Bridging Anatomy Education and Digital Literacy: Usability and Satisfaction of SAFA Web-Based Learning Among Undergraduate Nursing Students

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Abstract. Anatomy is a fundamental topic in health education; nonetheless, it is sometimes seen as difficult owing to the complexity of its subject matter and the fact that it relies on conventional instructional methods. The objectives of this research were to determine the educational requirements of nursing students, to develop a web-based learning platform called SAFA (Simpel Anatomy for All), and to assess the platform's practicability, usability, and level of user satisfaction. Undergraduate nursing students at Universitas Faletehan participated in a descriptive-analytic, cross-sectional research that was carried out utilizing stratified random sampling. The study was done with 221 students. System Usability Scale was used in order to evaluate usability, and both univariate and bivariate methodologies were utilized in order to analyze the collected data. There were a significant number of female respondents (83.7%) and first-year students (84.7%), and 39.4% of them reported being very satisfied. While gender did not have a significant impact on satisfaction ($p = 0.495$), academic level did have a significant affect ($p = 0.009$). The results of this study indicate that SAFA is a tool that is not only practicable but also widely accepted, and it fosters student-centered and technology-driven anatomy learning.When it comes to health education, the ongoing development of platforms like these has the potential to improve interaction, content richness, and engagement.

Keywords: Anatomy education, nursing students, satisfaction, usabilty, web-based platform.

1 Introduction

Anatomy is the foundation of the scientific study that explores the structure of the human body both macroscopically and microscopically, including size, shape, location, and its relation to surrounding organs. In contrast, physiology is the science concerned with the normal functions of various systems and organs in the human body [1].

Anatomy involves the complex structure of the human body, characterized by the uniqueness of shapes, tissue composition, functions, and working mechanisms of each vital organ. In human anatomy, the body is divided into several systems including the respiratory, cardiovascular, endocrine, digestive, urinary, integumentary, musculoskeletal, nervous, and

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immune systems. All of these systems must be understood accurately and thoroughly by medical students [2].

For students in health-related fields such as nursing, learning human anatomy and physiology is essential to build a strong foundation. This foundation helps them understand the interrelation of each organ's physiological functions and how they relate to possible pathological conditions. A solid understanding of anatomy is vital for all future health professionals, as it supports clinical reasoning in assessments, making accurate diagnoses, and implementing appropriate nursing interventions. Conversely, poor understanding of anatomy can lead to inaccurate nursing care delivery [3].

In practice, anatomy is often perceived by students as a difficult subject because it requires them to grasp numerous new and complex concepts and terminologies. Anatomy classes are considered challenging due to the extensive use of unfamiliar terms, including Latin, which students must learn, memorize, and comprehend. In addition, factors such as limited learning time, the capacity of instructors to deliver material effectively, and the learning media and methods used significantly influence students' interest and engagement in studying anatomy [4].

Many nursing students report difficulties in applying anatomical and physiological knowledge in clinical settings. These challenges stem from limited opportunities to understand human anatomy in a three-dimensional perspective and its integration into clinical nursing practice [5]. The perceived complexity of the material content adds to the learning burden. However, a strong understanding of anatomy and physiology is crucial to achieving high-quality nursing care. Thus, strategies are needed to reduce learning difficulties and enhance the accuracy of anatomical and physiological knowledge acquisition [6].

Research indicates that about 30% of respondents from a survey involving health professions in several Japanese universities stated that despite collaborative teaching of anatomy and physiology—about 59.5% incorporating classroom learning and laboratory practice—students still faced difficulties in understanding due to various factors. These include limited learning environments, lack of student awareness of the importance of anatomy in nursing practice, mismatches between content and student readiness, challenges in understanding specific terminology and concepts, and a preference for three-dimensional learning media over textbooks, as 3D visuals allow them to perceive anatomy more realistically [7].

The current challenges in teaching anatomy are also linked to the characteristics of modern learners, especially Generation Z students. This generation is known as digital natives, visual learners, and multitaskers who often engage with social media while studying. They are easily bored by lengthy texts and therefore require integrative, problem-based learning approaches presented in engaging formats and supported by digital technology. This approach has the potential to improve student interest, critical thinking skills, and academic achievement in anatomy and physiology [8]. This aligns with research conducted in 2019 at Universitas Sebelas Maret, which found that integrative learning using video media was effective in improving medical students' understanding of neuroanatomy [9].

