A Model for Scripting and Designing a Digital Textbook

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Abstract—The digital transformation of institutions renovates universities to strengthen the integration of educational technologies with a focus on the quality of learning. Our objective is to analyze the needs of students to determine the essential indicators to be used in the design of a digital textbook of soft skills, to measure the approval of the textbook by specialists and to measure the concordance of the criteria of the textbook with the expectations of students. The sample consisted of 60 university students and 8 educational and technical specialists. A digital textbook scripting and design model is designed to assist in the design of the textbook. The results showed that the identification of students' needs led to the conclusion that they are interested in learning through active teaching and learning methods, through the integration of ICT tools and using a textbook. In addition, students and pedagogical and technical specialists were satisfied with the digital textbook designed and to be used.

Keywords—digital textbook, needs analysis, design model, students, evaluation

1 Introduction

In the era of the expansion of digital tools dedicated to teaching, the digital transformation of universities is a key to enroll in an innovative pedagogical approach, especially after the period of the Covid-19 pandemic, which has challenged all institutions to overcome their constraints to ensure pedagogical continuity through the use of information technology and communication for teaching (ICT). As a result, universities become in an obligation to follow a new model for the digital transformation of universities [1] and to change the paradigm to reduce vulnerabilities and threats by taking advantage of technological tools [2].

The introduction of ICT in higher education has experienced many benefits for students, one of the crucial benefits that ICT promotes student learning [3]. In such a way, the use of ICT by the teachings during the deployment of pedagogical methods makes the students actors of their learning [4]. Students have a positive attitude towards the use of digital tools in general and specifically in education [5].

For the Moroccan context, the national strategy "Morocco Digital 2020" has implemented a new vision for digital by 2025 aims to accelerate the digital transformation of Morocco [6]. As well as the strategic vision of the 2015–2030 reform relies on

strengthening the integration of educational technologies by focusing on the quality of learning through different digital media, interactive programs, and networks [7]. And according to the ANRT [8], which recorded a substantial increase in the rate of equipment of computers and/or tablets in households in 2020 with 64.2%, knowing that in 2011 the rate was 39% and in 2016 a rate of 54.9%. In addition, the 19–24 age group is the most equipped with a smartphone with a rate of 93.8%.

In line with an innovative pedagogical approach, based mainly on the use of ICT tools in the optimization of the teaching-learning act. In recent years, we are faced with digital news, such as the digital workspace, mobile devices, digital educational resources, the digital textbook …

The textbook remains a fundamental and central element in the educational system, especially in rural, peri-urban and deficit areas. The use of the textbook as a carrier of knowledge is a central and effective role in a teaching-learning process and helps to improve the effectiveness of the learning process [9–11]. The digital textbook can improve the acquisition of disciplinary knowledge, and obtain better results in students, and can develop their soft skills [12]. Thus, learning using a textbook is an essential vector for academic success [13].

At Moroccan universities, most university teachers disseminate the course to their students only through simple black and white course materials or simple digital documents. [14] expresses those Moroccan students have been dissatisfied with the experience of learning on digital devices and that they value the efforts of professors to use interactive course materials. As such, the deployment of digital resources for teachers includes the dematerialization of course materials [15]. And [16] express that one of the advantages of using digital is the easy updating of course materials.

In this sense, this study consists of putting the innovative professional practices of teachers at the service of students in the act of teaching learning. Therefore, the aim of the research is to analyze the needs of students to determine the essential indicators to be used in the design of a digital textbook of soft skills, to measure the approval of the textbook by specialists and to measure the concordance of the criteria of the textbook with the expectations of students. In addition, the primary research question this study intends to answer is: Can we successfully structure the design of an approved digital textbook by teachers and students based on a study of students' didactic and digital needs and a scripting and design model?

2 Methods and materials

2.1 Characteristics of the sample

Our sample consists of students and pedagogical and technical specialists:

- 60 university students of the 1st year of the cycle license, these students will follow one of the following training courses: sciences of the physical matter, sciences of the chemical matter and sciences of the matter of the life. These students are all registered in the Faculty of Sciences Ben M'Sick of Hassan 2 University.
- 8 pedagogical and technical specialists from the Faculty of Sciences Ben M'Sick of Hassan 2 University and from the Regional Center of Education and Training of Casablanca.

