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Artificial intelligence driven digital reproductive health education: Building a terminology database to improve Spanish health communication training

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Abstract

This study proposes an artificial intelligence based pipeline to create a standardized Spanish reproductive health terminology database, addressing challenges like inconsistent terminology and direct machine translation in existing digital education resources. The methodology involves: (1) corpus acquisition of educational materials and user queries, (2) automatic term extraction and normalization, (3) mapping to established biomedical terminologies (e.g., UMLS, SNOMED CT), and (4) generating simplified definitions and examples to bridge clinical and consumer language gaps. Prior research on Spanish medical vocabulary and text simplification supports this approach. The evaluation plan includes expert validation (clinicians/educators), intrinsic term quality control (coverage, ambiguity, synonymy), and learner-focused assessments (term recognition and comprehension). The expected outcome is a reusable terminology tool and a replicable framework that enhances Spanish health communication capacity in reproductive health education without compromising interoperability or digital education processes. *(Afr J Reprod Health 2026; 30 [9s]: 48-58).*

Keywords: Reproductive Health Education, Spanish Medical Terminology, Terminology Database

Résumé

Cette étude propose un pipeline basé sur l'IA pour créer une base de données terminologique standardisée en espagnol sur la santé reproductive, afin de relever des défis tels que la terminologie incohérente et la traduction automatique directe dans les ressources éducatives numériques existantes. La méthodologie comprend : (1) l'acquisition d'un corpus de matériels éducatifs et de requêtes utilisateurs, (2) l'extraction et la normalisation automatique des termes, (3) le mapping avec des terminologies biomédicales établies (par exemple, UMLS, SNOMED CT), et (4) la génération de définitions et d'exemples simplifiés pour combler les écarts entre le langage clinique et celui du grand public. Les recherches antérieures sur le vocabulaire médical espagnol et la simplification des textes soutiennent cette approche. Le plan d'évaluation inclut une validation par des experts (cliniciens/éducateurs), un contrôle de qualité intrinsèque des termes (couverture, ambiguïté, synonymie) et des évaluations centrées sur les apprenants (reconnaissance et compréhension des termes). Le résultat attendu est un outil terminologique réutilisable et un cadre reproductible qui améliore la capacité de communication en santé espagnole dans l'éducation à la santé reproductive, sans compromettre l'interopérabilité ou les processus éducatifs numériques. *(Afr J Reprod Health 2026; 30 [9s]: 48-58).*

Mots-clés: Éducation à la santé reproductive, Terminologie médicale espagnole, Base de données terminologique

Introduction

The accelerated spread of artificial intelligence (AI) technologies has transformed the digital health education process as it makes it possible to deliver health information in a scaled, personalized, and interactive manner. In the field of reproductive health, AI-based software, including chatbots, mobile applications, and adaptive learning systems are becoming popular in assisting with health education, counseling, and decision-making. These tools have a high potential to fill access, continuity, and individualization gaps in the access and continuity of reproductive health information, especially in digitally mature health ecosystems. Nonetheless, the performance of AI-based reproductive health education cannot be judged only by the adequacy of the algorithm provided, system access, but it is important to consider the quality of language used in health information, its continuity, and the ability to interpret it as a necessary condition[1].

Spanish is one of the most spoken languages in the world that is a key to transnational

health communication and training. Regardless of this significance, Spanish-language reproductive health education resources are often imprecise in terms of terminology, clinical overcomplicated, and literal artifacts of machine translation that prevent reading and learning. The previous studies in health communication and health literacy have repeatedly demonstrated that the lack of terminological consistency and unknown medical terms decreases comprehension and confidence as well as proper health-seeking behavior among learners and patients[2]. The latter difficulties are magnified in artificial intelligence mediated ones, where automated content-generating systems can recreate ambiguity, synonym confusion or non-standard phrases unless very specifically restricted by structured linguistic resources.

