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Impact of a Surgical Anatomy Study Guide on Student Satisfaction: A Study Among Surgical Technology Students

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ABSTRACT

Introduction: Student satisfaction is a key indicator of educational quality in health professions training, particularly in surgical technology, where learners must integrate anatomical knowledge with clinical practice. Structured study guides may support self-directed learning, improve clarity, and strengthen the learning experience. This study aimed to evaluate the impact of a surgical anatomy study guide on student satisfaction among surgical technology students

Material and methods: This quasi-experimental study used a Solomon four-group design to examine the effect of a surgical anatomy study guide on student satisfaction among 60 undergraduate surgical technology students. Participants were selected by census and randomly allocated to intervention and control groups. The intervention groups received the study guide during clinical training, and satisfaction was assessed after the rotation using a validated questionnaire.

Results: Examiner satisfaction was generally favorable across practical skills, with mid-to-high scores predominating in direct observation, especially for hemostasis, patient transfer, and positioning, while catheterization showed greater variability. In the four study groups, satisfaction was higher and more homogeneous in the control groups than in the intervention groups (higher median scores and tighter dispersion), suggesting that the surgical anatomy study guide did not uniformly increase subjective satisfaction.

Conclusion: The surgical anatomy study guide appears to have influenced students' learning experience in a complex way rather than producing a simple rise in satisfaction. Although practical performance was acceptable overall, the lower and more variable satisfaction in the intervention groups suggests that the guide may have increased cognitive demand and self-awareness during training.

Introduction

Student satisfaction has become a central outcome in health professions education because it reflects learners' perceptions of educational quality, instructional support, and the relevance of learning experiences to their professional development. In clinical training programs, satisfaction is not merely an emotional response; it is closely linked to motivation, engagement, persistence, and willingness to participate actively in learning activities.

In surgical technology education, where students must acquire both theoretical understanding and practical competence, satisfaction may influence how effectively they absorb course content and adapt to the demands of the operating room environment [1].

Surgical technology students are expected to develop a broad set of competencies, including anatomical knowledge, sterile technique, instrument handling, perioperative assistance, and situational

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awareness. Among these, surgical anatomy occupies a foundational place because it underpins safe tissue handling, anticipation of operative steps, and recognition of anatomical variations. When anatomy is taught in a way that is disconnected from clinical application, students may struggle to appreciate its relevance. Conversely, educational strategies that connect anatomy with operative practice can improve learners' confidence and satisfaction with the learning process [2].

The operating room is a highly specialized clinical setting in which errors can have serious consequences for patient safety and surgical outcomes. For this reason, surgical technology students must be prepared not only to memorize anatomical structures but also to understand their functional and procedural implications during surgery. Educational dissatisfaction may arise when students perceive a gap between classroom instruction and the realities of the clinical environment. Therefore, instructional tools that bridge this gap are increasingly valued in competency-based curricula [3].

Traditional lecture-based teaching remains widely used in anatomy education, yet it often provides limited opportunities for self-directed learning, reinforcement, and individualized review. Many students encounter difficulty retaining large volumes of anatomical information, particularly when the material is dense, abstract, or delivered in a short time frame. In response to these challenges, supplementary learning resources such as study guides have been introduced to support structured review and improve the overall educational experience. These guides may help students organize content, prioritize essential concepts, and study more efficiently [4].

A study guide is generally defined as a structured educational tool designed to direct learners toward key concepts, learning objectives, and essential questions. In medical and allied health education, study guides can reduce cognitive overload by highlighting core information and encouraging active engagement with the material. When well designed, they can serve as a bridge between theoretical instruction and practical application, especially in disciplines that require integration of knowledge and procedure. This may be particularly important for surgical technology students who often face heavy academic workloads and time-limited clinical exposure [5].