2.2 The research process and data analysis

To collect data relevant to this research, we used the following data measurement instruments:

- A needs analysis questionnaire to analyze the didactic and numerical needs of a group of students to teach them the soft skills module. This questionnaire consists of closed-ended dichotomous and multiple-choice questions, to collect the following three parameters: the teaching/learning process, the technological tools, and the course materials.
- A textbook evaluation grid to measure the degree of relevance of the use of the textbook designed with students, the grid is filled in by pedagogical and technical specialists. The grid has 8 criteria and 87 items [11,17]. The criteria are physical presentation, scientific content, content structure, readability, illustrations, evaluation, autonomy of use and digital resources.
- A semi-structured interview focused on measuring the fit of the textbook criteria to the students' expectations. The interview includes questions on the 8 criteria of the textbook evaluation grid.

Data analysis was conducted using the Jamovi version (2.2.5) tool [18,19]. To answer the research question, results were examined using descriptive statistical analysis.

2.3 Design of the digital textbook

A teacher is called upon to mobilize his or her professional skills (planning, leading, evaluating and regulating) and to take into consideration the characteristics of the students (age, representations, learning style, etc.) so that he or she can enable them to learn better and develop their abilities and skills. It is necessary to refer to learning theories. The following figure (Figure 1) shows the interaction between the parameters of the pedagogical act and the place of learning theories in this process, to appropriately script the pedagogical sequences and to mediate the contents of the digital textbook.

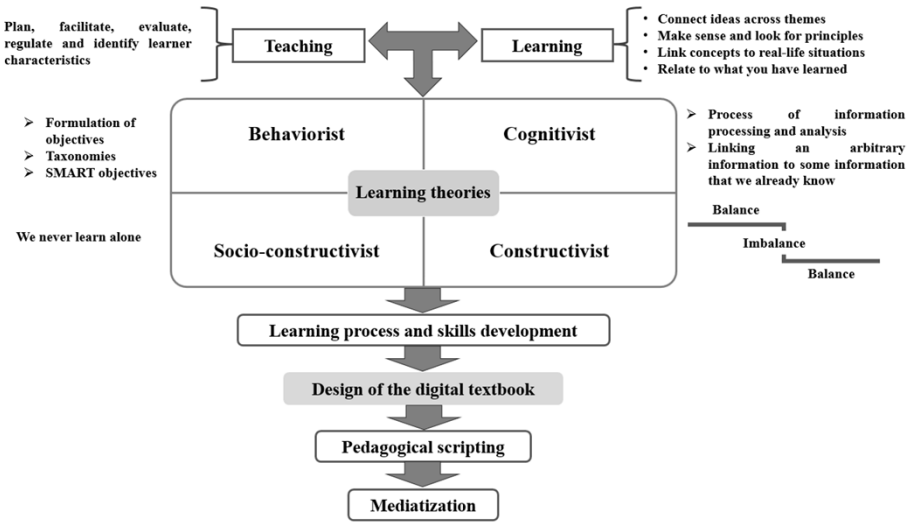

Fig. 1. A model designed on the pedagogical scripting of a digital manual

The design of a textbook does not follow a linear process between an author and a student, but involves a set of scientific, didactic, technical actors … who participate in the design of the textbook from different roles: writers, readers, designers, evaluators, users, publishers … [11].

Design requires a set of rigorous steps of different functions, these steps are represented as an organizational and methodological process (Figure 2). We can say that the process of designing a digital textbook goes through three phases [11,20]:

1. Analysis and pedagogical and technical preparation of the textbook,
2. Development of the content and digital resources,
3. Evaluation and use of the manual.

