

ORIGINAL ARTICLE

Evaluating e-learning satisfaction with a quali-quantitative analysis of the open-ended responses: A case study of a continuing medical education course

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Abstract. *Background and aim:* Continuing education is essential in the health sector, ensuring professionals stay updated with advancements and best practices. The growing reliance on e-learning, accelerated by the COVID-19 pandemic, has improved accessibility and engagement along with the use of interactive methodologies. These factors showed to increase participant satisfaction. The Italian National Institute of Health (ISS) has implemented e-learning courses using problem-based learning (PBL) to foster active learning. This study evaluates the informative potential of the feedback survey (FS) used in ISS courses, focusing on a quali-quantitative analysis of participant feedback from a case study course. *Methods:* The case study course was designed using PBL methodology and targeted healthcare professionals across all disciplines. Data on sociodemographic characteristics and FS responses to closed and open-ended questions were extracted from EDUISS, ISS e-learning platform. A combination of quantitative and quali-quantitative text analysis was conducted to examine responses and develop a thematic vocabulary. *Results:* A Satisfaction Training Index, derived from 18 Likert-scale items, showed high overall satisfaction (mean: 4.4, SD: 0.6) among 47,017 respondents out of 68,805 total participants (70% females, 57% nurses). Text analysis of open-ended responses revealed predominant themes of positive evaluations and clarity of content and delivery. Suggestions focused on enhancing content depth and improving evaluation methods. Thematic analysis produced a thematic vocabulary of 4 macro-themes and 13 specific themes covering positive comments (90%) and suggestions (>70%). *Conclusions:* Although overall satisfaction levels were high, the qualitative analysis of open-ended responses provided actionable insights for improving course delivery and tools. (www.actabiomedica.it)

Key words: continuing medical education (CME), satisfaction, e-learning, qualitative text analysis, lexicometric analysis.

Introduction

Continuing education plays a pivotal role in the health sector, ensuring that healthcare professionals

remain up to date with the latest scientific advancements, clinical guidelines, and best practices (1). Given the rapid evolution of medical knowledge and technological innovations, lifelong learning is essential

to maintaining high standards of care, improving patient outcomes, and addressing emerging public health challenges. This need applies to professionals at all career stages (2,3), from those in the early phases of their careers to experienced practitioners seeking to refine their expertise. Continuous professional development enables healthcare workers to adapt to evolving healthcare systems and the increasing complexity of patient needs. In Italy, this commitment to lifelong learning was institutionalized in 2002 with the launch of the National Continuing Medical Education (CME) Program, established pursuant to Legislative Decree 502/1992 and Legislative Decree 229/1999, which introduced the mandatory requirement of continuing education for healthcare professionals (4). Furthermore, it allows them to stay informed about the most relevant and recent topics in health, including advancements in public health research and threats (5,6), ensuring the ability to deliver evidence-based, high-quality care (7–9). Over the years, continuing education has undergone significant transformations, with the adoption of digital tools enhancing the accessibility and flexibility of training programs. E-learning has become an integral component of continuing education strategies, expanding opportunities for knowledge acquisition across healthcare disciplines (10,11). The COVID-19 pandemic acted as a catalyst in this process, accelerating the growing reliance on e-learning solutions (12). During the global health emergency, traditional in-person training faced substantial limitations, prompting the widespread adoption of digital platforms for professional education. This trend not only ensured the continuity of training but also demonstrated the effectiveness of online learning in reaching large audiences, fostering interactive engagement, and accommodating diverse learning styles. Furthermore, the widespread use of these tools contributed to increasing digital literacy among healthcare professionals, enabling them to become more familiar and confident with e-learning technologies (13). In this context, the integration of active learning methodologies has further enriched e-learning experiences in the health sector. Approaches such as problem-based learning (PBL), case simulations, and interactive assessments have been increasingly incorporated into course design to promote