Educational satisfaction is influenced by multiple factors, including the clarity of learning materials, accessibility of content, perceived usefulness, teaching quality, and the extent to which instruction supports learner autonomy. A clear and well-organized study guide can improve students' sense of preparedness, reduce uncertainty, and increase their satisfaction with a course or training program. In health education, students often value learning tools that provide direction and make complex subjects more manageable. As a result, the use of a surgical anatomy study guide may contribute not only to better learning outcomes but also to a more positive educational experience [6].

Satisfaction is especially relevant in undergraduate clinical education because students' perceptions of their learning environment may affect their future professional identity and commitment to their field. Positive experiences during training can strengthen students' confidence and reinforce their interest in perioperative practice, whereas poor educational experiences may contribute to stress, disengagement, or reduced enthusiasm. In this context, improving satisfaction is not simply a secondary goal; it is an important element of educational quality and student-centered training [7].

Research in medical education has shown that structured learning resources can improve students' perceptions of organization, relevance, and usability of educational content. Guided learning materials may be particularly effective when they are tailored to the demands of a specific discipline and aligned with clinical objectives. In anatomy-related subjects, where learners often need repeated exposure and conceptual reinforcement, study guides can enhance the learning process by clarifying essential points and supporting independent study. These benefits may translate into greater satisfaction with both the course content and the teaching method [8].

The role of student satisfaction has been widely recognized in higher education, but it remains underexplored in some clinical disciplines, including surgical technology. While many studies have examined the effect of educational interventions on knowledge, skill acquisition, and performance, fewer have focused on how such interventions influence learners' satisfaction. This is a noteworthy gap because students may respond differently to educational innovations depending on their learning preferences, workload, and prior exposure to similar resources. Understanding satisfaction can therefore provide a broader view of intervention effectiveness [9].

In surgical education, the value of a learning intervention extends beyond test scores. An educational resource that is easy to use, clinically relevant, and supportive of self-directed learning may improve students' confidence and satisfaction even if its immediate effect on measurable performance is modest. Conversely, an intervention that increases cognitive load or feels disconnected from practice may fail to gain student acceptance. For this reason, assessing satisfaction alongside other educational outcomes provides a more comprehensive evaluation of instructional quality [10].

Study guides have been used in a variety of disciplines to promote active learning and improve learner perceptions of educational support. Their advantages often include portability, consistency, and the ability to focus attention on high-yield material. In the context of surgical anatomy, a well-constructed guide may help students anticipate operative anatomy, review key structures before clinical sessions, and revisit important concepts after exposure to the operating room. These features can make learning more efficient and may increase satisfaction with the training process [11].

The transition from theoretical anatomy to surgical application can be difficult for undergraduate students, particularly when the educational environment does not provide enough repetition or contextualization. Students may feel overwhelmed by the amount of information they must master and uncertain about how to prioritize their learning. A surgical anatomy study guide can address this challenge by offering a concise roadmap for study and highlighting the most relevant structures and concepts. When students perceive such support as practical and accessible, their satisfaction with the educational experience may improve [12].

From an educational management perspective, student satisfaction is also important because it can inform curriculum planning and the design of supportive learning resources. If a learning tool is well received by students, it may be more likely to be used consistently and adopted more broadly within the program. In contrast, a resource that is perceived as confusing or unnecessary may have limited value despite its theoretical benefits. Therefore, evaluating student satisfaction is a meaningful step in determining whether a surgical anatomy study guide should be integrated into routine training [13].

Moreover, student-centered educational approaches are increasingly emphasized in contemporary health professions curricula. These approaches aim to promote autonomy, engagement, and active participation rather than passive information reception. A study guide can support this shift by enabling self-paced review and reinforcing responsibility for learning. In surgical technology education, where students must combine conceptual knowledge with procedural competence, such tools may be particularly valuable in strengthening both learning efficiency and learner satisfaction [14].

Despite the potential benefits of structured learning materials, evidence regarding their impact on satisfaction among surgical technology students remains limited. Most available studies have focused on academic achievement or skill development, while fewer have examined how students perceive and value such interventions. Accordingly, there is a need to explore whether implementing a surgical anatomy study guide can enhance the educational experience of surgical technology students. This study aimed to evaluate the impact of a surgical anatomy study guide on student satisfaction among surgical technology students.