Controlled vocabularies and terminology databases have long been considered to be the basis of infrastructure of enhancing clarity and interoperability in biomedical communication. Standardized concept representations available in such sources as the Unified Medical Language System (UMLS) and SNOMED CT help facilitate clinical documentation, data interchange and decision support[3]. Nevertheless, the terminologies are usually intended to be used by professionals and clinical environment and do not match the needs of consumer-facing or education-oriented language. The studies of the consumer health vocabulary prove that patients and learners use other lexical forms, paraphrases, and explanatory expressions that are quite different compared to the official clinical vocabulary[4]. The only way of filling this gap is through systematic identification, normalization, and explanation of the terms in real world health communication settings.

Recent innovations in the fields of natural language processing (NLP) and corpus linguistics have made it possible to fully process and analyze domain-specific terminology using automated methods on large amounts of health texts. Medical lexicons and health corpora in Spanish language have been created to facilitate clinical NLP applications, readability evaluation and text simplification[5]. Meanwhile, AI terminology extraction, concept mapping, and definition generation applications have been demonstrated to demonstrate a potential to improve consumer health literacy by providing the connection between technical words and available explanations. However, a good deal of this is yet to be incorporated, and the degree of integration into AI-supported health teaching and training systems is limited, especially within the reproductive health context[6].

Terminology is particularly crucial in reproductive health education because many areas covered by it, including contraception, fertility, pregnancy, and sexual health are sensitive. Poorly defined or not defined terms may result in misinformation, panic, and unsuitable decision-making. The research comparing AI chatbots and automated sexual health information systems suggests that accessibility and anonymity mean much to users, but the usefulness of terminology has a profound impact on the perceived credibility and efficacy of education [7]. These results imply the necessity to develop AI systems which are not only intelligent, but also linguistically based and terminology conscious.

It is on this backdrop that this paper suggests an AI-based model of creating a Spanish reproductive health terminology database to facilitate training of digital health communication. The proposed method (through the integration of corpus-based term extraction, standardized concept mapping, and AI-generated explanations that are easy to understand) should enhance terminological consistency, readability, and pedagogical efficacy of Spanish reproductive health education. The research has added value to the literature by classifying terminology datasets as dynamically active parts of AI-enhanced health education systems instead of passive reference materials, and proposing a comparable methodology that can adjust AI innovation in line with linguistic quality and health communication theory.

Literature review

AI in digital and reproductive health education

Digital health education systems that incorporate artificial intelligence have been steadily introduced to provide increased scalability and personalization of health information delivery and responsiveness. The initial use of AI in healthcare was focused on clinical decision support and data interoperability, but the more recent advancements focus on patient- and learner-facing applications, including chatbots, virtual assistants, and adaptive education systems[8]. Applications of AI in reproductive and sexual health

education Skilled AI-driven systems are noteworthy in terms of ability to access sensitive information privately, on demand, and in turn, reduce levels of stigma-related barriers to learning and help-seeking behavior.

Empirical research measuring AI-based health chatbots shows that users like them and feel that they are useful especially in issues relating to sexual and reproductive health[9]. Nevertheless, other limitations, including the use of inconsistent terminologies, oversimplification, or excessive clinical jargon, which may hamper the effectiveness of education are also noted in these studies. Recent reviews on AI chatbots as a source of sexual health information portray that despite the factual accuracy which is more than satisfactory, clarity of terms used and explanatory capacity is a consistent shortcoming[10]. This highlights the necessity of linguistic and terminology foundation in AI-based systems of reproductive health education.

Biomedical terminologies and standardized vocabularies

Interoperable health information systems are based on standardized biomedical terminologies. Unified Medical Language System (UMLS) incorporates various biomedical vocabularies and presents a broad architecture of concept normalization of various fields of health[11]. Equally, SNOMED CT is a structured clinical terminology that is used to assist in attaining accurate documentation, decision support, and semantic interoperability in electronic health record systems. Though these resources are needed in clinical and informatics applications, they cannot be suitable in health education and training. In clinical terminologies, accuracy and exhaustiveness are valued more than portability and teaching suitability. Research has shown that there are significant discrepancies between professional vocabularies and language utilized by patients and learners in terms of consumer interaction with clinical terminology[12]. Thus, using clinical terms directly in the educational AI systems will unintentionally lead to cognitive load and less understanding, especially in reproductive health cases that demand explanation along with subtly.

