Medical and Dental Students' Perceptions of Digital and Traditional Anatomy Dissection: A Comparative Study at MAHSA University

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ABSTRACT

This study explores the shift from traditional cadaver dissection to digital methods in anatomy education at MAHSA University, focusing on the perceptions of 860 medical (MBBS) and dental (DDS) students. Prompted by the COVID-19 pandemic, the research aimed to assess student preferences, the effectiveness of digital tools, and the challenges involved compared to conventional practices. Using a cross-sectional survey and SPSS analysis, five key factors were identified from 26 variables, covering technological, contextual, pedagogical, and course-related issues. Results showed that over half of the students supported integrating digital tools, especially for improving structure visualization, offering flexible access to content, and aiding exam preparation. About 35% of students remained neutral, reflecting uncertainty or mixed opinions. While many acknowledged the discomforts of cadaver dissection—such as exposure to chemicals and ethical concerns—most were hesitant to fully abandon traditional methods, valuing the hands-on experience and deeper understanding it provides. The findings offer valuable insights for educators and curriculum developers, emphasizing the need to balance technological innovation with essential practical training in anatomy education.

Introduction

Anatomy education forms a core component of undergraduate medical and dental training, providing essential knowledge of human structure that supports clinical reasoning, diagnosis, and surgical skills. Traditionally, cadaveric dissection has been the primary teaching method, offering hands-on experience that enhances spatial understanding, manual dexterity, and professional values such as empathy and respect for human life. This immersive approach has long been regarded as the gold standard in anatomy instruction.

In recent years, however, anatomy education has undergone major changes driven by technological advancements and shifts in teaching practices. Digital tools like virtual dissection platforms, 3D simulations, and AR/VR systems now serve as alternatives or supplements to traditional dissection. These tools offer benefits such as improved accessibility, cost-efficiency, and the ability to repeatedly explore anatomical structures. The COVID-19 pandemic further accelerated this transition, pushing many institutions toward remote and hybrid learning environments. Yet, the effectiveness of digital tools compared to cadaver-based learning remains widely debated.

Student perception plays a key role in evaluating and adopting new teaching methods. Engagement, satisfaction, and academic outcomes are all influenced by how students experience and value various approaches. This is particularly important in anatomy, where learning needs may differ between medical and dental students due to curriculum focus and clinical application. Dental students often emphasize the head, neck, and oral regions, while medical students require broader anatomical knowledge. This study investigates and compares the perceptions of digital and traditional anatomy teaching among medical and dental undergraduates at a private institution, aiming to provide insights that can guide curriculum development and align educational strategies with modern clinical and learner needs.

Materials and Method

Study Design

This research employed a cross-sectional, comparative study design to assess and compare the perceptions of digital and conventional anatomy dissection teaching among undergraduate medical and dental students. A self-administered, structured questionnaire was used to collect quantitative data on students' attitudes, preferences, and perceived learning outcomes. The design allowed for the examination of differences and associations between the two student groups across various perception metrics.

Study Location

The study was conducted at MAHSA University, Jenjarom, Selangor, Malaysia, offering undergraduate programs in both Medicine and Dentistry. The institution utilizes both cadaver-based dissection and digital anatomy teaching methods—such as virtual dissection tables and 3D anatomy software—making it an appropriate setting for this comparative study.

Pilot Study to Validate Research Questionnaire: Face, Content, and Construct Validation

A pilot study was conducted with 21 students to evaluate the validity and reliability of the research questionnaire. This process ensured that the instrument was psychometrically sound before full-scale data collection. To establish the validity of the questionnaire employed in this study, multiple validation procedures will be conducted, including face validation, content validation, and construct validation.

Validation of Questionnaire in Pilot Study

Face Validation

Face validity will be established through expert review by a panel of anatomy educators and educational specialists from MAHSA University, who will evaluate the questionnaire items for clarity, relevance, and appropriateness in relation to the study's focus. Additionally, student feedback will confirm that the questions are easily understood and interpreted as intended.

Content Validity

Content validity will be established by ensuring the questionnaire items align closely with key dimensions of faculty perception relevant to both digital and traditional anatomy instruction. These dimensions include clarity of instructional delivery, student engagement, spatial visualization, and overall learning efficacy. The questionnaire will be reviewed by a panel of three subject-matter experts in anatomy education and medical pedagogy to determine whether the items adequately and comprehensively represent the targeted construct, thus validating their coverage and relevance to the intended educational context.

Construct Validity

To empirically validate the questionnaire's internal structure, exploratory factor analysis (EFA) was employed to assess item loadings and examine whether responses aligned with theoretically anticipated domains. EFA, a statistical technique for uncovering latent constructs through observed variable correlations, enables the identification of coherent factors underpinning faculty and student perceptions.