Material and methods

Study Design

This was a quasi-experimental interventional study designed to evaluate the effect of a surgical anatomy study guide on student satisfaction among undergraduate surgical technology students. The study was conducted over 14 weeks using a Solomon four-group design to control for pre-test effects and strengthen the validity of the findings.

Sampling

The study population consisted of undergraduate surgical technology students enrolled. A census sampling approach was used, and all eligible students in the fifth and seventh semesters were invited to participate. A total of 60 students were included in the study. After applying the inclusion and exclusion criteria, participants were allocated to four groups by simple random assignment using lottery-based randomization. Two groups served as intervention groups and two as control groups. Students from the fifth semester were enrolled in the "Operating Room Technique I" internship, while seventh-semester students were enrolled in the "Digestive Technology" internship. The sample size was therefore determined by the full eligible population available during the study period, which was considered appropriate for the Solomon design and the educational context.

Inclusion and Exclusion Criteria

The inclusion criteria were willingness to participate in the study, being officially enrolled as an undergraduate surgical technology student in the fifth or seventh semester, and having registered for the relevant operating room internship course during the study period. Students were required to be available for both the pretest and posttest phases and to complete the assigned educational activities within the planned timeline. The exclusion criteria were failure to complete the posttest or any of the study phases, insufficient review or use of the surgical anatomy study guide by students in the intervention groups, and self-reported communication or sharing of the study guide between intervention and control groups, which could contaminate the comparison. In addition, students who were absent from clinical training for an extended period, withdrew consent, or were unable to participate fully in the assessment process were considered excluded from the final analysis. These criteria were selected to ensure comparability between groups and to minimize bias related to non-adherence or information crossover.

Procedures

After obtaining the necessary administrative approvals, the research team developed the surgical anatomy study guide and the assessment tools during the first four weeks of the project. The guide was prepared in line with the curriculum of surgical technology and included learning objectives, key topics, essential anatomical concepts, recommended learning strategies, illustrative images, and references. The guide was reviewed by faculty members from surgical technology, anatomy, and medical education, and revisions were made based on expert feedback. During the same phase, a 20-item multiple-choice questionnaire and six DOPS-based clinical skill checklists were designed to assess knowledge and practical performance. In the fourth week, the pretests were administered to the relevant groups according to the Solomon four-group structure. During weeks 5 to 10, the intervention groups received the surgical anatomy study guide and were asked to study it independently and not share it with control participants. To reduce contamination, the clinical internship schedules of intervention and control students were organized separately so that they would not attend practical sessions together. The control groups received routine clinical training without the study guide. In the final four weeks, posttests were administered to all groups. Student satisfaction was measured at the end of the intervention using a validated Likert-scale satisfaction questionnaire completed by the intervention and control groups after the clinical rotation. The questionnaire assessed students' perceptions of the clarity, usefulness, applicability, and overall value of the study guide in supporting their learning experience.

Statistical Analysis

Data were entered into SPSS version 26 for analysis. Descriptive statistics were used to summarize participant characteristics, including frequency distributions for categorical variables and means and standard deviations for continuous variables. The normality of quantitative variables, including MCQ and DOPS scores, was assessed using the Kolmogorov-Smirnov test. One-way analysis of variance was applied to compare baseline grade point averages across the study groups. Independent-samples t tests were used to compare MCQ and DOPS scores between groups, and Levene's test was used to examine equality of variances. Because satisfaction scores were not normally distributed, the Mann-Whitney U test was used for between-group comparisons. Statistical significance was set at a two-sided p value of less than 0.05.