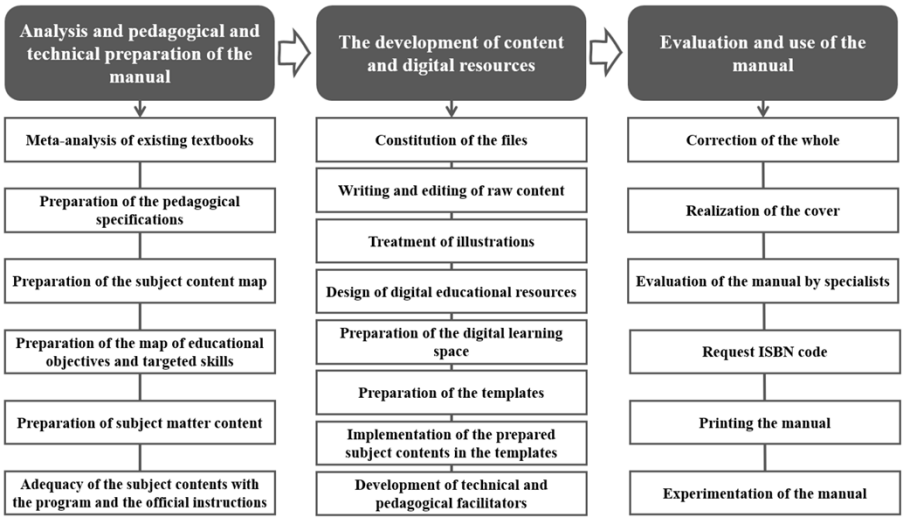

Fig. 2. Steps in the design of a digital textbook

They classified three types of the digital textbook [21,22]: the digitized textbook, the enriched digital textbook, and the personalized digital textbook. For our case, the designed digital textbook is of the personalized digital textbook type which is a kind of hybridization between a paper edition (physical textbook) and a digital edition (digital resources).

The paper edition is designed with a variety of forms of information such as: text, illustrations, diagrams, tables, shapes … For the digital edition, we have integrated a set of digital resources such as: videos, interactive content, self-correcting exercises, digital documents, applications, a digital workspace, a digital resource space … and to facilitate access to digital resources we have made available to students QR codes and short hyperlinks (Figure 3).

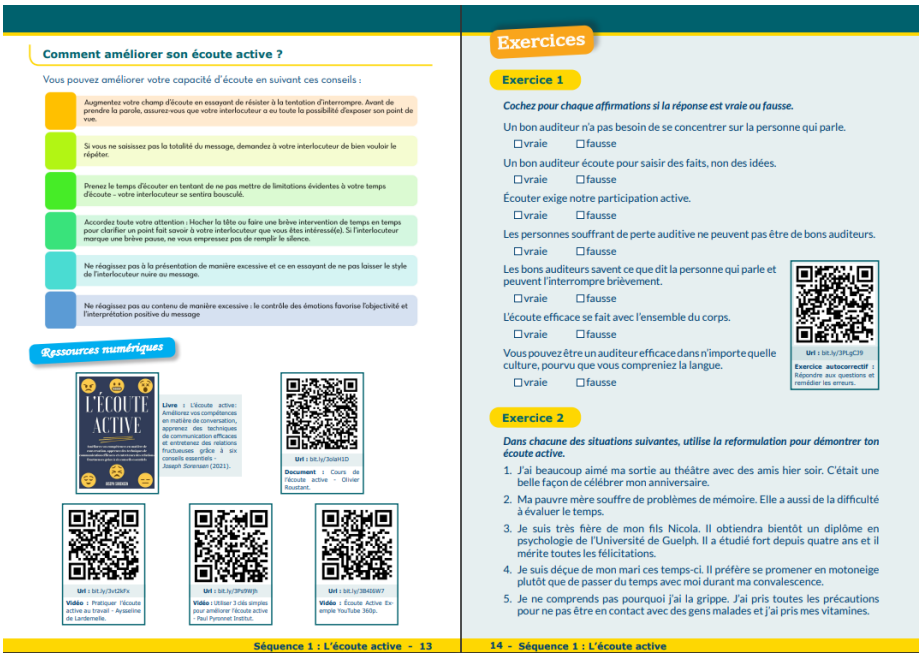

Fig. 3. A two-page preview of the digital manual designed

For the methodological development of the textbook, we followed a learning methodology process of Gerard and Rogiers [11] to align the structuring of the pedagogical sequences, the pedagogical alignment, and the pedagogical objectives.