Reliability of the Questionnaire

To evaluate the internal consistency and reliability of the questionnaire, Cronbach's alpha will be calculated for each thematic section of the instrument (Bonett, 2014). This coefficient measures the extent to which a group of items consistently reflect a single underlying construct, with values of 0.7 or above generally deemed acceptable for reliable scales. In the context of this study, Cronbach's alpha will be computed separately for domains addressing perceptions of conventional dissection, digital teaching tools, and comparative preferences. A high alpha value will affirm the coherence of items within each domain and support the questionnaire's capacity to reliably gauge student perceptions. Should any section yield a suboptimal reliability score, the associated items will be critically reviewed and refined to improve overall instrument robustness.

Sampling and Sampling Method

Stratified convenience sampling was used to ensure proportionate representation from both the Medicine and Dentistry programs across different academic years. Within each stratum (i.e., program and year level), participants were randomly selected. Inclusion criteria included enrolment in the MBBS or DDS programs, prior exposure to both conventional and digital anatomy teaching, and informed consent. Students lacking experience with either modality were excluded.

Sample Size Estimation

Sample size estimation was conducted using online Raosoft Software, based on a medium effect size (Cohen's d = 0.5), a significance level (α) of 0.05, and a power of 0.80. From 860 students, the minimum sample size was determined to be 266, thus, 522 participants were considered as sufficient sample size

Data Collection

After validation, the final version of the questionnaire was distributed online via institutional communication platforms. The data collection period spanned four weeks. Participation was voluntary, and informed consent was obtained electronically. Ethical approval was granted by the Research Management Centre, MAHSA University, and confidentiality was strictly maintained throughout the study.

Statistical Analyses

All analyses were conducted using IBM SPSS Statistics version 25. Data were screened for completeness, outliers, and normality before analysis

Results

Reliability Test for Overall Groups

The reliability analysis presented shows that all six questionnaire sections (Groups A–F) achieved acceptable internal consistency, with Cronbach's alpha values ranging from .623 (Group A) to .818 (Group E) (Figure 1). Group E had the highest reliability, indicating strong coherence among its items, followed by Group F (.792), Group B (.757), and Group D (.731). Group C (.635) and Group A (.623) still met the accepted reliability threshold (α ≥ .6), though they may benefit from minor refinement. Importantly, the overall Cronbach's alpha for all 26 items was .889, demonstrating high total reliability and confirming that the instrument consistently captures the intended constructs across its domains.

Section A

Cronbach's Alpha	N of Items
.623	6

Section B

Cronbach's Alpha	N of Items
.757	4

Section C

Cronbach's Alpha	N of Items
.635	4

Section D

Cronbach's Alpha	N of Items
.731	4

Section E

Cronbach's Alpha	N of Items
.818	4

Section F

Cronbach's Alpha	N of Items
.792	4

All variables

Cronbach's Alpha	N of Items
.889	26

Figure 1. Conceptual framework Module

Descriptive statistics for all groups.

The descriptive statistics reveal distinct patterns across the six groups. Group_B and Group_D received the highest mean scores (4.2184 and 4.1034, respectively), indicating strong positive perceptions, while Group_E had the lowest mean (3.3439), suggesting comparatively weaker endorsement. Skewness values for Groups B through D are notably negative (e.g., Group_B = -1.108), reflecting left-skewed distributions with more high-end responses (Table 1). In contrast, Group_E and Group_F show near-symmetrical distributions with minimal skewness. Kurtosis values for Groups B through D are elevated (above 1.5), indicating peaked distributions with concentrated responses, whereas Group_E's near-zero kurtosis (-.053) suggests a flatter, more dispersed response pattern. Overall, the data suggests that Groups B and D are most favorably perceived, while Group_E exhibits greater variability and lower consensus.

Table 1: Descriptive statistics for all groups.

	N	Minimum	Maximum	Mean	Standard Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Group_A	522	1.00	5.00	3.5907	.61350	-.221	.107	1.182	.213
Group_B	522	1.00	5.00	4.2184	.72929	-1.108	.107	1.974	.213
Group_C	522	1.00	5.00	3.9885	.67311	-.787	.107	1.540	.213
Group_D	522	1.00	5.00	4.1034	.72210	-1.044	.107	1.728	.213
Group_E	522	1.00	5.00	3.3439	.91009	-.309	.107	-.053	.213
Group_F	522	1.00	5.00	3.5105	.78837	-.171	.107	.494	.213
Valid N (listwise)	522								

T-test Statistics

The paired samples test results reveal statistically significant differences between Group_F and all other groups. Groups B, C, and D show strong positive mean differences (ranging from .478 to .708) with high t-values and p-values below .001, indicating that these domains were perceived significantly more favorably than Group_F. Group_A also shows a modest but significant difference (Mean = .080, p = .019), suggesting a slight preference over Group_F. In contrast, Group_E presents a negative mean difference (-.167, p < .001), indicating that it was rated significantly lower than Group_F. Overall, the findings suggest that Groups B through D are viewed more positively, while Group_E is perceived less favourably in comparison.

