronous session (1)	
Week6	11/10/2021	17/10/2021			Test 1
	13/10/2021				
Week7	18/10/2021	24/10/2021	MS WORD	Synchronous sessions (3)	Assignment 1
Week8	25/10/2021	31/10/2021	MS WORD	Synchronous sessions (3)	
Week9	01/11/2021	07/11/2021	MS Excel	Synchronous sessions (3)	Assignment 2
Week10	08/11/2021	14/11/2021	MS Excel	Synchronous sessions (3)	
Week11	15/11/2021	21/11/2021	MS PowerPoint	Synchronous sessions (3)	Assignment 3
Week12	22/11/2021	28/11/2021	MS PowerPoint	Synchronous sessions (3)	
Week13	29/11/2021	05/12/2021	Chapter 8	Content and Self Test	
	01/12/2021			Synchronous session (1)	
Week14	06/12/2021	13/12/2021	Chapter 9	Content and Self Test	
	08/12/2021			Synchronous session (1)	
Week15	15/12/2021	23/12/2021	Final Examinations		Final Exam

Table 3.3. Marking Scheme

Grades' Distribution	
SCORM Completion (Chapters 1,2,3,8 & 9)	10%
Online Discussion (Chapters 1,2,3)	5%
Assignments: MS Word, MS Excel, MS PowerPoint	30%
Test 1 (Chapters 1,2,3 & 4)	20%
Final Exam (Chapters 8 & 9)	35%
Total	100%

3.6.5 Evaluating Open Educational Resource implementation

To evaluate the delivery model that we applied and the effectiveness of OER, we conducted an evaluation survey at the end of the semester. 51 out of 60 students registered in the two CSC201 sections responded to the survey, resulting in an 85% response rate. The participants were gender-distributed equally and originated from different faculties. Most of the students were in their first year (53%) and 37% were in their second or third year.

Furthermore, we asked the students how often they purchased the required textbooks for the courses they took. The answers distribution in Table 3.2 below shows that 20% of the students never buy the book, 24% rarely buy it, 18% buy it about half the time, 16% often buy it, and 24% always buy it.

Table 3.2. Purchasing textbooks

Never	20%
Rarely	24%
About Half the Time	18%
Often	16%
Always	24%

Moreover, we asked them if they had access to any OER before taking CSC201. 59% confirmed that they already accessed OER in previous courses, and 73% confirmed that online learning via unlimited access to OER and online lectures and material expanded their knowledge.

In order to assess students' attitudes toward using OER in CSC201, we asked participants to rate their learning experience on a Likert scale from 1 to 5, where 1 is "strongly disagree" and 5 is "strongly agree." The results in Table 3.3 below confirm that the students enjoyed learning in CSC201 because it incorporates OER, and declared that OER directly improved the quality of their learning experience. They also confirmed that the OER content matches the course learning objectives of CSC201. In addition, most participants agreed that the use of OER in the course offers them significant advantages, renders CSC201 a more interesting course, and offers them a sense of independence. Moreover, a number of students agreed that online learning affected positively their self-paced learning when using OER resources presented in the SCORM format. The option to replay those resources enhanced their overall comprehension level and their confidence regarding how the material is assessed and grasped at various speeds and time intervals.

Table 3.3. Attitude toward the use of OER in CSC 201

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I enjoyed learning in CSC 201 because it incorporates OER.	0.00%	1.96%	17.65%	43.14%	37.25%
OER directly improved the quality of my learning experience in CSC 201.	0.00%	0.00%	21.57%	52.94%	25.49%
The learning objectives of CSC 201 match the content of the OER used.	1.96%	0.00%	11.76%	45.10%	41.18%
A CSC 201 course that uses OER is of less value to me because anyone can access the open educational resources used.	11.76%	33.33%	37.25%	13.73%	3.92%
A printed textbook would help me understand topics better than OER in CSC 201.	19.61%	37.25%	19.61%	13.73%	9.80%
The use of OER in CSC 201 offers significant advantages to me.	0.00%	1.96%	15.69%	49.02%	33.33%
The use of OER makes CSC 201 a more interesting course.	0.00%	1.96%	13.73%	41.18%	43.14%
I have had difficulties accessing digital OER due to internet connectivity issues.	19.61%	15.69%	35.29%	25.49%	3.92%
I feel that I am a more independent learner as a result of my CSC 201 course because of the use of OER.	0.00%	1.96%	19.61%	47.06%	31.37%
Online learning affected your self-paced learning using OER-based SCORM?	1.96%	3.92%	52.94%	29.41%	11.76%
The option to replay OER-based SCORM enhanced your overall comprehension level with confidence that the material is assessed and grasped at various speed and time intervals?	0.00%	0.00%	31.37%	43.14%	25.49%