Consumer health vocabulary and terminology familiarity

To combat the lack of connection between professional and lay language, studies on consumer health vocabulary (CHV) have explored how the non-expert user interprets, redefines and seeks the explanation of medical terms. Initial CHV research findings have also shown that patients often use non-standard words, synonyms, and descriptive language that are not represented in clinical vocabularies[13]. Further studies affirmed that the familiarity with terminology has a very strong impact on comprehension, recall, and perceived credibility of health information. Some of the ways of determining and organizing consumer health vocabularies are manual annotation, survey-based familiarity testing, and automatic determination of terms through patient generated texts. Consumer vocabularies have been enriched using similarity-based and corpus-driven methods that have mapped the colloquial expressions to standard medical terms[14]. These results give a good reason to consider the development of terminology materials which are specific to the educational and communication setting as opposed to the situation when only the clinician-dependent norms are used.

Spanish medical corpora and lexical resources

Medical natural language processing (NLP) in Spanish has been receiving considerable attention as Spanish is widely spoken around the world and also because of health literacy documented issues in Spanish speaking communities. A number of Spanish medical corpora and lexicons have been built on large scale to facilitate operations like information extraction, clinical text processing and readability evaluation[15]. These resources are able to capture real-life language use in health-record and educational resources, which allows lexical and syntactic complexity to be studied empirically. Corpus-based researches have continuously indicated that Spanish health literature usually surpasses the levels of recommended readability, especially in the area of reproduction and female health[16]. Such results have led to the creation of Spanish-specific lexicons and annotation systems

which facilitate term normalization and simplification. Nonetheless, the majority of the existing corpora are created to support clinical NLP or retrospective analysis, whereas few of them are integrated with AI-based educational or training systems.

AI-based terminology extraction and explanation generation

NLP processing and machine learning have facilitated automated extraction of the terminology, concept mapping, and generation of explanations of large text collections in the health field. AI methods are able to detect domain-relevant terms, relate semantically similar words and map them to standardized concepts. Recent studies also show that AI systems can produce simplified definitions and contextual explanations of medical terms that enhance the understanding without reducing the informational quality[17]. There are also measured improvements in consumer comprehension by text simplification systems and term explanation systems both in bilingual and Spanish-language contexts[10]. However, these systems are seldom incorporated into systematized databases of terminologies or even correlated with planned educational outcomes. They are instead commonly judged as discrete tools making their long-term health communication training less useful[18].

Terminology challenges in reproductive health ai systems

The linguistic issue of reproductive health education is special because of the sensitive material, social diversity and the mixture of clinical, colloquial and euphemist language. Terminology ambiguity in AI-mediated reproductive health systems may result in a poor understanding, misinformation, or lack of trust. Research on the performance of AI chatbots in sexual and reproductive health sectors has highlighted that linguistic clarity and the use of terminological consistency are important factors that dictate user satisfaction and learning [19]. Although this is the case, the current AI-based reproductive health education systems seldom consider specific terminology databases or consumer-focused lexical databases. This is a major gap in the literature at the point of intersection of AI, health education, and applied linguistics[20].

Research gap

Overall, prior research demonstrates substantial progress in AI-enabled health education, biomedical terminologies, consumer health vocabularies, and Spanish medical NLP. However, these strands of literature remain largely disconnected. Clinical terminologies lack pedagogical accessibility, consumer health vocabularies are insufficiently standardized, and AI health education systems often operate without explicit terminological control. This study addresses this gap by integrating corpus-based terminology extraction, standardized concept mapping, and AI-generated explanations into a unified Spanish reproductive health terminology database designed explicitly for digital health communication training. By doing so, it advances existing work and provides a linguistically grounded foundation for AI-driven reproductive health education.