This process adapted to our digital textbook identifies four steps:

- Presentation: includes a problem situation, an anticipatory approach, communication of objectives …
- Development: includes induction of the learning object, development activities, illustrations …
- Application: includes application exercises, comprehension questions, evaluation of learning …
- Integration: includes linking with other knowledge, disciplinary and/or interdisciplinary transfer …

At the end of the digital textbook design process, we made the textbook available to pedagogical and technical specialists to evaluate the consistency of the digital textbook against a set of criteria through a rating grid. The grid is filled in with an integer value between 1 and 4 (the Likert scale) of an even numbered form to force the respondent to position themselves. A value of 1 means that the indicator is inconsistent with the manual and a value of 4 means that the indicator is consistent with the manual.

The testing of the textbook is the last step in the design of a digital textbook, for this we conducted semi-directive interviews with some randomly selected students to measure the concordance of the criteria of the textbook with their expectations.

The qualitative data collected was represented and interpreted as integer values. We chose three scales (satisfied (3); somewhat satisfied (2); dissatisfied (1)) and estimated that each response would be assigned to a scale.

3 Results

3.1 Needs analysis

The analysis of the data from the needs analysis questionnaire with the three parameters yielded the following results. First, the first parameter presents the results related to the needs related to the teaching – learning process. The following table (Table 1) showed that 48% of the students prefer to start their courses in hybrid mode and 38.33% of the students prefer the face-to-face mode. Nevertheless, few students prefer the other two modes, distance (8.33%) and co-modal (5%).

Table 1. Students' representations of the needs related to the teaching-learning process

Item	Terms	Number of Participants	Proportion
The choice of teaching mode	Face-to-face	23	38.3%
	At a distance	5	8.3%
	Comodal	3	5.0%
	Hybrid	29	48.3%
The choice of learning methods	Understand the objects of the course outside the session and during the session discuss and practice activities or exercises	39	65.0%
	Understand the course objects in class and practice the exercises and activities outside of class	7	11.7%
	Understand the course objects, discuss, and practice the exercises and activities in class	14	23.3%
The choice of teaching methods	Direct teaching	8	13.3%
	Indirect teaching	39	65.0%
	Interactive teaching	48	80.0%
	Experiential learning	55	91.7%
	Independent study	42	70%
The choice of evaluation types	Direct questions	49	81.7%
	Open questions	16	26.7%
	Writing	18	30.0%
	Project	54	90.0%
	Search	49	81.7%
	Other	4	6.7%

The flipped classroom is the most preferred learning mode among students (65%). However, some students prefer the other two learning modes (23.33% and 11.67%). In addition, students strongly prefer experiential learning (91.67%) and interactive learning (80%), and quite strongly prefer independent study (70%) and indirect learning (65%) as their teaching method. Nonetheless, direct instruction was not found to occur in several students (13%) (Table 1).

On the other hand, the table (Table 1) showed that students strongly prefer project (90%), research (81.67%), and direct questions (81.67%) as the type of assessment. However, some students preferred writing (30%) and open-ended questions (26.67%). Thus, only a few students who added other types of assessment such as science experiments or field projects.

Moving to the second parameter that presents the results related to the needs of integration and use of technological tools in the teaching-learning process. The following table (Table 2) represents the forms of digital data that the students focus their words to find information. The results showed that texts (100%), images (100%) and videos (95%) are the most searched forms of information by almost all the students. As well as documents (65%) and diagrams (61.67%) are fairly searched by students. Nevertheless, few students focus on other data such as podcasts, augmented reality, or serious games.