Ethical Considerations

The study was approved by the Ethics Committee of Tabriz University of Medical Sciences under the ethical code IR.ABZUMS.REC.1403.199. Participation was voluntary, and all students were informed about the study objectives, procedures, and their right to withdraw at any time without any academic consequences. Confidentiality of student data was maintained throughout the study, and all collected information was analyzed anonymously.

Results

The chart shows the gender distribution of participants across the four study groups. Overall, females constituted a larger proportion of the sample than males, accounting for 63.8% of all participants, while males made up 36.2%. In the control group, females were also more numerous than males, and the same pattern was seen in the control with pre-test group. By contrast, the intervention group had a slightly higher proportion of males than females, whereas the intervention with pre-test group again showed a predominance of females. Overall, the findings indicate that female students were the majority in the study sample, with some variation in gender composition across the groups (figure 1).

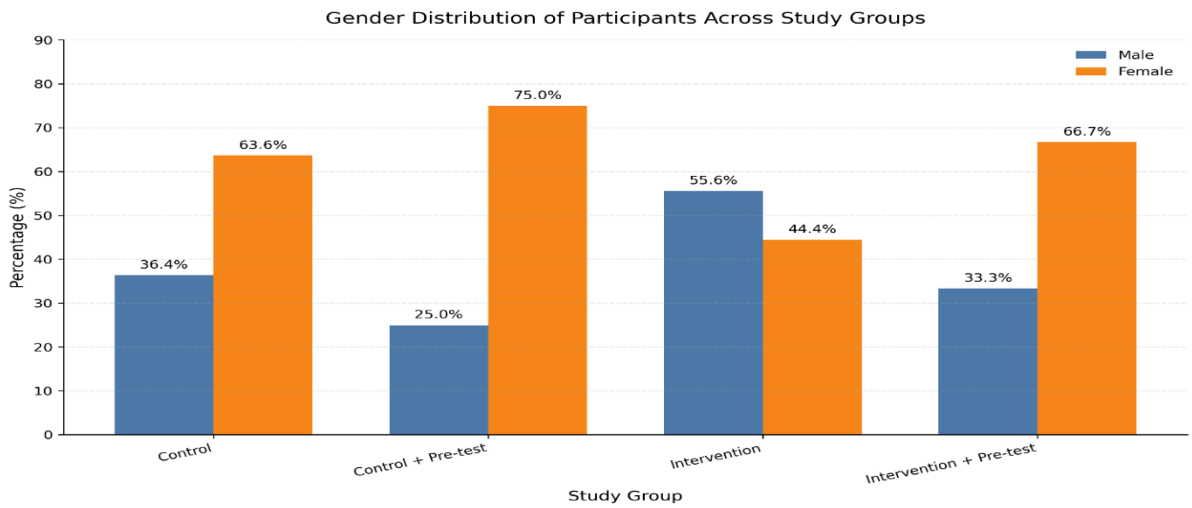

Figure 1. Gender Distribution of Participants Across the Study Groups

The figure illustrates the mean GPA across the study groups and shows that the groups were broadly comparable at baseline, with only minor differences in average academic performance. This suggests that the random allocation process produced relatively balanced groups in terms of prior academic achievement, which strengthens the internal validity of the study. Overall, the distribution of GPA values indicates that no group had a pronounced academic advantage before the intervention, supporting a fair comparison of outcomes between the intervention and control conditions (figure 2).