We also asked the students to use a scale from 1 to 5, where 1 is "very poor," and 5 is "very good," to rate their experience with the presentation of OER in SCORM format on Blackboard. Additionally, we asked them to rate on a scale from 1 to 5, where 1 is "strongly disagree" and 5 is "strongly agree," how much the presentation of OER in SCORM format was effective and served as a substitute for the additional resources provided such as PDF, videos, and online resources. As shown in Figure 3.6 and Figure 3.7 below, 84% of students offered very positive feedback for both

questions, which also supports our previous analysis on the effectiveness of OER-based SCORM.

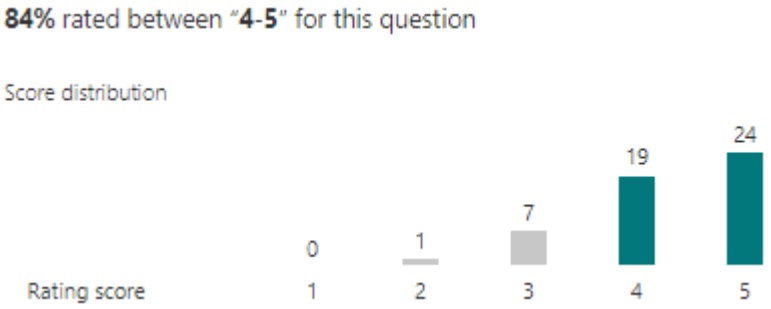

Figure 3.6. Presentation of OER in SCORM format on Blackboard

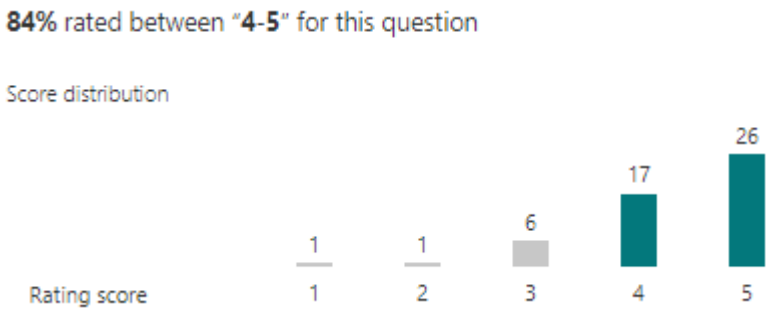

Figure 3.7. Presentation of the OER in SCORM format was effective.

To supplement our study of the OER-based SCORM's quality, we relied on student responses, as shown in Figure 3.8 below: most students (86%) rated the quality between good and very good. Moreover, as shown in Figure 3.9 below, 71% of the students prefer to be enrolled in the future in a course that uses OER rather than in a course that uses a printed textbook.

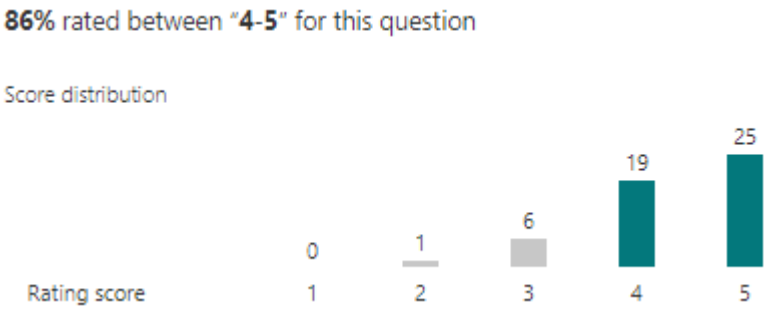

Figure 3.8. Quality of OER-based SCORM

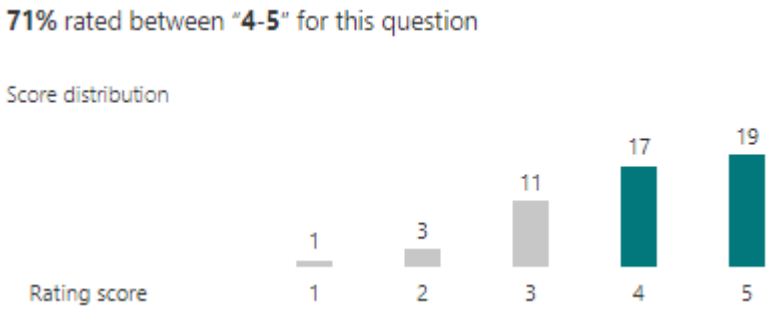

Figure 3.9. OER vs printed textbook.