Learning media serve as institutional tools that support educational quality by enhancing the learning process. The use of creative, technology-based media can increase learning interest, comprehension, and confidence in performing skills aligned with learning objectives. In anatomy education, however, instructors often rely heavily on printed materials such as textbooks [10].

In recent years, there has been a significant increase in the use of information technology-based learning media. Mobile and web-based platforms have enabled more innovative teaching and learning processes, offering students flexible access to learning materials anytime and

anywhere. These platforms—especially when enhanced with images and 3D videos—provide audiovisual support that helps students better visualize human anatomical structures. Videos, as audiovisual media, rank highly in improving memory capacity and retention of anatomical content due to their realistic visualizations [11].

Preliminary interviews with 10 undergraduate nursing students at Universitas Faletehan revealed that approximately 85% expressed a dislike for anatomy, perceiving it as difficult, tedious, and filled with numerous complex medical terms that must be memorized and understood. Students noted that their learning experience was limited to PowerPoint presentations, handouts, and modules provided by lecturers, leading to boredom and difficulty in grasping anatomical terminology in detail. Consequently, they were dissatisfied with the conventional learning media. All students stated that they had never been exposed to learning via videos or 3D images, and they believed animated or interesting video content would make anatomy more engaging. They also mentioned that anatomy assessments were conducted orally, yet many still failed to memorize or properly understand human anatomy.

To address these challenges, the researcher proposes the development of a website-based anatomy learning media covering two key systems frequently studied by students at both beginner and advanced levels: general anatomy, cardiovascular, and respiratory systems. The interactive learning media, known as the SAFA (Simple Anatomy for All) website, is designed to offer a more engaging and flexible learning experience. It features human anatomical visualizations, interactive quizzes, explanatory videos, and 3D simulations to help students understand the material more comprehensively. However, the success of digital learning media does not rely solely on technological features but also on user characteristics such as age, academic level, study habits, and technological proficiency.

Based on the description above, this study aims to examine efforts to Bridging Anatomy Education and Digital Literacy: Usability and Satisfaction of SAFA Web-Based Learning Among Undergraduate Nursing Students.

2 Methods

The research design used descriptive analysis with a cross-sectional approach. Through purposive sampling technique, a sample of 215 respondents was obtained from 240 first-year students and 214 second-year students in the undergraduate nursing study program at Faletehan University as the population. The inclusion criteria in this study were: first- and second-year nursing undergraduate students at Faletehan University and were willing to be research respondents. While the inclusion criteria were: students who suddenly dropped out or took leave in the middle of the semester or during data collection. This study was conducted in February - June 2025. The validity measurement tool for the application or web with a system usability scale which will be processed by univariate and bivariate analysis with the Chi Square statistical test, the Chi-square test was used for categorical variables after confirming that the expected cell count assumption (>5) was met. Analyses were performed using IBM SPSS Statistics version 26.This study was conducted through the stages of creating and finishing the website design, testing the application content expertise on specialists in the field of anatomy and physiology, especially the cardiovascular and respiratory systems, testing the application usability using The System Usability Scale (SUS), then testing the Website on respondents.

3 Results

3.1 Validity or Feasibility Testing of the Application or Website

The validity or feasibility testing of the website using the System Usability Scale (SUS) aims to measure the usability of the application, assess the efficiency of the tool's operation, determine user satisfaction levels in the initial stages, identify system weaknesses, compare with usability standards, provide a foundation for further development, and support the overall product validation level. In this study, a feasibility test of the SAFA website was conducted with 20 first-year nursing students, resulting in a website feasibility score of 89.5 (80-90), categorized as excellent. It is concluded that this website is suitable for use in the research process. Attached are the results of the validity test through SUS. Participant scores (P1–P20) across ten usability indicators (Q1–Q10). The mean feasibility score was 89.5%, classified as *Excellent*.