deeper learning. These methodologies enhance learner engagement by encouraging critical reflection, real-world problem-solving, and collaborative learning (14,15). The adoption of these strategies has led to more effective educational interventions (16). To ensure the effectiveness of e-learning initiatives, evaluating participant satisfaction is a fundamental step, aligning with the first level of Kirkpatrick's model for training evaluation (17) and evaluating the effectiveness of educational activities is crucial, particularly in the context of CME (18). In this regard, participant satisfaction plays a key role in determining the overall success of a training course (17,19). Satisfaction assessment provides insights into learners' perceptions of course content, structure, and delivery, offering valuable feedback for continuous improvement (20,21). A positive learning experience enhances motivation and engagement, increasing the likelihood of knowledge retention and application in clinical practice. Moreover, systematically analyzing participant feedback allows educators to identify areas for refinement, ensuring that training programs remain relevant, responsive to learners' needs, and capable of fostering professional growth. Satisfaction can be measured through various methodologies, including both closed- and open-ended questions (22). Text analysis of open-ended responses provides deeper insights into participants' experiences, helping to identify areas for improvement and capturing learners' reactions (23,24). Since 2004, the Italian National Institute of Health (Istituto Superiore di Sanità, ISS) has provided e-learning courses using PBL methodology for healthcare professionals (25) through an ad hoc platform, EDUISS (www.eduiss.it). The ISS Training Office (TO) has the goal of strengthening professional competencies and contribute improving overall health outcomes. All ISS e-learning courses include tools to assess their effectiveness in knowledge acquisition and user satisfaction, based both on closed and open-ended questions, facilitating continuous quality improvement (26). This study aims to deepen the informative potential of the satisfaction evaluation tools in use in ISS e-learning courses, using a course as a case study. By integrating both quantitative feedback and open-ended responses, the study seeks to gain deeper insights into the learning experience. A specific focus

is placed on a quali-quantitative text analysis of open-ended responses, offering a detailed understanding of healthcare professionals' perceptions.

Methods

Recently, the ISS TO, in collaboration with the ISS Department of Infectious Diseases, developed an online course aimed at increasing awareness of antimicrobial resistance (AMR). We selected this course as a case study to carry out a quantitative analysis for closed questions and a quali-quantitative text analysis for the open-ended responses from the feedback survey (FS), the tool set up by ISS to evaluate all the provided e-learning courses.

The case-study course

The course "Introduction to antibiotic-resistance phenomenon and to its contrast in human and veterinary health field" was held in two identical editions. The first edition ran from October 6, 2022, to December 9, 2022, while the second was available from January 30, 2023, to July 31, 2023. Designed for healthcare professionals across different disciplines, the course was delivered through the EDUISS platform and structured using the PBL methodology. It had five specific learning objectives. First, it aimed to describe antimicrobial resistance as a major threat to public health. It also sought to provide an overview of the epidemiology of antimicrobial resistance at both national and international levels. Another key objective was to identify the strategies for combating antimicrobial resistance. Additionally, the course focused on describing the use of antibiotics in human medicine and its impact on antimicrobial resistance. Lastly, it examined the consequences of antibiotic use in the veterinary and livestock sectors and its role in the development of antimicrobial resistance. The course included various evaluation tools: a non-mandatory FS administered at the end of the course focused on participants satisfaction; a mandatory 10-question test administered both at the beginning (pre-test) and at the end (post-test) to evaluate knowledge acquisition, with each correct answer corresponding to one point,

for a maximum possible score of 10; and a final certification test. The latter test was required for course completion and was mandatory to obtain CME credits, as mandated in Italy by the National Agency for Regional Health Services (AGENAS).

Data collection

All data were extracted from EDUISS platform. Socio-demographic information about participants (age, gender, residence, profession, employment status) was obtained from EDUISS user profiles, which are required upon registration to the platform. The use of personal data complied with EU and Italian privacy regulations, including Regulation (EU) 2016/679 (GDPR) and Legislative Decrees 196/2003 and 101/2018, and requires explicit user authorization. Data on course satisfaction was obtained from the non-mandatory FS administered at the end of the course. The FS, whose reliability and consistency were previously measured (27), consists of 18 items assessed using a 5-point Likert scale, where 1 corresponded to 'strongly disagree' and 5 to 'strongly agree', along with two open-ended questions. Items are regrouped into four sections: the first and second sections contain seven items each, evaluating general impressions and the course resources, respectively. The third and fourth sections include two items each, assessing technical and tutoring support as well as platform usability. Finally, the two open-ended questions allow participants to highlight particularly positive aspects of the course and suggest areas for improvement.