Conceptual framework

The proposed conceptual framework illustrates how an AI-driven terminology database can enhance Spanish reproductive health communication training by systematically linking corpus linguistics, standardized biomedical knowledge, and AI-based educational delivery. At the input level, the framework begins with diverse reproductive health texts, including clinical guidelines, educational materials, frequently asked questions, and real-world user interactions from digital health platforms. These texts represent authentic language use in reproductive health education and communication, capturing both professional and consumer-oriented discourse.

These texts are processed through a corpus construction and natural language processing (NLP) layer, where linguistic preprocessing, automated term extraction, and contextual analysis are performed. This stage enables the identification of high-frequency, domain-specific, and ambiguous reproductive health terms that commonly appear in Spanish-language health communication. The extracted terminology is then subjected to terminology normalization, where terms are mapped to standardized biomedical concepts (such as those found in UMLS or SNOMED CT when applicable), grouped into synonym clusters, and disambiguated. This step ensures conceptual

consistency while preserving linguistic variation relevant to non-expert learners.

The core output of this process is a Spanish reproductive health terminology database. Unlike traditional clinical terminologies, this database integrates standardized terms with consumer-friendly variants, AI-generated plain-language explanations, and contextual usage examples. This structure directly addresses the gap between clinical precision and educational accessibility. The terminology database feeds into AI-driven education systems, including digital training platforms, chatbots, and intelligent tutoring systems used for reproductive health education. By grounding AI-generated content in a controlled terminology resource, these systems can produce linguistically consistent, pedagogically effective, and culturally sensitive Spanish health communication.

Finally, the framework leads to improved health communication outcomes, including enhanced terminology comprehension, reduced ambiguity, greater learner confidence, and overall improvement in the effectiveness of Spanish reproductive health communication training. These outcomes collectively strengthen health literacy and support informed reproductive health decision-making.

Methods

This study adopted a design-oriented, cross-sectional empirical research design to develop and evaluate an AI-driven Spanish reproductive health terminology database. The study combined corpus-based linguistic analysis with quantitative evaluation of communication quality and training effectiveness."

Study population and sampling

The study involved two participant groups**:** subject-matter experts and Spanish-speaking learners. The expert group consisted of clinicians and health educators with professional experience in reproductive health and health communication. The learner group comprised Spanish-speaking university students and health trainees exposed to digital reproductive health education materials.Participants were selected using purposive sampling based on domain relevance and language proficiency. Inclusion criteria for learners included fluency in Spanish and prior exposure to digital health education content. Experts were selected based on professional experience in reproductive health or medical education. A total sample sufficient for reliability testing and structural equation modeling was obtained, consistent with methodological recommendations for SEM-based studies.

Study instruments and protocol

Data were collected using a structured questionnaire designed to assess three constructs: AI-driven Terminology Integration (ATI), Spanish Communication Quality (SCQ), and Training Effectiveness (TE). Measurement items were adapted from established literature on health literacy, consumer health vocabulary, and AI-mediated education. All items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. Participants interacted with AI-supported training materials that incorporated the terminology database. The questionnaire was administered electronically following exposure to the training content. Expert participants additionally evaluated terminological accuracy, clarity, and appropriateness.

Design of the AI-driven terminology system

A Spanish reproductive health corpus was constructed from clinical guidelines, patient education materials, frequently asked questions, and anonymized user queries obtained from publicly available digital health resources. Natural language processing techniques were applied to preprocess the corpus, including tokenization, lemmatization, and sentence segmentation.

Automated term extraction was performed to identify high-frequency and domain-specific reproductive health terms. Extracted terms were normalized and mapped to standardized biomedical concepts using established terminological resources (e.g., UMLS and SNOMED CT) where applicable. AI-based generation techniques were then used to produce plain-language Spanish explanations and contextual usage examples for each normalized concept. The resulting terminology database was integrated into prototype AI-driven training and conversational systems to constrain and guide content generation.

Data analysis

Quantitative data were analyzed using statistical software appropriate for multivariate analysis. Internal consistency and convergent validity of constructs were assessed using Cronbach's alpha, composite reliability, and average variance extracted (AVE). Correlation analysis was conducted to examine relationships among constructs.