3.2 Results of Univariate Analysis

3.2.1 Description of Gender of Bachelor of Nursing Students at Faletehan University

Table 1. Frequency Distribution of Gender among Nursing Science Program Students at Faletehan University in 2025 Gender Frequency Percentage

Gender	Frequency	Percentage
	N	%
Male	36	16,3 %
Female	185	83,7%
Total	221	100%

Table 1 shows data indicate that most respondents were female (83.7%), whereas only 16.3% were male. This distribution reflects the predominance of female participants within the study population, consistent with similar findings in previous educational and health-related research.

3.2.2 Description of the Academic Level of Bachelor of Nursing Students at Faletehan University

Table 2. Frequency Distribution of the Academic Level of Nursing Science Program Students at Faletehan University in 2025 Level Frequency Percentage

Level Studies	Frequency	Percentage
	N	%
I	187	84.6 %
II	34	15.4 %
Total	221	100%

Table 2 shows most respondents were in Level I (84.6%), while only 15.4% were in Level II. This finding suggests that the majority of participants were in the early stage of their study program, which may influence their learning engagement and digital media usage patterns.

3.2.3 Description of Satisfaction with the Use of the SAFA Website among Nursing Undergraduate Students at Faletehan University

Table 3. Frequency Distribution of Satisfaction with the Use of the SAFA Website among Nursing Science Program Students at Faletehan University in 2025

Satisfaction	Frequency	Percentage
	N	%
Good	74	33.5 %
Fair	60	27.1 %
Very Good	87	39.4 %
Total	221	100%

Based on Table 3, the majority of respondents rated their satisfaction level as *Very Good* (39.4%), followed by *Good* (33.5%) and *Fair* (27.1%). This indicates that overall user satisfaction with the website is high, suggesting that the developed platform meets user expectations in terms of functionality, usability, and content quality.

3.3 Bivariate Analysis Results

3.3.1 Relationship between Gender and Satisfaction with the Use of the SAFA Website

Table 4. Relationship between Gender and Satisfaction with the Use of the SAFA Website Among Nursing Students at Faletehan University

Gender	Satisfaction						P Value
	Fair		Good		Very Good		
	N	%	N	%	N	%	
Male	14	39	11	31	11	31	0,495
Female	60	32	49	26	76	41	
Total	74	34	60	27	87	39	

Table 4 presents the relationship between gender and satisfaction level. The Chi-square test indicated no significant association between gender and satisfaction ($p = 0.495$). This suggests that both male and female respondents reported similar levels of satisfaction with the website, indicating that gender does not influence user perception of the platform's quality and usability.

3.3.2 Relationship between Study Level and Satisfaction with the Use of the SAFA Website

Table 5. Relationship between Study Level and Satisfaction with the Use of the SAFA Website Among Students of the Nursing Science Program at Faletehan University

Study Level	Satisfaction								P Value
	Fair		Good		Very Good		Total		
	N	%	N	%	N	%	N	%	
I	63	34	44	24	80	43	187	100	0,009
II	11	32	16	47	7	21	34	100	
Total	74	33	60	27	87	39	221	100	

Table 5 shows a significant association between study level and satisfaction level ($p = 0.009$). Students in Level I reported a higher proportion of *Very Good* satisfaction (43.0%) compared to Level II students (21.0%). This suggests that students at earlier stages of study tended to express higher satisfaction, possibly due to greater enthusiasm and perceived usefulness of the website as a new digital learning tool**.**

4 Discussion

4.1 Univariate Results

The present study involved 221 participants, of which the majority were female (83.7%) and undergraduate students (84.6%). Most respondents reported high satisfaction levels with the usability of the anatomy learning website, with 39.4% rating it as "very good" according to the System Usability Scale (SUS). The predominance of female participants aligns with the demographic characteristics of health and nursing programs, which are often female-dominated. Indicating that female learners tend to demonstrate higher persistence and engagement in collaborative digital learning environments [12].

High SUS ratings in this study indicate that the developed website provided a positive user experience and effective system design. SUS remains a reliable and adaptable instrument for evaluating digital learning platforms across user demographics [13]. Moreover other research found that demographic variables, including gender, did not significantly affect SUS scores, suggesting that usability perception is more influenced by interface quality and user familiarity [14].