Table 2: One-sample T-test for all groups.

One-Sample Test (independent variable)							
	Test Value = 0						
	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Group_A	133.720	521	<.001	<.001	3.59068	3.5379	3.6434
Group_B	132.154	521	<.001	<.001	4.21839	4.1557	4.2811
Group_C	135.381	521	<.001	<.001	3.98851	3.9306	4.0464
Group_D	129.834	521	<.001	<.001	4.10345	4.0414	4.1655
Group_E	83.946	521	<.001	<.001	3.34387	3.2656	3.4221
Group_F	101.737	521	<.001	<.001	3.51054	3.4427	3.5783

Table 3: Paired samples T-test for all groups.

Paired Samples Test										
		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
Pair 1	Group_A - Group_F	.08014	.78125	.03419	.01296	.14732	2.344	521	.010	.019
Pair 2	Group_B - Group_F	.70785	.88406	.03869	.63184	.78387	18.293	521	<.001	<.001
Pair 3	Group_C - Group_F	.47797	.79117	.03463	.40994	.54600	13.803	521	<.001	<.001
Pair 4	Group_D - Group_F	.59291	.82502	.03611	.52197	.66385	16.420	521	<.001	<.001
Pair 5	Group_E - Group_F	-.16667	.82894	.03628	-.23794	-.09539	-4.594	521	<.001	<.001

Regression Analysis for All Groups

The regression model summary indicates a moderate relationship between the predictor variables (Groups A–E) and the dependent variable (Group_F), with an R value of .619 and an R^2 of .383, meaning approximately 38.3% of the variance in Group_F is explained by the model. The adjusted R^2 (.377) confirms the model's robustness after accounting for the number of predictors. The F-statistic (63.980, $p < .001$) demonstrates that the overall model is statistically significant, suggesting that the included groups collectively contribute meaningfully to predicting perceptions in Group_F. The Durbin-Watson value of 1.941 indicates no serious autocorrelation in the residuals, supporting the reliability of the regression assumptions.

The ANOVA results demonstrate a statistically significant overall model, indicating that the combined predictors (Groups A–E) meaningfully explain variance in the dependent variable, Group_F. The regression sum of squares (123.925) compared to the residual (199.892) yields a high F-value of 63.980 with a p-value less than .001, confirming that the differences among group means are unlikely due to chance. With five predictors and 516 degrees of freedom for the residual, the model accounts for a substantial portion of the total variance (323.817), supporting the relevance of the selected groups in predicting perceptions associated with Group_F. This validates the inclusion of these domains in the regression framework and underscores their collective influence.

Table 4: Table shows the summary of regression and ANOVA analysis between the dependent and independent variables.

Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.619[a]	.383	.377	.62240	.383	63.980	5	516	<.001	1.941

a. Predictors: (Constant), Group_E, Group_B, Group_A, Group_C, Group_D

b. Dependent Variable: Group_F

ANOVA Test for overall analysis.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.925	5	24.785	63.980	<.001[b]
	Residual	199.892	516	.387		
	Total	323.817	522			

Analysis of variance (ANOVA) is applied when comparing the average scores of three or more groups.

a. Dependent Variable: Group_F

c. Predictors: (Constant), Group_E, Group_B, Group_A, Group_C, Group_D

Comparison between Digital and Traditional Anatomy learning amongst MBBS and DDS students

Demographics Statistics for MBBS and DDS groups.

The demographic profile of the study population reveals a predominantly female cohort (67.6%), with males comprising 32.4%. The majority of participants were enrolled in the MBBS program (80.7%), particularly in Year 1 (27.8%) and Year 4 (23.0%), while DDS students represented a smaller proportion (19.3%), with Year 1 being the most represented (12.5%). Age distribution was concentrated in the 21–30 range (63%), followed by those below 20 (36.2%), indicating a largely young adult sample. Only 0.8% were above 30. Income data showed a wide spread, with 38.7% opting not to disclose, while the T20 group formed the largest disclosed segment (35.4%), followed by M40 (15.1%) and B40 (10.7%). These demographics suggest a youthful, academically diverse population with a relatively high socioeconomic representation.

Table 5: Table shows the demographic statistics for MBBS and DDS groups.