Statistical analysis

We developed an overall Satisfaction Training Index (STI) based on the mean scores of the 18 Likert-scale items of the FS (27). Then, we performed descriptive statistics to analyse the main socio-demographic characteristics of course participants and of FS respondents, the pre and post-test results; the scores of the 18 Likert-scale items of the FS and the overall STI. Further, we performed a mixed quali-quantitative text analysis, including a lexicometric analysis (28,29), on the two open questions of the FS. The answers to the two open questions constituted

the text corpus. Before processing the text, we filtered out stopwords, namely words that do not carry significant meaning. Then, through the quantitative text-analysis we assessed the word frequency, namely how many times a specific word appeared in the text corpus, to identify the principal themes emerging from participants' feedback. Finally, the qualitative text-analysis allowed a detailed assessment of the most frequent 10 topics of the text corpus and led to identify macro-themes and themes in which the corpus was organized and to construct a thematic vocabulary summarizing the key aspects of participant perceptions. Quantitative analyses were performed using IBM SPSS statistics, version 29.0.0.0, while qualitative and lexicometric analyses were carried out with Qualitative Data Analysis software, QDA Miner, version 2024.0.7, and WordStat, version 2024.0.4. The Topic Extraction feature of WordStat was used to identify the most frequent topics within the text corpus. Data visualization was conducted using Microsoft Excel and WordStat.

Results

Socio-demographic characteristics of the course attendees and FS respondents

The course was attended by 68,805 participants and the non-mandatory FS was filed by 47,017 subjects corresponding to the 68% of the participants. The main socio-demographic features of subjects are reported in Table 1 and reveal for both groups a predominance of females, accounting for around 70%, and of subjects falling within the 46-55 age range. Geographically, participants and FS responders were distributed across various Italian regions. In terms of professional background, nurses constituted the majority. The FS was filled in mainly by participants completing the course. Most FS respondents showed an increase in their knowledge of AMR.

Overall satisfaction of participants

The overall satisfaction of participants was evaluated by analysing the scores attributed to the 18

closed questions included in the FS. As reported in Figure 1 all the items received very high evaluations: for 15 items the median rating was equal to the maximum score of 5 (IQR 4-5), only 3 items included in the first section (Figure 1A), had a median score of 4 (IQR 4-5) (item "Appropriateness of content to background", item "Acquisition of new skills," and item "Applicability of what has been learned"). The overall STI score, developed starting from of the 18 Likert-scale items, confirmed the high perceived satisfaction of course attendees, showing an average score of 4.4 (SD 0.6).

Open-ended question evaluation

4,286 participants, representing the 6.2% of the total study population, answered at least one open-ended question allowing a deeper evaluation of the course satisfaction. Their main socio-demographic features were similar to those of the overall FS respondents with exception of age, which resulted higher (median age: 52 years; IQR 43-58), with the largest proportion of subjects falling within the >56 age range (35.1%).

Lexicometric analysis

The text corpus for the question asking feedback on "Positive course's aspects" (Table 2) contained 4,021 responses, or cases. After removing stopwords (44% of total words), the processed corpus included 4,164 sentences with an average length of 4.3 words, 2,194 unique words (types), and 17,769 total word occurrences (tokens). The type/token ratio was 12.3%, and the percentage of terms occurring only once (hapax percentage) was 38.6%, making the corpus suitable for lexicometric analysis. High-frequency word analysis identified 22 highly recurrent terms (Figure 2) and 73 moderately frequent words, mainly referring to overall evaluations of the course and its topic. Segment repetition and co-occurrence analyses further confirmed the predominance of themes related to overall positive course evaluations, content clarity, and presentation. Lexical analysis highlighted variations among participant subgroups. Respondents from the South and Islands used more frequently words expressing general satisfaction

Table 1. Characteristics of the entire study sample, namely participants who enrolled in the course (N: 68,805) and of the participants who filed the feedback survey (N:47,017). Values are number (N) and percentage (%) if not differently specified.