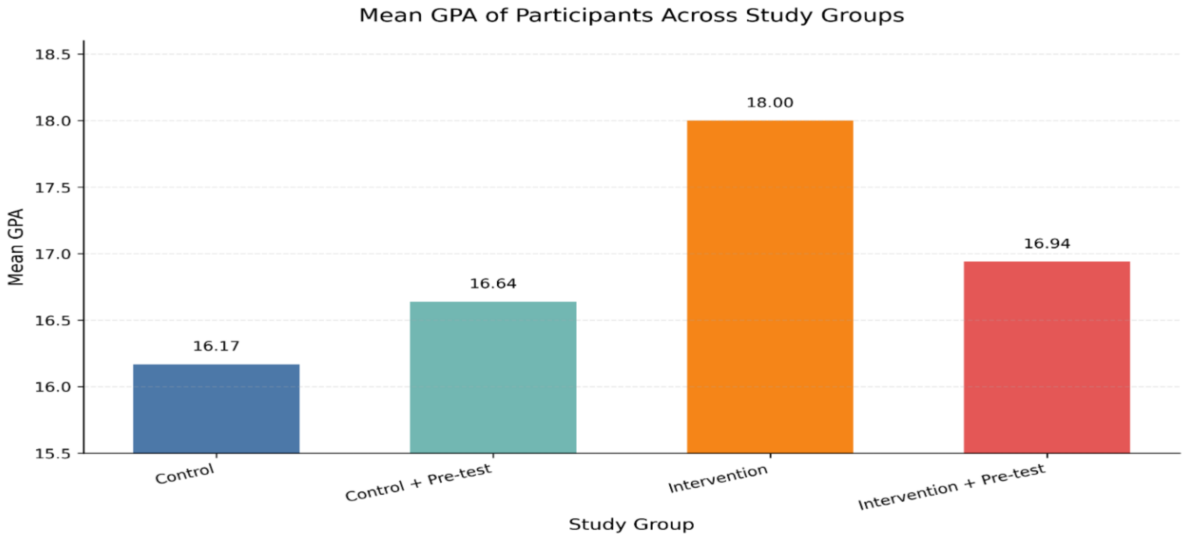

Figure 2. Mean GPA Across the Study Groups

The heatmap shows the distribution of examiner satisfaction scores for six practical skills assessed by direct observation. Overall, the scores were concentrated in the mid-to-high range, indicating generally favorable examiner satisfaction across the observed procedures. Patient transfer and positioning received relatively higher frequencies in scores around 6 to 7, while wound closure and instrument use also showed a similar pattern with substantial clustering in the moderate-to-high satisfaction range. Catheterization displayed a broader spread of scores, including some lower ratings, suggesting greater variability in performance. Hemostasis stood out with a notable concentration of higher scores, particularly at the upper end of the scale, reflecting stronger examiner satisfaction with this skill. Overall, the findings suggest that students performed better in some practical tasks than others, but examiner satisfaction was generally positive across all skills (figure 3).