Table 2. Most preferred forms of numerical data for students to search

Item	Terms	Number of Participants	Proportion
The most preferred forms of digital data for students to search	Texts	60	100.0%
	Images	60	100.0%
	Videos	57	95.0%
	Schematics	37	61.7%
	Digital documents	39	65.0%
	Other	3	5.0%

The figure below (Figure 4) shows the students' representation on the place of ICT in the teaching-learning process. The figure showed in general that most of the students presented a strong appreciation of strongly agree on the proposed statements (A1: 31.67%; A2: 48.33%; A3: 63.33%; A4: 53.33%) and somewhat agree (A1: 41.67%; A2: 40%; A3: 36.67%; A4: 31.67%).

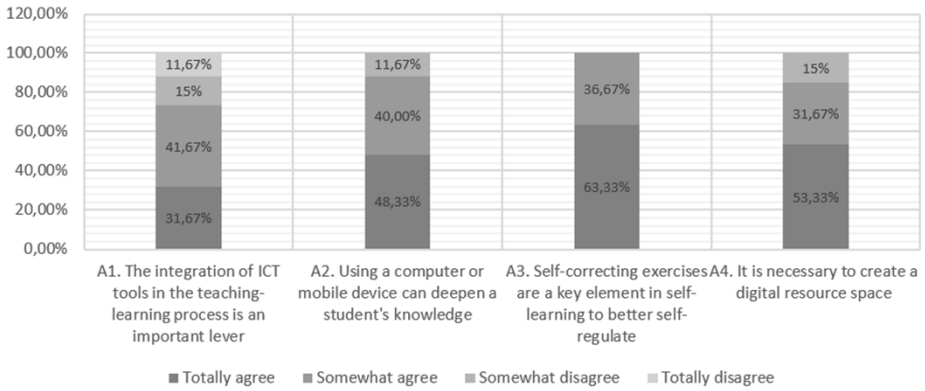

Fig. 4. Students' representation of the place of ICT in the teaching-learning process

Nevertheless, some students have a rather disagreement (15%) and a disagreement (11.67%) on the affirmation of the integration of ICT tools in the teaching-learning act. Also, few students (11.67%) rather disagree on the use of a computer or mobile device to deepen their knowledge and 15% of students rather disagree on the need to create a digital resource space (Figure 4).

The last parameter presents the results related to the needs for using a course support in the teaching – learning process. The following figure (Figure 5) showed in general that most of the students presented a strong assessment of strongly agree on the proposed statements (A1: 48.33%; A2: 43.33%; A3: 56.67%; A4: 63.33%; A5: 38.33%) and somewhat agree (A1: 43.33%; A2: 28.33%; A3: 43.33%; A4: 36.67%; A5: 46.67%).

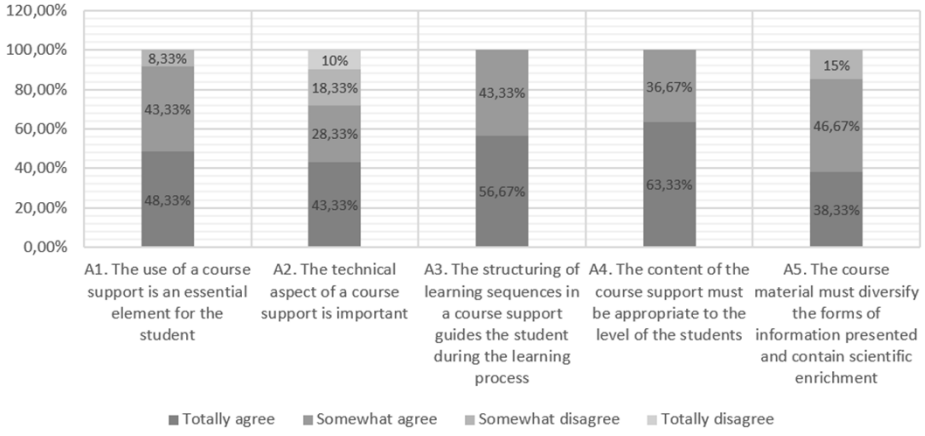

Fig. 5. Students' representation of the use of course support in the teaching-learning process

However, some students chose a rating of somewhat disagree (18.33%) and strongly disagree (10%) on the statement of the importance of the technical aspect of a course support. Also, few students (8.33%) rather disagreed that the use of a course support is an essential element and 15% of students rather disagreed that the course support

should diversify the forms of information presented and contain scientific enrichment (Figure 5).