Characteristic	Course Participants (N: 68,805)	FS Respondents (N: 47,017)
<i>Age, M (IQR)</i>	49 (38-56)	50 (38-56)
Age groups		
<i><35 years</i>	13,654 (19.8)	9,309 (19.8)
<i>36-45</i>	14,380 (20.9)	9,634 (20.5)
<i>46-55</i>	21,743 (31.6)	14,943 (31.8)
<i>>56 years</i>	19,028 (27.7)	13,131 (27.9)
Gender		
<i>Female</i>	48,417 (70.4)	32,533 (69.2)
<i>Male</i>	20,388 (29.6)	14,484 (30.8)
Geographic Macroarea		
<i>Nord-West</i>	16,102 (24.4)	10,988 (23.4)
<i>Nord-East</i>	8,175 (11.9)	5,492 (11.7)
<i>Center</i>	17,377 (25.3)	11,940 (25.4)
<i>South</i>	18,273 (26.6)	12,410 (26.4)
<i>Islands</i>	8,754 (12.7)	6,113 (13.0)
Professional area		
<i>Nursing</i>	38,967 (56.6)	26,565 (56.5)
<i>Health management</i>	14,425 (21.0)	9,286 (19.8)
<i>Technical-diagnostic</i>	7,215 (10.5)	5,345 (11.4)
<i>Rehabilitation</i>	6,249 (9.1)	4,439 (9.4)
<i>Prevention</i>	1,198 (1.7)	883 (1.9)
<i>Technical-assistance</i>	747 (1.1)	496 (1.1)
Course completion		
<i>Completers</i>	43,054 (62.6)	42,940 (91.3)
<i>Non-completers</i>	25,751 (37.4)	4,077 (8.7)
Employment status		
<i>Employee</i>	55,438 (80.6)	38,292 (81.4)
<i>Freelancer</i>	9,066 (13.2)	5,890 (12.5)
<i>Unemployed</i>	2,707 (3.9)	1,809 (3.8)
<i>Contracted</i>	1,586 (2.3)	1,023 (2.2)
Pre-test score, M (IQR)	6 (5-7)	6 (5-7)
Post-test score, M (IQR)	7 (5-8)	7 (5-8)

Abbreviations: M=median; IQR: interquartile range.

like “all,” “ok,” and “excellent,” whereas those from the North-East and North-West more frequently used words expressing evaluation on the usefulness of course “useful” and “topic.” Employment type also influenced word choice, with contracted professionals more often

using terms like “all,” “content,” and “topic(s),” while employees used the term “interesting” more frequently.

The text corpus of the question “Suggestions for improving the quality of the course” included a total of 2,925 responses (Table 2). After excluding stopwords