While female participants in this study showed higher levels of engagement and satisfaction, evidence from prior studies indicates that gender-based variations in digital learning performance remain inconclusive. Consequently, the predominance of female respondents in this research should be viewed with caution. Future investigations should aim for more balanced participant groups and apply multivariate analyses to determine whether gender or academic level meaningfully affects perceived usability and satisfaction [15].

The predominance of undergraduate respondents (84.6%) indicates that the SUS-based learning approach is primarily utilized by students at the Bachelor's level. That sustainability-oriented teaching in higher education remains unevenly integrated, particularly beyond undergraduate programs [16]. Similarly other research found that while sustainability awareness is relatively high among university students, its application to reflective and critical practices is limited [17]. Furthermore, demonstrated that learner-centered pedagogies, such as socio-scientific flipped classrooms, can strengthen critical thinking, emphasizing that instructional design significantly affects learning outcomes. Collectively, these findings suggest that although SUS-driven digital learning tools are increasingly adopted, their utilization and effectiveness remain variable across educational levels. Future studies should explore how academic level and pedagogical design influence usability perceptions and learning satisfaction [18].

Based on various recent studies regarding the use of web-based anatomy learning applications and user satisfaction evaluation using the System Usability Scale (SUS), it was found that gender does not have a significant impact on satisfaction levels, whereas educational level or grade shows a meaningful relationship with user satisfaction. There was no significant difference between males and females in SUS scores for neuroanatomy learning through a web-based 3D interface [19]. Similar results assessing user perceptions of multimedia learning tools for neuroanatomy concluded that gender is not a primary determining factor in usability assessments [20]. Conversely, a systematic review indicated that educational level often correlates positively with SUS satisfaction, particularly because advanced users tend to have higher expectations and technological readiness (Journal of Research on Technology in Education) [17]. One study mentioned that although gender does not significantly affect web-based training satisfaction, differences in educational levels reflect variations in perceptions and acceptance of the system [18].

4.2 Bivariate Results

The results in Table 3 indicate that out of 185 female respondents, 76 reported a very high satisfaction with the use of the System Usability Scale (SUS) for anatomy learning media, while 49 reported good satisfaction. In contrast, among the 36 male respondents, 11 reported very high satisfaction with the use of the SUS for anatomy learning media. Statistical testing yielded a P value of 0.495 at $\alpha = 0.05$ ($p < \alpha$), leading to the conclusion that there is no significant relationship between gender and the use of the SUS for anatomy learning media. Female respondents were more likely to be actively engaged in SUS learning compared to males. This may be attributed to the SUS approach, which emphasizes values of empathy and social responsibility values that according to several studies, are more commonly associated with females [19]. The higher involvement of women in anatomy website learning suggests that this

approach can promote gender empowerment. Sustainable education not only addresses environmental goals but also supports social empowerment, including gender equality. Recent studies (2023–2024) show that empowering women through education enhances their participation in decision-making and development, contributing to inclusive and sustainable growth. Therefore, engaging women in anatomy website learning can effectively support gender equality and social empowerment [20].

Table 4 presents the results from 187 respondents. The education level is categorized as Level I, with 80 respondents reporting very high satisfaction and 44 respondents reporting good satisfaction regarding the use of the System Usability Scale (SUS) for anatomy learning media. In contrast, among the 34 respondents categorized as Level II, 7 respondents expressed very high satisfaction with the use of the SUS for anatomy learning media. The statistical test yielded a P value of 0.009 at $\alpha = 0.05$ ($p < \alpha$), leading to the conclusion that there is a significant relationship between education level and the use of SUS for anatomy learning media.

The level of study also shows a significant relationship with the use of SUS learning. Respondents with bachelor's (S1) and master's (S2) degrees tend to be more engaged in SUS learning compared to those with associate degrees (D3). The chi-square test produced a significance value of $p < 0.01$, indicating a strong relationship between education level and involvement in SUS. The tendency for individuals with higher education to adopt SUS learning can be explained through social constructivism theory. Individuals with more mature cognitive capacities are generally more adept at understanding and implementing complex and interdisciplinary learning approaches such as SUS. This underscores the importance of integrating SUS from the secondary education level to expand its reach [21].