As for the students' general remarks about OER, some students highlighted the effectiveness of OER in online education. One stated that "online education was somewhat better than I expected, especially while using OER and all the new technology, but it cannot replace the benefits of face-to-face learning. Although for the course of CSC201, online learning was way better than the face-to-face sessions." Two other students noted that "the course was very effective, I found that the use of OER helped a lot with understanding information" and that "OER helped understand more the concept of CSC 201 and in a fun/easy way." One of the students stressed the financial advantage of OER and remarked that "due to the economic situation, students can't afford to buy books anymore." In parallel, another asserted that "using OER was great because I could save money on textbooks." As for the presentation of OER in SCORM format and its delivery through Blackboard to facilitate self-paced learning, one student stated: "It was nice, I enjoyed learning independently, and we got the chance to meet in MS Teams meetings and ask for any clarification we needed."

Figure 3.10 below shows the students' insight about the course in general, and displays the terms frequently used by the students in the evaluation survey.

Figure 3.10. General insights about the course

In general, students agreed that the overall experience was good, smooth, and that they would like to repeat it in other courses.

3.7 Conclusion and recommendations

Will teaching be elevated? It is an educator's responsibility to integrate tools, activities, and experiences to improve students' understanding of the material given. However, we must not forget to look backward as we go forward toward a future with more certainty and efficiency in our educational programs. The future generation depends on our critical initiatives to grant our students an ameliorated educational system, or else we are at risk of failing their potential, skills, and ambitions. The choice is in the hands of the current academics to overcome the pandemic's difficulties and seize whatever positive consequences it has brought.

In this study, we responded to the main research question through which we wanted to test the effectiveness of the OER-based solution implemented to ensure teaching and learning continuation, and overcome the challenges and obstacles caused by the pandemic during an economic and financial crisis. Based on the evaluation of this experience and the positive feedback received from the students, we can conclude that the solution we implemented met the objectives and helped solve most of the obstacles for which it was designed. In general, this solution helped to ensure educational continuation disrupted by pandemic-related closures and the unprecedented economic meltdown. Furthermore, transforming OER to interactive SCORM and uploading the SCORM to Blackboard helped widen students' active learning, engagement, and interactivity with learning. Moreover, by curating the content, we ensured expanded access to learning and provided students with equal opportunities for access to learning anywhere in the world and at any time. The students' feedback confirmed the need for and the utility of this OER-based model in reducing textbook cost and its burden on students, especially during a financial crisis.

As for the advantage of this solution and its benefits to faculty members, based on our experience, we can confirm that this solution has a lower cost of creation, use, and maintenance for faculty in the long term. Since the content is uploaded to Blackboard, faculty can reuse and improve it periodically, thus saving time and money. Additionally, they have great freedom in selecting and customizing course materials. In other words, they will have the ability to Retain, Reuse, Revise, Remix, and Redistribute content for educational purposes, which are the main advantages of using OER.

Despite the various benefits accompanying this solution, its implementation and design were obstructed by some hurdles. We not only faced hurdles in finding the appropriate OERs and aligning them with the course learning objectives, but also in dividing these OERs into sections to later turn them into SCORM. In addition, student motivation proved to be particularly challenging. Spreading awareness among students about the benefits of OER in general, and this solution in particular, requires a strategy that needs to be well devised. Not only that, but motivating students to both complete the readings and test their knowledge can present a challenging obstacle to overcome. This should be highlighted given that students play an important role in implementing this solution, which is why we need to rise to that challenge and encourage students to evaluate the solution and share their experiences by submitting the survey.

In the future, further research studies could be conducted to test the effectiveness of the OER by comparing the overall class performance with other classes not using those resources or classes using OER and delivered in blended or hybrid mode. We aim to test if the resources we provide to learners will increase their performance, improve end-of-course grades and completion rates. Once proving its effectiveness, the generalization and implementation of such models will surely have great implications for curriculum development and for the integration of new styles of pedagogy across the higher education curriculum.

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