Structural equation modeling (SEM) was employed to test the hypothesized relationships between AI-driven terminology integration, communication quality, and training effectiveness. Model fit was evaluated using standard indices, including CFI, TLI, RMSEA, and SRMR. Statistical significance was assessed at conventional threshold levels.

Ethical considerations

All data used in the study were handled in accordance with ethical research standards. User queries included in the corpus were anonymized prior to analysis. Participation by learners and experts was voluntary, and informed consent was obtained electronically. The study involved no clinical intervention and posed minimal risk to participants. All procedures complied with institutional and ethical guidelines for research involving human participants.

Results

This section presents the empirical results of the study, structured around corpus characteristics, measurement reliability and validity, correlational relationships, and structural model testing. The results are reported with reference to Tables I–IV and interpreted in light of existing literature on health communication, terminology management, and AI-driven education systems.

Table 1 highlights pronounced differences in linguistic complexity across reproductive health text types. Clinical guidelines exhibit the highest sentence length and lexical density, indicating dense terminological and syntactic structures that are unsuitable for training and consumer-facing education. In contrast, FAQs and user queries show significantly simpler language. This confirms prior Spanish health communication research showing that professional medical texts frequently exceed recommended readability thresholds and create comprehension barriers[7,8]. These findings justify the study's corpus-driven approach and demonstrate the need for a terminology database that mediates between clinical precision and learner accessibility.

Table 1: Corpus characteristics and linguistic complexity

Corpus Component	Documents	Tokens	Avg. Sentence Length	Lexical Density
Clinical Guidelines	412	410,230	24.6	0.58
Patient Education Materials	536	356,110	19.8	0.52
FAQs & User Queries	2,104	298,770	13.2	0.41
Total Corpus	**3,052**	**1,065,110**	—	—

Table 2: Reliability and convergent validity of measurement constructs

Construct	Items	Cronbach's α	Composite Reliability (CR)	AVE
AI-driven Terminology Integration (ATI)	6	0.88	0.90	0.57
Spanish Communication Quality (SCQ)	8	0.91	0.92	0.60
Training Effectiveness (TE)	7	0.89	0.90	0.58

Table 3: Correlation matrix

Construct	ATI	SCQ	TE
ATI	1.00		
SCQ	0.62**	1.00	
TE	0.48**	0.67**	1.00

Note: $p < 0.01$

As shown in Table 2, all constructs exceed recommended thresholds for internal consistency and convergent validity ($\alpha \geq 0.70$, CR ≥ 0.70, AVE ≥ 0.50). The strong reliability of Spanish Communication Quality (SCQ) supports its theoretical role as a mediating construct, consistent

Table 4: Structural equation modeling (SEM) results

Hypothesized Path	β	t-value	Result
ATI → SCQ	0.65***	10.21	Supported
SCQ → TE	0.71***	11.84	Supported
ATI → TE	0.19*	2.47	Supported
ATI → SCQ → TE	Indirect	—	Supported
CFI = 0.95	TLI = 0.94	RMSEA = 0.045	SRMR = 0.038

Note: ***p < 0.001, *p < 0.05

with health literacy and consumer health vocabulary research emphasizing terminology clarity as a measurable determinant of learning outcomes[5,6]. These results confirm that terminology quality can be empirically operationalized within AI-driven training systems.

Table 3 demonstrates a strong positive association between AI-driven terminology integration and Spanish communication quality, indicating that structured terminology databases substantially improve linguistic clarity and consistency. The strongest correlation is observed between communication quality and training effectiveness, reinforcing evidence from consumer health vocabulary studies that terminology familiarity directly enhances comprehension, recall, and confidence[5,9]. The weaker, but still significant relationship between AI integration and training effectiveness suggests that AI systems alone are insufficient without explicit terminological control.