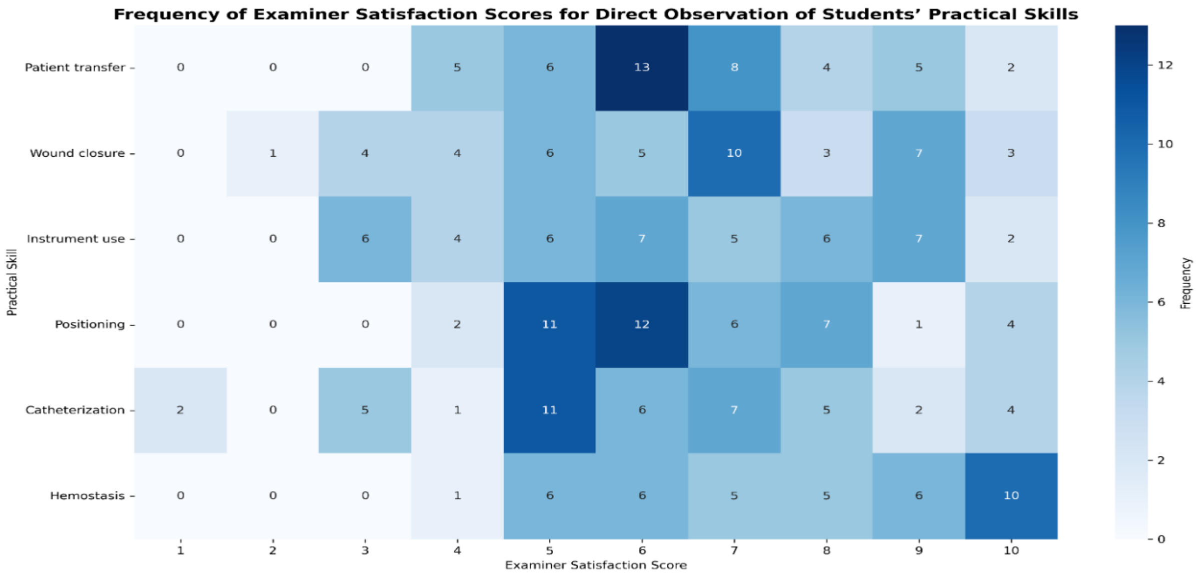

Figure 3. Frequency of Examiner Satisfaction Scores for Direct Observation of Students' Practical Skills

The boxplot presents the distribution of satisfaction scores across the four study groups and shows noticeable variation in central tendency and spread. The control groups demonstrated higher median satisfaction scores, with relatively tighter dispersion, indicating more consistent outcomes. In contrast, the intervention groups had lower central values and wider variability, particularly in the intervention group, suggesting a broader range of responses among participants. The intervention with pre-test group also showed moderate variability, but its scores remained below those of the control groups overall. Taken together, the figure suggests that satisfaction was generally higher and more homogeneous in the control conditions, whereas the intervention groups displayed lower and more dispersed satisfaction scores (figure 4).

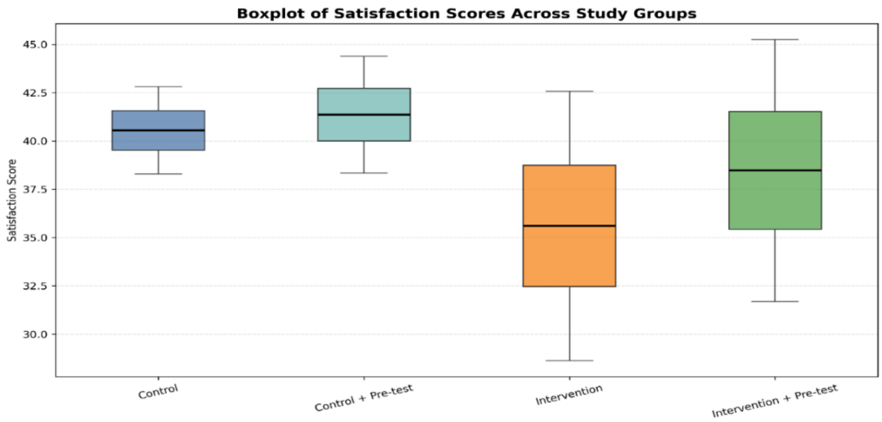

Figure 4. Satisfaction Scores Across Study Groups

Discussion

The present study examined the impact of a surgical anatomy study guide on student satisfaction among surgical technology students using a Solomon four-group design. Overall, the findings showed that examiner satisfaction with students' practical performance was generally favorable, particularly in hemostasis, patient transfer, positioning, wound closure, and instrument use, whereas catheterization showed greater variability. In contrast, student satisfaction scores were higher and more stable in the control groups than in the intervention groups, suggesting that the study guide did not simply increase perceived satisfaction in a linear fashion. Instead, the pattern indicates that the intervention influenced students' experiences in a more complex way, likely by changing how they perceived the learning process and their own readiness for clinical performance [14].

One reason for this pattern may be that a structured study guide increases cognitive engagement rather than immediate comfort. In health professions education, structured learning materials can improve organization, clarify expectations, and support students in linking theoretical content with clinical tasks, but these benefits may come with a more demanding learning experience [15]. When students are asked to study anatomy in a more active and self-directed way, they may become more aware of what they do not yet know, which can reduce short-term satisfaction even if it strengthens long-term learning. Thus, lower satisfaction in the intervention groups may reflect deeper critical engagement rather than a weaker educational effect [16].