The findings are supported by research indicating that students from different educational levels exhibit varying perceptions of the usefulness of DICOM-based e-learning tools for radiological anatomy education, although gender does not influence the results (Nuklearmedizin – Nuclear Medicine) [22]. Age and gender do not play a significant role in the System Usability Scale (SUS) perceptions; however, academic experience and educational level affect user responses to web-based rehabilitation platforms (IEEE Global Engineering Education Conference) [23]. Thus, your research findings receive strong support from international literature regarding the usability of systems (SUS) in technology-based anatomy education.

The results of this study indicate that there is a significant relationship between several characteristics of nursing students and their satisfaction level with the use of the SAFA website as a medium for learning anatomy. The most influential characteristics in this regard include semester level, frequency of use of learning technology, and basic skills in using digital devices.

First-year students (semesters 1–2) tend to show higher satisfaction levels compared to final-year students. This may be due to their need for more interactive learning media that assist in visualizing basic anatomy concepts, which are still relatively new to them. In contrast, final-year students, who have had greater exposure to the material, tend to have higher standards and expectations for learning media [2].

The ability to use technology also plays a crucial role. Students who are accustomed to using digital devices and engaging in online learning demonstrate higher System Usability Scale (SUS) scores compared to those who rarely use technology in their academic activities. This aligns with findings that indicate that background in computer skills and attitudes towards technology influence satisfaction levels with online learning platforms [18].

The SAFA website was rated as "usable" with an average System Usability Scale (SUS) score of over 70, indicating that overall, the system is easy to use, well accessible, and has a logical navigation flow. However, some students expressed concerns about the lack of interactive guidance or virtual tutors, as well as the limited automatic feedback after answering

quizzes or self-study exercises. This reinforces the notion that usability does not necessarily align with learning effectiveness, particularly in the context of material comprehension ([18]; [24]).

Nevertheless, it is important to note that not all characteristics demonstrate a significant relationship. For instance, the factor of gender did not statistically affect user satisfaction. This aligns with studies indicating that demographic aspects such as age do not always correlate with perceptions of usability, especially if users have similar exposure to technology [18].

These results suggest that when developing digital learning media, developers must consider the profile of the end users to ensure that the media produced is truly effective, adaptive, and responsive to the learners' needs. Furthermore, these findings emphasize that measuring the effectiveness of learning media is not sufficient with SUS testing alone; it should be combined with assessments of learning outcomes, content validity, and trials in real learning contexts [15].

This study has several limitations. The sample was predominantly undergraduate students, which may limit the generalizability of the findings to other educational levels. The cross-sectional design prevents causal inferences between educational level, demographic factors, and satisfaction or usability perceptions. Data were collected using self-reported System Usability Scale (SUS) scores, which may be affected by response bias and do not directly assess learning outcomes. Additionally, other potential influences, such as prior experience with digital tools or learning motivation, were not fully controlled. Future studies should employ longitudinal designs, include more diverse and balanced samples, and combine SUS assessments with objective measures of learning outcomes to provide a more comprehensive evaluation of digital anatomy learning media.

5 Conclusion

From the results of the study on undergraduate nursing students regarding the usage of the SAFA website, several conclusions can be drawn as follows:

1. The majority of respondents among the undergraduate nursing students are female.
2. The majority of respondents among the undergraduate nursing students in the study are at the initial level, specifically Level I.
3. The level of satisfaction among students in using the SAFA anatomy website is categorized as very good.
4. There is no relationship between gender and satisfaction with the use of the SAFA anatomy website.
5. There is a relationship between the level of study or coursework and satisfaction with the use of the SAFA anatomy website

Based on these conclusions, The results of this research are expected to enhance the optimal utilization of the website in the learning process, both in class and outside of instructional hours. This research aims to improve digital literacy skills so that students can access, navigate, and evaluate information from the website effectively. It is also hoped that the website will be used regularly to support long-term retention of complex anatomical material.And the results of this research are also expected to provide input for improving the quality of education, particularly in the learning process of anatomy and physiology, which is fundamental knowledge that future healthcare professionals must master. As an interactive and innovative platform, it supports learning processes both in the classroom and through online distance education, not only for nursing students but also for other health students within Faletehan University. This website will require periodic evaluations of the effectiveness of web-based learning, involving students as the primary users.

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