3.2 Evaluation of the digital textbook

Technical and pedagogical evaluation of the digital manual. Analysis of the data from the eight-criteria digital textbook evaluation grid yielded the following results:

The following table (Table 3) presents the descriptive statistics of the grid results. To measure the consistency of each criterion of the grid with the manual, we used the theoretical formula (Q=average/(maximum score)*100) to compare the results with a quartile scale (Q1: 0%–25%, Q2: 25%–50%, Q3: 50%–75%, Q4: 75%–100%). We notice that all the criteria of the grid are positioned on the Q4 (75%–100%) which means a strong agreement (T1: Q=91.87%; T2: Q=85.83%; T3: Q=92.5%; T4: Q=94.72%; T5: Q=78.75%; T6: Q=76.25%; T7: Q=80%; T8: Q=88.27%).

Table 3. Descriptive statistics for the results of the digital manual evaluation grid

	T1[1](8)[2]	**T2[1](15)[2]**	**T3[1](10)[2]**	**T4[1](9)[2]**	**T5[1](10)[2]**	**T6[1](8)[2]**	**T7[1](14)[2]**	**T8[1](13)[2]**
N	8	8	8	8	8	8	8	8
Average	29.4	51.5	37.0	34.1	31.5	24.4	44.8	45.9
Median	29.0	51.5	37.0	34.0	31.5	24.0	45.0	45.0
standard deviation	1.19	2.20	1.07	1.25	1.31	0.916	1.67	1.64
Minimum	28.0	49.0	35.0	32.0	29.0	23.0	42.0	44.0
Maximum	32.0	55.0	38.0	36.0	33.0	26.0	47.0	49.0

Notes: [1]Criteria of the evaluation grid (T1: Physical presentation, T2: Scientific content, T3: Content structure, T4: Readability, T5: Illustrations, T6: Evaluation, T7: Autonomy of use, T8: Digital resources). [2]Number of items in a criteria.

The table below (Table 4) shows that there is no relationship between the eight criteria of the evaluation grid, which can be shown by the p-value of all relationships since it is higher than the significance value .01.

Table 4. Test of correlations of the regression analysis between the criteria of the evaluation grid

		T1(8)	T2(15)	T3(10)	T4(9)	T5(10)	T6(8)	T7(14)	T8(13)
T1[1] (8)[2]	Pearson's r	–							
	p-value	–							
T2[1] (15)[2]	Pearson's r	–0.191	–						
	p-value	0.650	–						
T3[1] (10)[2]	Pearson's r	0.225	0.303	–					
	p-value	0.592	0.465	–					
T4[1] (9)[2]	Pearson's r	–0.422	0.598	0.322	–				
	p-value	0.297	0.117	0.437	–				
T5[1] (10)[2]	Pearson's r	0.046	–0.198	–0.612	–0.131	–			
	p-value	0.914	0.638	0.107	0.757	–			
T6[1] (8)[2]	Pearson's r	–0.016	0.601	–0.146	0.328	–0.298	–		
	p-value	0.969	0.115	0.730	0.427	0.474	–		
T7[1] (14)[2]	Pearson's r	0.414	0.117	0.160	0.292	0.131	–0.023	–	
	p-value	0.307	0.784	0.705	0.483	0.758	0.956	–	
T8[1] (13)[2]	Pearson's r	–0.412	–0.059	0.000	–0.270	0.166	–0.439	–0.639	–
	p-value	0.310	0.889	1.000	0.517	0.694	0.276	0.088	–

Notes: [1]Criteria of the evaluation grid (T1: Physical presentation, T2: Scientific content, T3: Content structure, T4: Readability, T5: Illustrations, T6: Evaluation, T7: Autonomy of use, T8: Digital resources). [2]Number of items in a criteria.

Usage evaluation. The analysis of the data from the semi-structured interview with the students yielded the following results, which we have summarized in the form of a map. The following figure (Figure 6) shows the results of the measurement of the concordance of the criteria of the textbook with the students' expectations.