This interpretation is especially relevant in surgical technology education, where anatomical knowledge must be translated rapidly into clinical action. Unlike purely theoretical learning, surgical training requires students to recognize structures, anticipate procedures, and respond correctly in real time during patient care and operative support [17]. A study guide may be useful for organizing this knowledge, but it cannot fully replace supervised clinical exposure, repetition, and direct instructor feedback. If the guide raises expectations without fully bridging the gap between theory and practice, students may feel less satisfied with the learning experience even while their actual understanding improves [18].

The higher examiner satisfaction observed in hemostasis may be explained by the skill's procedural clarity. Hemostasis is often easier to teach and assess because it has visible steps, clear performance criteria, and a strong relationship between action and outcome [19]. Similarly, patient transfer and positioning are technical skills that can benefit from repetition and structured instruction, which may explain their relatively favorable scores. In contrast, catheterization is more variable because it depends on anatomical judgment, manual precision, and patient-specific conditions, making it harder for students to perform consistently. This variability likely contributed to the broader spread of scores in that skill area [20].

The difference between the intervention and control groups may also reflect the effect of the pre-test itself. In Solomon four-group designs, pre-testing can sensitize participants to the study topic and alter how they respond to later instruction [21]. Students who completed the pre-test may have become more aware of their own weaknesses and more attentive to their learning needs, which can influence both performance and satisfaction. For some students, this awareness may have been motivating; for others, it may have been stressful or confidence-reducing. Therefore, the pre-test may have acted as an educational stimulus, not only as a measurement tool [22].

Another important point is that satisfaction in clinical education is shaped by many factors beyond instructional content. Learners' satisfaction depends on workload, confidence, supervision, clarity of expectations, and the extent to which educational materials match the realities of the clinical environment [23]. A study guide may improve structure and self-directed learning, but if students are under time pressure or face a demanding rotation, they may not experience immediate satisfaction from the added material. In such situations, the guide may be educationally helpful yet still feel burdensome during the short term, especially for students who prefer instructor-led learning [24].

The higher satisfaction in the control groups may therefore not indicate that they learned better. In some cases, familiar teaching methods feel easier and more comfortable, even if they are less effective for deep understanding [25]. The control groups may have perceived less academic pressure because they were not required to engage with an additional structured resource. By contrast, the intervention groups may have faced a more active learning process that demanded greater effort, self-regulation, and reflection. This can produce lower satisfaction scores even when the intervention improves the quality of learning [26].

The wider variability seen in the intervention groups may also be linked to differences in prior academic preparedness and learning style. Some students benefit greatly from written guides and independent study, while others learn more effectively through demonstration, repetition, and immediate feedback [27]. In a group with mixed levels of readiness, the same guide may be highly useful for some students but less effective for others, creating a broader distribution of satisfaction scores. This heterogeneity is common in clinical education and may explain why the intervention effect was not uniform across participants [28].

From a pedagogical standpoint, these findings suggest that a surgical anatomy study guide is likely most effective when used as part of a blended learning approach. Guides can support preparation and reinforce key concepts, but they are strongest when combined with instructor guidance, clinical demonstration, and reflective discussion. In surgical technology education, students need not only access to structured content but also opportunities to apply that content in supervised clinical settings. The study guide may therefore serve as a valuable adjunct, but not as a complete replacement for active teaching methods. Its educational value may be greater than its immediate effect on satisfaction, especially when learners are still developing confidence in clinical performance [29].

Conclusion

Overall, the results indicate that the study guide influenced student satisfaction and examiner-rated performance in a nuanced manner. The intervention appears to have strengthened engagement with surgical anatomy and practical skill development, but it did not produce a simple increase in satisfaction across all groups. Instead, the findings suggest that more structured learning may lead to deeper learning and greater self-awareness, which can temporarily lower subjective satisfaction while improving educational substance. For this reason, future work should consider refining the guide's format, adding visual or digital components, and integrating it more closely with clinical mentorship to enhance both satisfaction and learning outcomes.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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