		Frequency (Count)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Gender	Female	353	67.6	67.6	67.6
	Male	169	32.4	32.4	100.0
Programme	DDS Year 1	65	12.5	12.5	12.5
	DDS Year 2	10	1.9	1.9	14.4
	DDS Year 3	11	2.1	2.1	16.5
	DDS Year 4	8	1.5	1.5	18.0
	DDS Year 5	7	1.0	1.0	19.0
	MBBS Year 1	145	27.8	27.8	46.7
	MBBS Year 2	97	18.6	18.6	65.3
	MBBS Year 3	31	5.9	5.9	71.3
	MBBS Year 4	120	23.0	23.0	94.3
	MBBS Year 5	28	5.4	5.4	99.6

Age Grouping	Below 20	189	36.2	36.2	36.2
	21-30	329	63.0	63.0	99.2
	Above 30	4	.8	.8	100.0
Income Group	Did not disclose	202	38.7	38.7	38.7
	B40	56	10.7	10.7	49.4
	M40	79	15.1	15.1	64.6
	T20	185	35.4	35.4	100.0

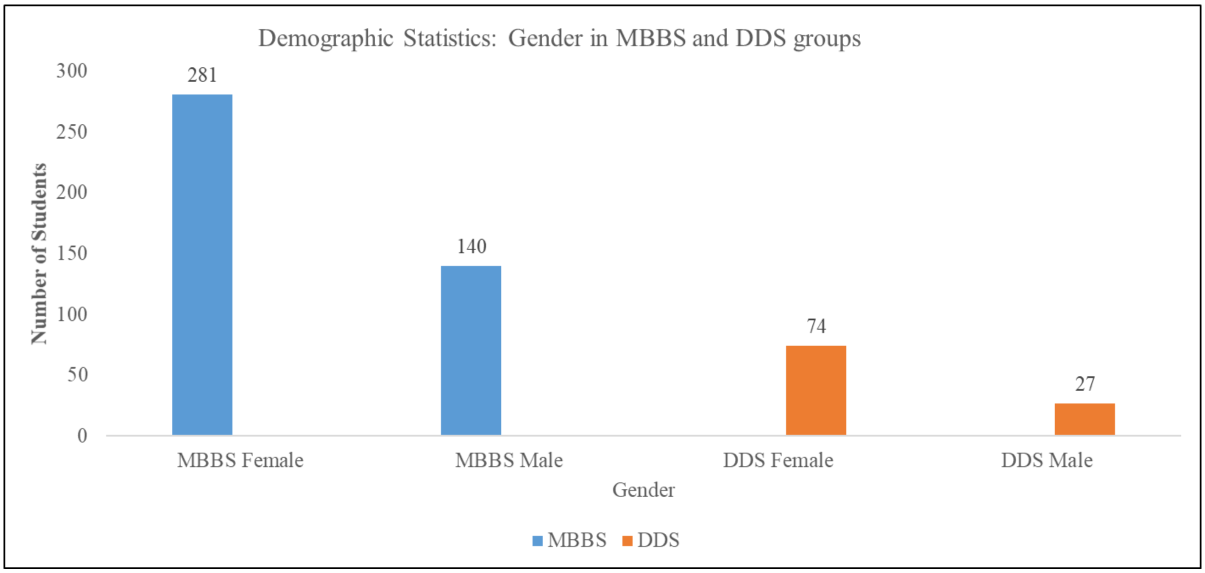

Figure 1: Demographic statistics based on gender within the MBBS and DDS groups. Total students are 522.

Reliability Test for MBBS and DDS Groups

The comparative reliability analysis between MBBS and DDS faculty responses across Groups A–F shows consistently acceptable internal consistency, with all Cronbach's alpha values exceeding .60. DDS scores were generally higher than MBBS across most groups, particularly in Groups B (.805 vs. .740), C (.729 vs. .607), and D (.810 vs. .704), suggesting that DDS respondents interpreted the grouped items more uniformly. Group E had the highest reliability overall for MBBS (.823), while DDS also scored strongly (.787). Group F showed solid consistency in both cohorts (.801 MBBS; .762 DDS). Though Group A exhibited the lowest reliability (MBBS: .640; DDS: .685), both still surpassed the threshold for acceptability. These findings support the questionnaire's sound internal structure and suggest slightly stronger coherence within DDS responses across several perception domains.

GROUP A (MBBS)

Cronbach's Alpha	N of Items
.640	6

GROUP A (DDS)

Cronbach's Alpha	N of Items
.685	6

GROUP D (MBBS)

Cronbach's Alpha	N of Items
.704	4

GROUP D (DDS)

Cronbach's Alpha	N of Items
.810	4

GROUP B (MBBS)

Cronbach's Alpha	N of Items
.740	4

GROUP B (DDS)

Cronbach's Alpha	N of Items
.805	4

GROUP E (MBBS)

Cronbach's Alpha	N of Items
.823	4

GROUP E (DDS)

Cronbach's Alpha	N of Items
.787	4

GROUP C (MBBS)

Cronbach's Alpha	N of Items
.607	4

GROUP C (DDS)

Cronbach's Alpha	N of Items
.729	4

GROUP F (MBBS)

Cronbach's Alpha	N of Items
.801	4

GROUP F (DDS)

Cronbach's Alpha	N of Items
.762	4

Figure 2: Cronbach's alpha for MBBS and DDS Groups

Descriptive Statistics for MBBS and DDS groups.