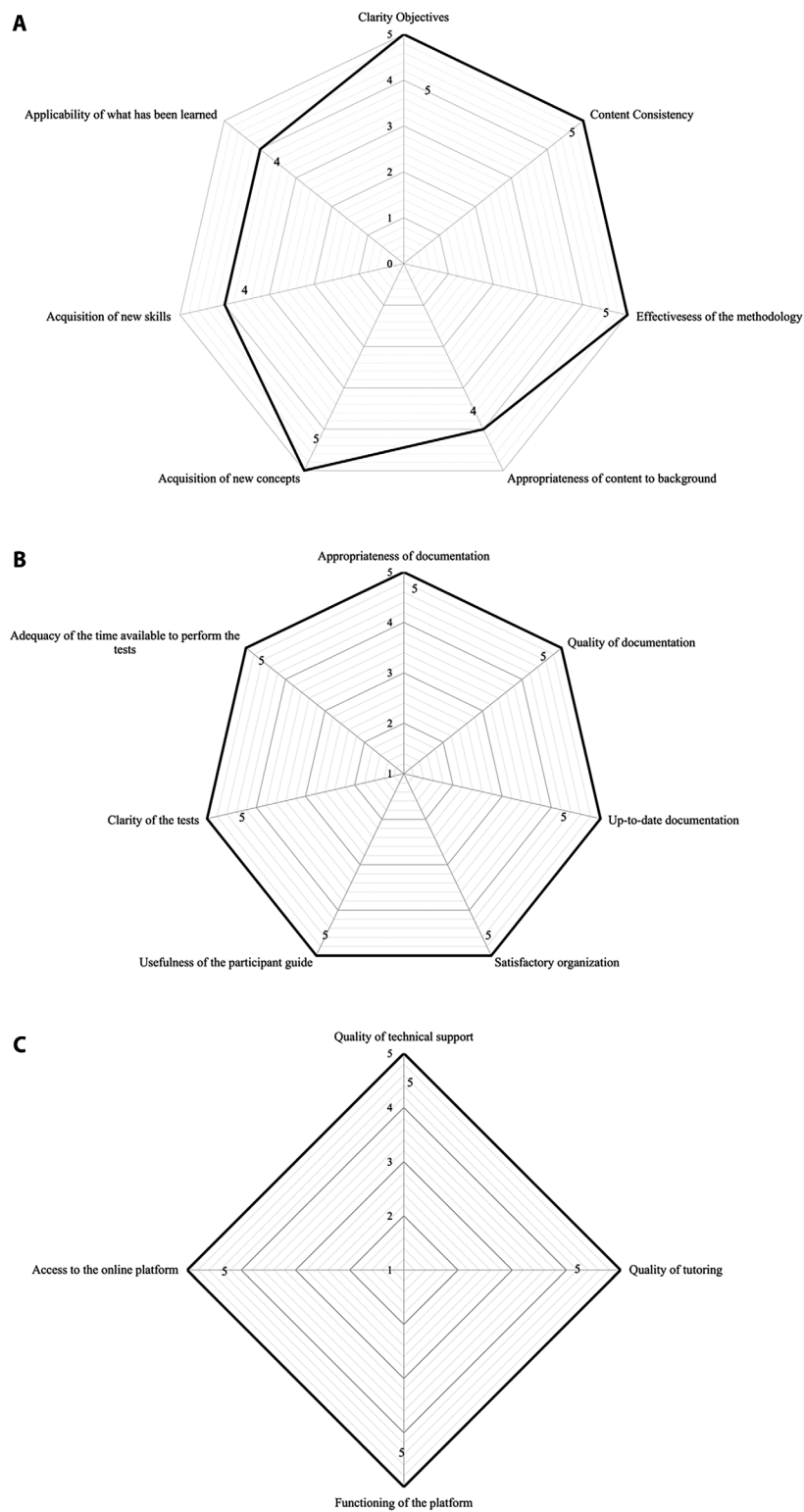
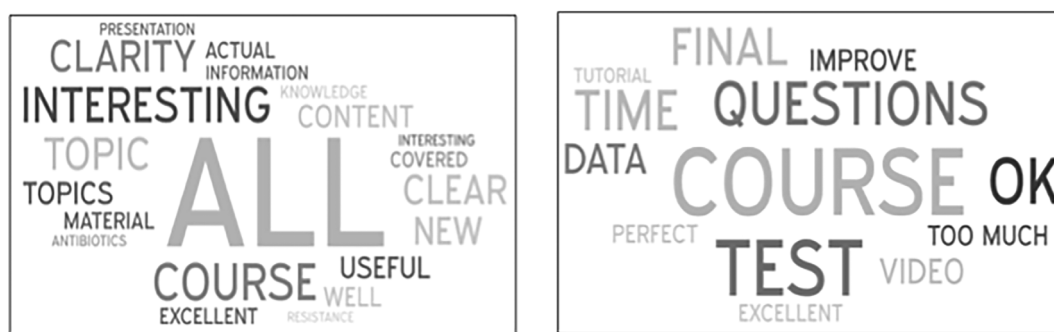


Figure 1. Results of Feedback Survey on: A) the first section, “General impressions”; B) the second section, “Resources”; C) the third and fourth section, “Technical Support and Tutoring” and “Platform Functionality”.

Table 2. Quantitative analysis of text corpus of the two open-ended questions included in the feedback survey

	Positive aspects of the course	Suggestions for improvement
Cases	4021	2925
Sentences	4164	3062
Occurrence (token)	17769	13933
Graphical figures (type)	2194	2422
Type/token ratio	0.12	0.17
Hapax percentage	39%	49%
Words per sentence	4.3	4.6

**Figure 2.** High-frequency words of the item “Positive course’s aspects” (left) and “Suggestions for improving the quality of the course” (right). The bigger the words the higher the occurrence.