Model fit indices

Table 4 confirms the proposed conceptual framework. AI-driven terminology integration has a strong direct effect on Spanish communication quality, validating the central role of terminology databases in AI-generated reproductive health education. Communication quality exerts the strongest influence on training effectiveness, confirming health literacy theory that language clarity is the primary mechanism through which digital interventions achieve educational impact[1,2,10]. The significant indirect effect further demonstrates that communication quality partially mediates the relationship between AI system design and training outcomes, aligning with recent evaluations of AI health chatbots where terminology transparency shaped trust and learning[11,12].

Discussion

This investigation assumes that an artificial intelligence - driven Spanish reproductive health terminology database complements digital reproductive health communication training primarily by improving the quality of communication. The empirical results presented in Tables 1- 4 support this proposition and can be rigorously defended by connecting each outcome with identified theoretical streams in health literacy, consumer health vocabulary, biomedical terminologies, and sociotechnical/ AI- in-health communication research.

Table 1 shows that clinical guidelines are much more complex in terms of their sentence length and lexical density compared to patient education materials and, to a greater extent, FAQs/user queries. This pattern is consistent with health literacy scholarship that holds that simply having access to information is not always enough to ensure that users can comprehend it [13, 20], because language and terminology are beyond the capacity of users to understand functionally. From the point of view of corpus - linguistics and in the context of applied natural language processing, the heterogeneity supports the methodological choice of creating a terminology resource based on multiple discourse genres instead of focusing on one, "authoritative" source. Spanish corpora and lexicon research also underscore the fact that clinical language differs structurally and lexically from consumer-facing materials, and these differences create gaps in understanding in Spanish health communication[17,21]. In reproductive health education, gaps of this kind take on increased importance on account of the potentially sensitive nature of the issues (e.g., misinformation, anxiety, delayed help-seeking). Accordingly, the complexity gradient of Table 1 presents not only descriptive

evidence but a theory - consistent rationale: A terminology database is needed as a bridging mechanism between a professional discourse and training/ consumer discourse.

Table 2 shows considerable internal consistency and convergent validity for AI-inducement of terminology integration (ATI), communication in Spanish (SCQ), and training effectiveness (TE). This is theoretically consequential because mediation claims are based on the coherence and measurability of the mediator as opposed to an intuitive label. Health-literacy theory conceptualises clarity and comprehensibility as latent constructs, which can be operationalised through measurable indicators (e.g., readabileness, interpretability, actionability)[19,20]. Consumer health vocabulary research also provides further evidence that term familiarity and interpretability can be measured and tied to outcomes of comprehension[5,6]. Thus, the measurement evidence in Table 2 strengthens the idea that "communication quality" is a defensible construct that can be used to explain mechanisms in educational interventions that incorporate artificial intelligence (AI).

The pattern of the correlation in Table 3 is consistent with the postulated causal logic. ATI has a significant correlation with SCQ, and also SCQ has a significant correlation with TE. This is theoretically in line with literature on consumer health vocabulary and familiarity, which suggests that better mapping between health care and consumer understood terms boosts comprehension and confidence[5,6]. It also accords with CHV enrichment work which shows that mining user language (queries, Q&A) provides the linguistic variants required to bridge the professional-consumer language gap[9]. In other words, the strong ATI - SCQ relationship supports the argument that terminology control enhances linguistic products, while the strong SCQ - TE relationship supports the premise of health literacy theory that clarity is a prerequisite for effective learning and utilisation of health information[21]. Importantly, the ATI- TE correlation is positive but weaker than the ATI-SCQ and SCQ- TE correlations. This pattern overcomes the common criticism that "AI features alone improved training." Instead, the weak direct association indicates that the integration of AI is primarily beneficial via the linguistic pathway, and not necessarily because there is an AI component. This distinction is consistent with the theory of eHealth communication which maintains that technology is efficacious only if it conveys understandable and actionable messaging in user contexts[2].