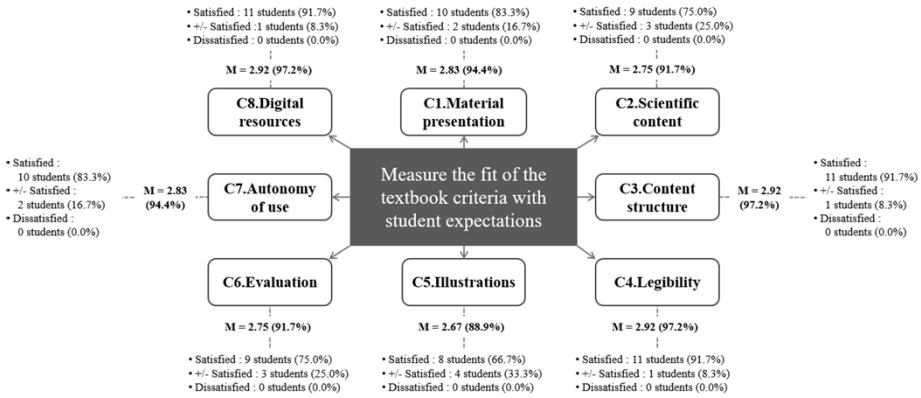

Fig. 6. The results of measuring the fit of the textbook criteria with students' expectations

The figure shows that the results of the criteria C3, C4 and C8 have an average of 2.92, thus a percentage going to 97.2% of the agreement of these with the expectations of the students. As long as only one student was more or less satisfied, and no student dissatisfied (Figure 6). As an example:

- C3: "The learning units are well structured and organized in each learning sequence. The structure is well rounded, and I do not find it difficult to understand the parts of the sequence."
- C4: "The textbook uses very simple and understandable language and vocabulary, and I find it appropriate for the level of students. The font size and font are standard and very readable."
- C8: "The digital resources presented on the textbook are very diverse and allow us to reinforce or expand our knowledge. The quality of the resources is ideal, and the resources are accessible on either a computer or a smartphone."

The two criteria C1 and C7 have an average of 2.83 with a percentage going to 94.4% so we notice a strong agreement. So much so that 2 students had a response tending towards "more or less satisfied" (Figure 6). As an example:

- C1: "The presentation of the textbook is wonderful and attractive, especially the colors chosen on the pages and the cover page. This textbook makes me want to consider it to learn more".
- C7: "The textbook makes it easy to use with QR codes and short links to a digital resource. Pages show how to use the textbook, as well as a summary and footers show the sequence being studied."

The two criteria C2 and C6 have an average of 2.75 with a percentage going to 91.7% and we see a strong agreement. As long as we say that 3 students had a response tending towards "more or less satisfied" (Figure 6). As an example:

- C2: "The concepts covered on the textbook are well defined and explained, the learning situations understandable, feasible and contextualized."
- C6: "The exercises proposed in the manual are diversified and feasible. Some are accompanied by a correction and others are interactive. However, there is a lack of application exercises between the parts of a learning sequence".

For criterion C5 shows an average of 2.67 and a percentage of 88.9% which also shows a strong agreement between the criteria of the textbook and the students' expectations. Nevertheless, 33.3% had a response tending towards "more or less satisfied" (Figure 6). As an example:

- C5: "I find that the illustrations have a great added value on the textbook especially they complete the explanation, or they treat an idea, as well as they are numerous. However, the illustrations are not too diversified".

A final question asked stakeholders to estimate their satisfaction with using the digital textbook on a scale of 1 to 5. According to the responses, 91.7% of the students were satisfied with using the manual and 8.3% were more or less satisfied (level 3). Nevertheless, no student had a satisfaction level of 1 or 2.

4 Discussion

First, let us recall that the purpose of our research is to analyze the needs of students to determine the essential indicators to be employed in the design of a digital textbook of soft skills, to measure the approval of the textbook by specialists, and to measure the concordance of the criteria of the textbook with the expectations of the students. We will discuss the results in light of our purpose, and in light of previous research.