(60% of total words), the text corpus of suggestions consists of 2,422 words (types), 13,933 occurrences (tokens), and 3,062 sentences with an average of 4.6 words per sentence. The type/token ratio of 17.4% and the percentage of terms occurring only once (hapax) of 48.6% indicate that the corpus can be subjected to lexicometric analysis. The word frequency analysis identified 13 high-frequency words (Figure 2) and 9 medium-frequency words. Most reported words were related to general suggestions or to specific aspects of the course’s structural components, especially time, content load or methodology and final test. The analysis of the most frequently repeated segments and co-occurrences also highlighted suggestions concerning the depth of content coverage and the final certification test. Additionally, the high-frequency word analysis revealed differences among various subgroups of participants. Regarding the macro-area of residence, participants from the South and the Islands most

frequently used the generic word “ok,” while those from the Northeast and Northwest more often used more focused words, such as “test” and “questions.” Regarding employment type, affiliated participants more frequently used the term “excellent,” whereas other professions used “ok” and “final” more often.

Thematic categorization

A qualitative analysis was then conducted to explore emerging themes from both responses and organize the content into a thematic vocabulary. The qualitative analysis aimed to deepen the understanding of emerging themes and systematically organize content. Firstly, this phase identified separately for the two open-ended questions the 10 main topics (Table 3), to which recurring keywords and phrases were associated. The topics from the item “Positive course’s aspects” were then grouped into 5 themes

related to general aspects of the course, subject matter, workplace applicability, teaching methods, and tools. The topics from the item “Suggestions for improving the quality of the course” were organized into 7 different themes that is final test, content depth, objectives, tools and tutorials, workplace applicability, and general aspects of the course. The latter 5 topics and themes identified were not pertinent to the question. Finally, by merging the categorization of main topics responses to both positive aspects and suggestions questions, a satisfaction vocabulary was identified. The final vocabulary structure consists of 4 macro-themes (general impressions, resources, platform, support) and 13 themes reported in Table 4.

Regarding positive aspects (Table 4), the vocabulary covers 89.8% of words. The most frequent macro-theme is “general impressions” (including 79.4% of words), followed by “resources” (8.2%), “platform” (1.7%), and “support” (0.5%). Within the general impressions macro-theme, the “general aspects” theme is the most populated (30.0%) and consists of general evaluations that users gave to the course, without attributing them to specific components. The “topic” theme (29.6%) includes cases in which positive aspects referred to the course’s specific topic, which in this case is antibiotic resistance. The themes “didactics” (8.5%) and “applicability” (7.1%) were also populated, albeit less frequently; the former includes positive aspects regarding the teaching methodology, while the latter encompasses positive aspects related to the usefulness and applicability of the course content in professional settings. Within the “resources” macro-theme, positive aspects relate to the “tools” theme (3.6%), which includes all cases in which users appreciated the documents provided during the course, as well as the “tutorial” (2.0%) and “organization” (1.8%) themes, where users praised aspects of the video tutorials or the course’s organization and structure. Regarding suggestions (Tables 4), the vocabulary covers 70.7% of words. The most frequent macro-theme is “general impressions” (41.2%), followed by “resources” (25.2%), “platform” (3.2%), and “support” (1.1%). Within the general impressions macro-theme, the “general aspects” theme is the most populated (21.6%) and consists of generic suggestions that users provided for

the course. The “topic” theme (10.2%) includes cases in which suggestions related to the course topic. The themes “applicability” (3.7%) and “appropriateness” (3.4%) were also populated, albeit less frequently; the former includes suggestions regarding the workplace applicability of the course content, while the latter consists of recommendations for further exploration of specific aspects of the course topic.

Within the “resources” macro-theme, suggestions relate to the “test” theme (14.0%), encompassing all cases where improvements to the final certification exam were suggested, as well as the “tutorial” (4.2%) and “organization” (3.9%) themes, where users proposed changes to video tutorials or the organization and structure of the course.

Discussions

This study shows an overall high satisfaction of participants as well as a perceived interest of the specific topic of the case study course in line with what observed in other courses offered by the ISS. The socio-demographic characteristics of the participants, including geographical distribution, gender, and profession, reflect a partition similar to that observed in previous studies on other ISS courses, suggesting consistency in the audience profile and reinforcing the generalizability of the findings (27,30,31). The analysis of open-ended responses included in the satisfaction evaluation tool provided valuable insights into the positive aspects of the course and gathered useful suggestions for improving the quality of development of future courses. The lexicometric analysis and thematic categorization underscore a strong appreciation for the course as a whole, as evidenced by the predominance of positive terms and topics, mainly focusing on general aspects of the course, the topic covered, the teaching methodology, and the practical applicability of the content. Regarding suggestions, the text analysis highlighted a focus on structural aspects of the course, such as the final certification test and clarity of materials, with specific references to the need to reconsider the content depth and the final certification test questions and length. The high frequency of