Table 4 provides the strongest test from a theoretical perspective. The structural equation model has a large effect of ATI on SCQ and a large effect of SCQ on TE with a smaller but statistically significant direct effect of ATI on TE, and a supported indirect pathway. These results show a partially mediated effect: terminology integration contributes to higher outcomes mainly by improving the quality of communication, but there is a residual direct effect, which could represent other benefits of AI (e.g., structured retrieval, enforcing consistency or improving dialogue flow).

This mediated model is theoretically in line with health-literacy theory in terms of making language clarity the main conduit through which digital interventions deliver educational impact[1,2]. It is also consistent with models of consumer health vocabulary in which the positive effects of increased term familiarity/interpretation on downstream outcomes such as comprehension and confidence[5,6]. The findings are also further in concert with biomedical terminology theory: UMLS/SNOMED CT offer conceptual integrity yet without translation into learner-friendly explanations, educational outcomes remain constricted[3,4]. Accordingly, a hybrid approach, i.e. standardised concept mapping and consumer-oriented variants with explanations, is consistent with both the interoperability theory and the communication theory.

The results are also in line with the evidence from acceptability and evaluation studies of such AI chatbots. Users may be willing to accept AI chatbots for health information, but perceived usefulness and trust are sensitive to message clarity and transparency of terms, especially for sexual and reproductive health[11,12]. Thus, the detected strength of the SCQ-TE link can be defended as being consistent with the trust-clarity linkage emphasised in AI-mediated health communication.

A key implication of theory, then, is that reproductive-health education requires more than fluid text generation; it requires text terminology governance. Generic language generation systems are able to generate grammatically correct Spanish, but may be inconsistent in terminology or conceptually ambiguous. Biomedical terminologies

infrastructures have been made to minimize conceptual ambiguity across systems, rather than to ensure pedagogical clarity for learners[3,4]. In contrast, consumer health vocabulary research indicates that learners and patients use different kinds of variants and descriptive phrases that are not always contained in a clinical resource[5,6,9]. The database approach proposed here answers this tension, in that it anchors the terms to standardised concepts but records consumer variants and explanations, simultaneously addressing issues of semantic interoperability as well as instructional accessibility. This is exactly the mechanism supported by ATI- SCQ in Table 4.

A sensible sceptic may well hypothesize that better results are due to novelty effects, general simplification of contents, or better usability of the system rather than control over terminology. The results contradict this in two ways. First, the strongest pathway is ATI -SCQ - TE, which suggests that improvements are focused in communication quality as opposed to a purely technology - driven effect. Second, the direct ATI-TE path is relatively small in comparison with SCQ-TE as one would expect if the mechanism is linguistic clarity rather than system novelty. This structure is more consonant with health literacy and CHV theory than is a broad "AI improves everything" argument[1,2,5,6].

Practically and policy implications based on theory

From a health communication policy standpoint, the findings suggest that regulators and implementers should consider AI reproductive health education systems in terms of language quality standards, not just safety, privacy or technical accuracy. This is a direct consequence of the theory of health literacy: if the message is not understandable, the public-health value of the intervention has a structural limit[1,2]. Practically, developers should integrate terminology databases and controlled-generation constraints as opposed to implementing unconstrained-generative outputs, in agreement with evidence that AI acceptability in health settings is predicated on credible, clear communication[11,12]. For Spanish health communication training, the terminology database represents a reusable infrastructure ensuring consistency in the modules, tutors and chatbot interactions without compromising the concept level correctness through standardised mappings[3,4].

Limitations and future research

Despite good model fit and theory agreement, there are several limitations that should be acknowledged. The corpus composition and evaluation context may affect generalisability; reproductive health discourse depends on the variation of region, cultural standards and platform usage. Additionally, although concept mapping to UMLS/SNOMED CT underpins semantic consistency, not all consumer expressions map to standardised concepts cleanly and this may require iterative human validation and domain expert review[3,4]. Finally, future work should challenge the framework in longitudinal deployments to try and determine whether enhanced training effectiveness is converted into durable knowledge retention or real-world decision support behaviour, which health literacy and eHealth communication scholarship consider ultimate endpoints[1,2].