The identification of students' needs allowed us to deduce the teaching-learning mode preferred by the students to better learn and develop their abilities and skills. The results showed that students are interested in studying through active learning methods, which is approved by the results that students prefer the hybrid (48.3%) and face-to-face (38.3%) teaching mode. For learning methods, they prefer the flipped classroom (65%) and for teaching methods they prefer all student-centered methods (experiential 91.7%, interactive 80%, independent 70%, indirect 65%). They also preferred types of assessment that required the mobilization of skills and competencies such as projects (90%) and research (81.7%) and the mobilization of knowledge to direct questions (81.7%).

These results have been confirmed by some works that consider that students prefer hybrid or face-to-face teaching [23–26], flipped classroom [27–29], active learning methods [30,31]. Similarly, the results showed that students strongly prefer the integration of ICT in the teaching – learning process (Figure 4), and according to [32–34] showed that students are satisfied with the use of digital resources. As well as [35] showed that students are more satisfied at the use of dynamic ICT.

In addition, the results presented those students have remarkable representations on the importance of using a course material in the teaching – learning process and that its form and content must contain essential elements (Figure 5), and according to [13] who expressed those students valued the use of interactive course materials. In addition, [36,37] showed that students are satisfied with the use of a textbook. And according to [38] who expresses that the use of digital tools creates student engagement in the completion of learning activities, also [20] express that the use of a digital textbook develops student engagement in the learning process.

Our second result showed that by following a model of scripting and design of the digital textbook, the evaluation of the textbook by technical and pedagogical specialists is highly appreciable, given that all the criteria of the evaluation grid are positioned on the Q4 quartile (75%–100%). We also found that there is no relationship between the criteria of the grid.

In the same sense, similar studies have been carried out and according to [39] who carried out a study of design and development aimed at validating a model of instructional design and that after the validation by experts they show that this model facilitates the process of teaching for teachers and student learning. Thus, the design of a new product consists of assessing the needs and expectations of the users so that the designers reinvent the needs into a product that is adequate for the users [40].

The identification of the students' needs and following a model of scripting and design of the digital textbook allowed the students to be satisfied with using the designed digital textbook, since the results showed a strong concordance of the evaluation criteria and the students' expectations since all the averages were higher than 2.67/3.00 and

with a percentage of 88.9% and going to 97.2%. As well as the results of the students' satisfaction with the use of the digital textbook reached 91.7%.

Similarly, [41] show that learning through digital textbooks focuses on student acceptance and perception. In the same sense, students preferred to use a digital textbook [42,43].

Nevertheless, studies have shown the unsuccessful realization of a textbook even following observations and needs analysis, the textbooks did not reach the level of students since the textbook contains fragmented and incomplete content [44].

Limitations of our research seem to be mentioned, the experimentation focused only in one institution, as well as the sample is not large enough and that requires experimentation on a large population, varied institutions, and fields of study of students to show more comprehensiveness.

5 Conclusion

ICT tools remain an easy asset to integrate into the teaching-learning process to foster and improve the acquisition of knowledge and the development of skills in students on the one hand, and on the other hand to allow the teacher to use a panoply of resources helping to complement his innovative professional practices.

The objective of our research is to analyze student needs to determine the essential indicators to be used in the design of a digital soft skills textbook, to measure the approval of the textbook by specialists, and to measure the concordance of the criteria of the textbook with student expectations.

The identification of student needs led to the conclusion that students are interested in learning through active learning methods and student-centered teaching methods and prefer types of assessment that require the mobilization of abilities and skills. In addition, students strongly prefer the integration of ICT tools in the teaching-learning process and show remarkable representations on the importance of using a course material in the teaching-learning process.

The design of the digital textbook, following a model of scripting and design, has achieved remarkable results in its evaluation by technical and pedagogical specialists, and has led to a high level of satisfaction of students in using the digital textbook.

To follow up the results, we consider that this study contributes to a preliminary study of a future study that aims to experiment the use of the digital textbook of soft skills by university students to analyze the development of skills necessary for the success of academic studies and integration into the labor market.

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