Table 3. The 10 main topics identified by qualitative analysis of the open-ended questions with relative keywords and synthetic interpretation

	Topic	Keywords	Synthesis	Theme
Positive aspects of the course	WELL-STRUCTURED COURSE	WELL-ORGANIZED; WELL-ARTICULATED; INTERESTING; CLEAR; COMPLETE	The course results well-structured, well-organized and well-articulated	GENERAL ASPECTS
	NEW KNOWLEDGE	ACQUIRED NEW KNOWLEDGE; NEW KNOWLEDGE; NEW THINGS; NEW CONCEPTS; NEW INFORMATION	The course allows to learn new concepts, new information new things	TOPIC
	ANTIBIOTIC RESISTANCE	PROBLEM OF ANTIBIOTIC RESISTANCE; GREATER AWARENESS	The topic of course is important, relevant	
	TOPIC COVERED	IMPORTANT TOPIC; VERY IMPORTANT TOPIC; IMPORTANCE OF THE TOPIC; RELEVANCE OF THE TOPIC		
	WORKPLACE REALITY	WORK-RELATED; WORK ACTIVITIES; WORK REALITY	The topic of course is work-related, applicable to work activities	APPLICABILITY
	WORK ENVIRONMENT	USE OF ANTIBIOTICS; WORK-RELATED FIELD		
	CLINICAL PRACTICE	DAILY; LIFE; IMPORTANT	The course content is explained clearly	DIDACTICS
	CLEAR PRESENTATION OF ALL TOPICS	EXPLAINED IN A CLEAR MANNER; CLEAR PRESENTATION		
	CLARITY OF CONTENT	COMPLETENESS AND CLARITY; EXPLANATORY CLARITY; CLARITY OF PRESENTATION	The course's support material is good	TOOLS
	TEACHING MATERIAL	SUPPORT MATERIAL; EDUCATIONAL MATERIAL; EXCELLENT MATERIAL; MATERIAL QUALITY; AVAILABLE MATERIAL		

Table 3 (Continued)

	Topic	Keywords	Synthesis	Theme
Suggestions for improvement	FINAL TEST	TIME AVAILABLE; REDUCE THE NUMBER; QUESTIONS IN THE FINAL TEST	The final test of the course is too long	TEST
	QUESTIONS	QUIZ; TOO MUCH; TOO MANY; TOO SPECIFIC		
	REMEMBER PERCENTAGES	TOO MANY; DIFFICULT; TEST; TOO MUCH; QUESTIONS	The final test contains too many data that result difficult to remember	APPROPRIATENESS
	STATISTICAL DATA	TOO MANY; MEMORIZE; REDUCE; TOO MUCH DATA		
	OBJECTIVES	PROBLEM; AVOID; EVALUATION;	Answers not pertinent to the question	OBJECTIVES
	PRACTICAL EXAMPLES	PRACTICAL EXAMPLES		TUTORIAL
	CLINICAL PRACTICE	CLEAR; INFORMATION; ANTIBIOTICS		APPLICABILITY
	MATERIALS	READING; STUDY; CLEAR;		TOOLS
	EXCELLENT QUALITY	QUALITY; EXCELLENT; SATISFACTORY		GENERAL ASPECTS
	WELL-STRUCTURED, GREAT COURSE	WELL-STRUCTURED; EXCELLENT COURSE		

Table 4. Composition of the “Positive aspects” and the “Suggestions” vocabulary

Macro-theme	Theme	Positive aspects frequency	Suggestions frequency
GENERAL IMPRESSIONS	GENERAL ASPECTS	30.0%	21.6%
	TOPIC	29.6%	10.2%
	DIDACTICS	8.5%	2.0%
	APPLICABILITY	7.1%	3.7%
	OBJECTIVES	0.3%	0.3%
	APPROPRIATENESS	3.9%	3.4%
Total coverage		79.4%	41.2%
RESOURCES	TOOLS	3.6%	3.1%
	TUTORIAL	2.0%	4.2%
	ORGANIZATION	1.8%	3.9%
	TEST	0.8%	14.0%
Total coverage		8.2%	25.2%
PLATFORM	PLATFORM	1.7%	3.2%
SUPPORT	TECHNICAL	0.3%	0.7%
	TUTORING	0.2%	0.4%
Total coverage		0.5%	1.1%