The findings provide theory-consistent, mechanism-focused evidence to support the main claim of this study: integration of AI-driven terminology in sexual and reproductive health communication training works mostly by increasing the quality of the communication. Corpus evidence supports the need for terminology intervention, and measurement evidence supports the mediator and it is then confirmed through SEM that a mediated pathway is consistent with health-literacy and consumer-vocabulary theory. Collectively, these findings support the conceptual contribution that terminology databases should be considered part of the infrastructure for responsible, effective AI-driven reproductive health education rather than as optional additions.

Policy and practice implications

The findings of this study carry important implications for digital health policy, AI governance, and reproductive health education practice, particularly in multilingual and AI-mediated learning environments.

From a policy perspective, the results indicate that existing frameworks for regulating AI in health education are incomplete if they focus solely on data protection, algorithmic accuracy, or system

interoperability. Health literacy theory and the present findings jointly demonstrate that linguistic and terminological quality is a core determinant of educational effectiveness. Regulators and public health authorities should therefore incorporate terminology clarity and communication quality benchmarks into guidelines for AI-driven reproductive health education systems. For Spanish-language health communication, this may include requirements for standardized concept mapping, consumer-oriented explanations, and systematic evaluation of terminology comprehension, rather than reliance on automated translation or generic language generation.

In terms of AI system design and implementation, the study highlights the necessity of embedding terminology databases as foundational infrastructure rather than optional enhancements. Developers of reproductive health chatbots, digital training platforms, and AI tutors should integrate controlled terminology layers that link standardized biomedical concepts to learner-friendly Spanish expressions and explanations. Such integration reduces ambiguity, improves consistency across educational modules, and mitigates the risk of misinformation in sensitive reproductive health topics. This approach aligns with responsible AI principles by ensuring that system outputs are not only accurate, but also interpretable and educationally appropriate.

For health education and training practice, the findings suggest that terminology-aware AI systems can substantially improve training effectiveness for learners, educators, and frontline health workers engaged in reproductive health communication. Training programs that rely on AI-generated or AI-supported materials should prioritize terminological consistency and explanation over stylistic fluency alone. The proposed terminology database offers a scalable solution that can be reused across curricula, platforms, and institutional settings, thereby strengthening Spanish health communication capacity without duplicating educational content development efforts.

Finally, at a global health communication level, the framework demonstrates how AI and corpus-based terminology management can support transnational health education initiatives. By separating conceptual correctness from linguistic realization, health organizations can deploy AI-driven education systems that are adaptable to different linguistic contexts while maintaining consistent reproductive health messaging. This has particular relevance for international public health programs seeking to deliver culturally and linguistically accessible reproductive health education at scale.

Conclusion

This study examined how an AI-driven terminology database can enhance digital reproductive health education by improving Spanish health communication training. Drawing on corpus linguistics, biomedical terminology standards, and AI-based content generation, the study proposed and empirically tested a framework in which terminology integration functions as a central mechanism linking AI system design to educational outcomes. The findings demonstrate that Spanish reproductive health texts exhibit substantial linguistic and terminological complexity, particularly in clinically oriented materials. By systematically extracting, normalizing, and explaining reproductive health terminology, the proposed terminology database significantly improves communication quality, which in turn enhances training effectiveness. Structural equation modeling confirmed that communication quality acts as a key mediating construct, supporting health literacy and consumer health vocabulary theory that language clarity is the primary pathway through which digital health interventions achieve educational impact. Theoretically, the study contributes to AI-in-health education literature by positioning terminology management as a core design requirement rather than a peripheral concern. It extends biomedical terminology research by demonstrating how standardized concepts can be repurposed for educational accessibility, and it advances health communication theory by empirically validating communication quality as a mechanism in AI-driven training systems. Practically, the study offers a replicable and scalable approach for improving Spanish reproductive health communication in digital education environments. While future research should test the framework in longitudinal and real-world deployments, the evidence presented here underscores a clear conclusion: effective AI-driven reproductive health education depends not only on intelligent systems,

but on linguistically and terminologically grounded communication.

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