From the tables 6 and 7, Group A, C, D and F could be considered as normally distributed whereas the distribution of Group B and E could be moderately skewed. Skewness: Values between -1 and -0.5 or 0.5 and 1 means moderately skewed distribution. A value between -1.5 and -1, or between 1 and 1.5, indicates a highly skewed distribution. A value below -1.5 or above 1.5 signifies an extremely skewed distribution (Orcan, 2020).

Table 6: Descriptive statistics for MBBS group.

Descriptive Statistics (MBBS)

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Group_A	421	1.00	5.00	3.5673	.61482	-.195	.119	1.366	.237
Group_B	421	1.00	5.00	4.2607	.71227	-1.209	.119	2.548	.237
Group_C	421	1.00	5.00	4.0059	.66006	-.883	.119	2.146	.237
Group_D	421	1.00	5.00	4.1247	.69149	-1.047	.119	1.948	.237
Group_E	421	1.00	5.00	3.3064	.93490	-.326	.119	-.100	.237
Group_F	421	1.00	5.00	3.4941	.81044	-.252	.119	.560	.237
Valid (listwise)	N421								

Table 7: Descriptive statistics for DDS group.

Descriptive Statistics (DDS)

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Group_A	99	1.67	5.00	3.6818	.60144	-.332	.243	.604	.481
Group_B	99	1.50	5.00	4.0429	.78249	-.766	.243	.564	.481
Group_C	99	1.50	5.00	3.9167	.72580	-.453	.243	-.123	.481
Group_D	99	1.25	5.00	4.0177	.83929	-.948	.243	.924	.481
Group_E	99	1.75	5.00	3.4924	.78770	.078	.243	-.479	.481
Group_F	99	2.50	5.00	3.5808	.69513	.507	.243	-.830	.481
Valid (listwise)	N99								

Paired sample T-test for MBBS and DDS groups

The paired samples test for MBBS faculty responses revealed statistically significant differences across all five comparisons involving Group_F. Groups B through D showed strong positive mean differences (ranging from 0.51 to 0.77) with high t-values and p-values below .001, indicating substantial perceived advantages in those domains compared to Group_F. Group_A displayed a small, marginally significant difference (Mean = .073, p = .060), suggesting limited divergence. Notably, Group_E had a negative mean difference (-.188, p < .001), implying lower perception scores than Group_F. These results indicate that MBBS respondents rated Groups B, C, and D notably higher than Group_F, while Group_E was perceived less favorably, underscoring clear differentiation in teaching modality preferences.

The paired samples test for DDS faculty responses indicates statistically significant differences between Group_F and Groups B, C, and D, with positive mean differences ranging from .336 to .462 and p-values below .001, suggesting that these domains were rated notably higher than Group_F. Group_A, while slightly more favorable (Mean = .101), did not reach statistical significance (p = .167), indicating minimal divergence. Group_E showed a small negative mean difference (-.088), also non-significant (p = .212), suggesting its perception was similar to or slightly less favorable than Group_F. Overall, DDS faculty perceived Groups B, C, and D as more effective or positively aligned constructs, while Groups A and E showed weaker differentiation relative to Group_F.

Table 8: Paired sample T-test for MBBS group.

Paired Samples Test (MBBS)

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Group_A - Group_F	.07324	.79587	.03879	-.00301	.14948	1.888	420	.030	.060
Pair 2	Group_B - Group_F	.76663	.91321	.04451	.67914	.85411	17.225	420	<.001	<.001
Pair 3	Group_C - Group_F	.51188	.80392	.03918	.43486	.58889	13.065	420	<.001	<.001
Pair 4	Group_D - Group_F	.63064	.82493	.04020	.55161	.70967	15.686	420	<.001	<.001
Pair 5	Group_E - Group_F	-.18765	.85677	.04176	-.26973	-.10557	-4.494	420	<.001	<.001

Table 9: Paired sample T-test for DDS group.

Paired Samples Test (DDS)

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	Group_A - Group_F	.10101	.72171	.07254	-.04293	.24495	1.393	98	.083	.167
Pair 2	Group_B - Group_F	.46212	.70924	.07128	.32067	.60358	6.483	98	<.001	<.001
Pair 3	Group_C - Group_F	.33586	.72418	.07278	.19142	.48029	4.615	98	<.001	<.001
Pair 4	Group_D - Group_F	.43687	.81390	.08180	.27454	.59920	5.341	98	<.001	<.001
Pair 5	Group_E - Group_F	-.08838	.70014	.07037	-.22802	.05126	-1.256	98	.106	.212

Regression Analysis For Comparative Study Between MBBS and DDS Groups.

From the tables 8 and 9, Model 1 predicts around 37% and 44% of relationships between the predictors and dependent variables fro MBBS and DDs groups, respectively.

Table 10: Regression analysis for MBBS and DDS groups.