topics such as “remember percentage” and “statistical data” could suggest the need to address participants specific potential disparities in educational levels and to better adapt the level of detail in course content to the audience. These finding suggest that it would be worthy to introduce a pre-course training needs assessment step which could be carried through a dedicated questionnaire. Such an evaluation may support efforts to reduce educational disparities and assist the ISS TO in refining course materials to better reflect the needs of healthcare professionals, thereby optimizing the effectiveness and relevance of educational pathways. Additionally, satisfaction evaluation can be the starting point to develop effective indicators for the continuous monitoring of training quality. Interesting geographical differences in the responses emerged. Participants from the South and Islands expressed more general and global appreciation or suggestions, while those from the North-West and North-East provided more targeted evaluations on specific aspects such as “topic” and “test”, “question”. These variations may be linked to differences in previous training experiences and regional work contexts. Qualitative analysis of the answers, through the development of

a thematic vocabulary, allowed for the systematization of key themes emerging from open-ended responses. The macro-theme “general impressions” represents the most populated category for both positive aspects and suggestions, underscoring the importance participants place on the course as a whole. Among the most populated themes are “general aspects,” followed by “topic” and “teaching”. These observations highlight the value attributed to the course’s specific subject and the content delivery method. Regarding suggestions, the macro-theme “resources” stands out, indicating again a need for improvements in components such as the final certification test and tutorial organization. This study presents several strengths and some limitations that deserve further consideration. Among its strengths, it represents the first analysis conducted on ISS e-learning courses using a quali-quantitative text analysis approach to evaluate participants’ satisfaction, marking an important step toward more in-depth and structured assessment methodologies. The large sample size, as in other online courses (32,33), exceeding 68,000 participants, ensures high representativeness and statistical robustness. Moreover, the integrated methodological approach to evaluate participants’

satisfaction, combining quantitative and qualitative response analysis, represents another methodological strength (20). Lexicometric analysis enabled the identification of the most frequent words and segments, while thematic categorization further explored the content of opinions, offering a comprehensive view of participants' perceptions. These suggestions could lead to the creation of additional Likert items to include in the FS. However, the study also presents some limitations. One of the main drawbacks is the low percentage of participants who completed the open-ended fields (34), amounting to only 6.2% of the total. The low proportion of open-ended responses compared to the total number of participants suggests a potential difficulty in engaging with this feedback modality or a lack of motivation to provide additional comments, an issue already known and emerged in different contexts (22). This could introduce a selection bias, as the opinions collected may not reflect those of the entire participant population but rather a more motivated subgroup or individuals with particularly positive or negative experiences. Furthermore, some of the answers and the frequent topics from the item "Suggestions for improving the quality of the course" were not pertinent to the question. However, the respondents to open-ended questions seem representative of the overall respondents and overall course attendees in terms of geographical distribution, gender, and profession, only age resulted different, with the largest proportion of subjects falling within the >56 age range instead of the 46-55 age range. The introduction of a pre-course training needs assessment through a dedicated user questionnaire could be useful not only to optimizing the effectiveness and relevance of educational pathways but also to favor the commitment of less interacting subgroups of course participants. From a methodological perspective, although the analysis considered certain sociodemographic variables, other potentially relevant factors—such as professional experience or available technological resources—were not taken into account. These elements may have influenced both course participation and expressed opinions. Additionally, despite using a structured thematic vocabulary, the categorization of themes in the qualitative analysis involves a certain degree of subjectivity.

Conclusion

Satisfaction evaluation plays a crucial role in enhancing the quality of training. It provides practical and concrete insights to refine both content design and course delivery by identifying critical aspects. If included, the quali-quantitative analysis of open-ended responses is an extremely valuable tool that can provide evidence-based input for optimizing future courses, even the presence of high overall satisfaction, making it easier to identify targeted area of further improvement.

Ethic Approval: According to Italian regulations, ethics committee approval was not required for this study. By registering for the course on the online platform, participants provided their consent to the use of their anonymous data.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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