Model Summary (MBBS)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.614[a]	.377	.369	.64354	.377	50.218	5	415	<.001

a. Predictors: (Constant), Group_E, Group_B, Group_A, Group_C, Group_D

b. Dependent Variable: Group_F

Model Summary (DDS)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.668[a]	.446	.416	.53101	.446	14.987	5	93	<.001	1.993

a. Predictors: (Constant), Group_E, Group_A, Group_B, Group_D, Group_C

b. Dependent Variable: Group_F

ANOVA Analysis for MBBS and DDS groups.

From the table 10 and 11, Model 1 is statistically significant for both MBBS and DDS.

Table 11: ANOVA test analysis for MBBS and DDS groups.

ANOVA (MBBS)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	103.989	5	20.798	50.218	<.001[b]
	Residual	171.871	415	.414		
	Total	275.860	420			

a. Dependent Variable: Group_F

b. Predictors: (Constant), Group_E, Group_B, Group_A, Group_C, Group_D

ANOVA (DDS)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.130	5	4.226	14.987	<.001[b]
	Residual	26.224	93	.282		
	Total	47.354	98			

a. Dependent Variable: Group_F

b. Predictors: (Constant), Group_E, Group_A, Group_B, Group_D, Group_C

Coefficients Analysis for MBBS and DDS Groups

For both tables shown, Model 1 is statistically significant for both MBBS and DDS. Regression coefficients are the values in a regression equation that indicate how much the predicted outcome changes for every one-unit change in a predictor variable, while keeping the other predictors constant.

For MBBS group, the coefficient analysis indicates that Group_E has the strongest and most statistically significant influence on the outcome variable, with the highest standardized coefficient ($\beta = .401$), a large t-value (9.198), and a highly significant p-value ($p < .001$). Group_A also shows a significant positive effect ($\beta = .135$, $p = .004$), while Group_B, Group_C, and Group_D demonstrate weaker effects with borderline significance (p-values = .052, .058, and .069 respectively). The constant term is not statistically significant ($p = .321$). Overall, Group_E emerges as the most influential predictor in the model, suggesting that the perception domain it represents has the strongest association with the dependent variable.

For DDS group, the analysis revealed that Group_E is the strongest and most statistically significant predictor of the outcome variable, with the highest standardized coefficient ($\beta = .391$), a large t-value (4.570), and a highly significant p-value ($p < .001$). Group_B also demonstrated a meaningful effect ($\beta = .295$, $p = .012$), suggesting its perception domain contributes notably to the model. In contrast, Group_A, Group_C, and Group_D showed weak and statistically non-significant associations with the outcome (p-values = .700, .414, and .939 respectively), indicating limited predictive power. The model constant ($B = .742$, $p = .050$) is marginally significant. Overall, the results underscore Group_E as the most influential factor shaping DDS respondents' perceptions, with Group_B also contributing positively, while other domains show negligible predictive strength.

Table 12: Coefficients test analysis for MBBS and DDS groups.

Coefficients (MBBS)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.243	.244		.993	.321
	Group_A	.178	.061	.135	2.936	.004
	Group_B	.111	.057	.098	1.951	.052
	Group_C	.126	.067	.103	1.900	.058
	Group_D	.118	.065	.101	1.820	.069
	Group_E	.348	.038	.401	9.198	<.001

a. Dependent Variable: Group_F

Coefficient (DDS)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.742	.374		1.983	.050
	Group_A	.051	.131	.044	.387	.700
	Group_B	.262	.102	.295	2.571	.012
	Group_C	.108	.131	.113	.821	.414

	Group_D	-.008	.107	-.010	-.076	.939
	Group_E	.345	.075	.391	4.570	<.001

a. Dependent Variable: Group_F

To summarize, regarding the distribution of data, MBBS students show normally distributed groups in A, E, and F, with Group C being moderately skewed and Groups B and D highly skewed. DDS students have normal distributions in groups A, C, D, and F, while Groups B and E are moderately skewed. Paired sample correlations indicate a strong relationship between Groups E and F for both MBBS and DDS students. The paired sample test results are highly significant for both groups. The effect size analysis shows that the MBBS group has a large sample effect, while the DDS group has a moderate effect size. Cronbach's alpha for reliability studies suggests acceptable reliability for both groups. Additionally, Model 1 is statistically significant in both the ANOVA and coefficients analyses for both MBBS and DDS students.

Discussion

A study was carried out to understand how the digital era has affected the way medical and dental students learn human anatomy, specifically focusing on prosected specimens versus traditional cadaver dissection. The research involved around 500 preclinical MBBS and Dentistry students from MAHSA University. The survey, distributed via email, used a Likert scale to gather students' preferences and satisfaction levels. Data analysis included both descriptive and inferential statistics, and the questionnaire's reliability was confirmed through expert validation and Cronbach's alpha.

The research question was explored through three key indicators under Group A (Individual Challenge), namely: risks associated with handling surgical instruments (A1), exposure to hazardous chemicals (A2), and proneness to injuries during dissection sessions (A3). The normal distribution of responses, as indicated by skewness values within the range of -0.5 to 0.5, confirms the appropriateness of applying parametric tests such as the one-sample T-test and ANOVA. The mean scores for each of the three items hovered around 3.5 on a Likert scale, suggesting that the majority of respondents remained neutral in their perceptions. This neutrality may reflect uncertainty, lack of awareness, or variability in the individual experiences of the students during dissection. Despite this neutrality, statistical analysis via ANOVA revealed a p-value below the conventional threshold of 0.05, indicating a statistically significant relationship between the perceived presence of injuries/health hazards and the experience of cadaver dissection. The acceptance of the alternative hypothesis strengthens the argument that these issues are non-negligible within the educational system, even if students do not overwhelmingly report strong agreement or disagreement. Additionally, the reliability of the items used in Group A was supported by a Cronbach's alpha greater than 0.6, signifying acceptable internal consistency. This indicates that the three items consistently reflect a unified construct—namely, the perception of individual-level challenges associated with cadaver dissection. The finding that students largely responded neutrally, despite statistical significance, points to a possible dissonance between subjective perception and objective risk. It is plausible that students may not feel empowered or informed enough to evaluate the real dangers posed by instrument handling or chemical exposure. Moreover, this neutrality could stem from normalization of risk in medical education, where injuries such as minor cuts or prolonged exposure to formaldehyde are viewed as part of the learning process. From a pedagogical standpoint, these findings underscore the need for enhanced training on occupational safety in dissection labs. While technical skill development is central to gross anatomy, it must be balanced with structured instruction on risk mitigation strategies, proper use of personal protective equipment (PPE), and emergency protocols. The study suggests that formalized safety briefings and health surveillance mechanisms may be underutilized or inconsistently applied across institutions. Although the current analysis grouped medical and dental students together, future studies should consider stratifying by discipline to assess whether the intensity, frequency, and nature of exposure differ between cohorts. Dental students, for instance, may have different contact hours or handle dissection tools less frequently, which could influence their perceived and actual risk. Moreover, qualitative follow-up studies (e.g., interviews or focus groups) may help elucidate why students report neutral perceptions despite demonstrable risk. Investigating variables such as prior experience with cadavers, anxiety levels, or institutional safety culture could provide deeper insight.

The analysis focused on four key items under Group B (Course Challenge), exploring hands-on spatial learning, tactile familiarity with anatomical variability, and the procedural aspects of dissection. The results demonstrated that the mean responses across all four items were significantly above the neutral midpoint (mean > 4.0), as confirmed by one-sample T-tests. This finding suggests strong agreement among participants that cadaveric dissection meaningfully contributes to their comprehension of anatomical orientation and appreciation of structure consistency. The internal consistency of these items, as evidenced by a Cronbach's alpha around 0.8, further validates the coherence of the construct being measured—i.e., the educational value of hands-on dissection. The skewness values, ranging from -0.5 to -1.5, indicate a moderate to high tendency of students agreeing with the items. Notably, item B3 (dissection aids in handling sharp blades) was highly skewed, implying a more uniform perception—possibly due to the procedural repetitiveness and skill-building aspects of dissection. This also reflects an implicit development of psychomotor competencies, which are often under-emphasized in digital learning platforms. Statistical significance was reaffirmed by ANOVA, where p-values fell below 0.05. The results thus support the alternative hypothesis that cadaveric dissection significantly enhances students' orientation and understanding of anatomical structures. Moreover, the paired sample analysis comparing Group B with Group F (impact of digital learning) revealed a large effect size (Cohen's d > 0.8). This suggests that students perceive a markedly higher educational benefit in traditional cadaver-based learning compared to digital or virtual alternatives, particularly when it comes to three-dimensional spatial reasoning and hands-on experience. These findings strongly endorse cadaveric dissection as an irreplaceable component of anatomy education, particularly for its role in enhancing spatial orientation and structural appreciation. While digital learning platforms offer accessibility and standardized content delivery, they often lack the depth of tactile engagement and anatomical variability found in real cadavers. However, the moderate skewness on this item may also hint at variability in group dynamics, resource availability, or institutional infrastructure, which could influence participation equity.

The concern of damage is a common challenge faced by students new to dissection, often arising from limited dexterity, unfamiliarity with the tools, or difficulty in differentiating fine anatomical structures. To investigate this, four items under Group C (Contextual Challenge) were analyzed, focusing on both the cognitive and procedural aspects of learning anatomy through cadaveric dissection. The mean values for the items in Group C were approximately 4.0, indicating that a majority of students agreed with the notion that anatomical structures are likely to be damaged during dissection. Specifically, items C2 (chances of damaging normal anatomy) and C3 (difficulty identifying damaged structures) exhibited normal distribution (skewness between -0.5 and 0.5), indicating balanced student responses with a slight lean toward agreement. This suggests that students commonly encounter difficulties in preserving the integrity of anatomical structures, which may affect their ability to fully appreciate spatial relationships and morphology. Items C1 and C4 were moderately and highly skewed, respectively. C1 (virtual memory following dissection is better with digital demonstration) skewed moderately, suggesting that while students value cadaveric dissection, they also acknowledge the role of digital resources in reinforcing memory retention. This aligns with modern blended-learning approaches. Meanwhile, the highly skewed distribution of C4 (dissection helps students learn to use basic surgical instruments) suggests strong agreement among respondents, reinforcing the procedural benefit of dissection in developing early surgical skills. The internal consistency of the group (Cronbach's alpha > 0.6) supports the reliability of the items in measuring a coherent underlying construct—namely, the perceived risks and consequences of structural damage during dissection. The statistical significance ($p < 0.05$) from ANOVA further validates the results, justifying the acceptance of the alternative hypothesis that structure damage is a significant concern in cadaver dissection.

The inquiry was guided by three items from Group D (Technological Challenge), examining the students' perceptions of ease of structure identification during dissection (D1), the role of three-dimensional (3D) visualization tools in knowledge enhancement (D2), and their ability to illustrate spatial relationships between organs (D3). The results of the one-sample T-test revealed a mean value around 4.0 across all items, indicating a high level of agreement among students that digital visualization technologies contribute positively to anatomical learning. Items D1 and D2 demonstrated normal distribution with skewness within -0.5 to 0.5, suggesting a consistent perception among students regarding the utility of these tools. Item D3 was moderately skewed (-0.5 to -1.0), with the overall group skewness trending below -1.0, suggesting the presence of outliers and indicating that some students showed particularly strong agreement, especially concerning 3D technology's ability to reveal inter-organ spatial relationships. The internal consistency of the group (Cronbach's alpha > 0.6) confirmed the reliability of the instrument in measuring perceptions related to technological support in anatomical education. The ANOVA test yielded statistically significant results ($p < 0.05$), thereby supporting the alternative hypothesis that digital visualization technology significantly aids students in structure identification and anatomical comprehension. These tools allow learners to manipulate anatomical views, explore cross-sections, and visualize relationships from multiple perspectives—features that are not always feasible in traditional cadaveric dissection, especially when structures are obscured or damaged.

Then, analysis was done based on the relationship between the dependent variable Group E (importance of digital-aided education) and the independent variable Group F (impact of digital-aided education). The statistical analysis yielded robust evidence supporting the educational value of computer-aided tools. The ANOVA results produced p-values below 0.05, indicating statistically significant differences in responses and validating the acceptance of the alternative hypothesis—that digital technologies do play a significant role in exam preparation. Furthermore, the internal consistency of all relevant items was confirmed through Cronbach's alpha values above 0.7, reflecting strong reliability and coherence across measured constructs. The Pearson correlation coefficients between Groups E and F were greater than 0.5, denoting a strong positive association. This implies that students who perceive digital tools as important also experience a substantial impact from their use—particularly in preparing for summative assessments. The mean scores for both groups hovered around 4.0, signifying a general consensus among students that computer-aided learning significantly contributes to their ability to understand, retain, and apply anatomical knowledge in an exam setting.

A critical question was explored in contemporary anatomy education: can computer-aided learning (CAL) technologies adequately replace conventional dissection-based methods involving cadaver specimens? This debate sits at the intersection of pedagogical innovation, ethical consideration, resource availability, and cognitive outcomes. The investigation focused on Group E (digital-aided education) as the dependent variable and Group F (impact of digital-aided education) as the independent variable. The results of the analysis present a nuanced picture. While the mean values for both groups hovered around 3.5, suggesting a generally neutral stance among students, the statistical metrics indicate that the data are robust and meaningful. Both Group E and Group F were normally distributed (skewness < 0.5), suggesting consistency in student responses. The one-sample T-test mean difference around 3.5 suggests that students neither strongly support nor strongly oppose the idea of replacing cadaver dissection with computer-aided methods. Despite this neutrality, deeper statistical analyses reveal underlying trends. This reflects the current transitional stage in anatomical pedagogy, where technological advancements offer promising alternatives, but traditional methods still hold perceived irreplaceable value. Cadaveric dissection provides not only tactile and spatial learning experiences but also a profound appreciation for human anatomy's complexity and variability.

Conclusion

Cadaver dissecting allows medical and dental students to directly observe the human body's structure that provides an accurate understanding of anatomy. The hands-on training helps students recognise variations and nuances that may not be shown in textbooks. Cadaveric dissection, provides a tangible way to think how these structures are interconnected and these helps the students to develop critical surgical skills. When students encounter the complicities of human anatomy in a cadaver it encourages students to think critically and help solve problems. Handling cadaver gives a sense of respect and professionalism. The insight gained from cadaveric study are foundation of understanding diseases and therapeutic intervention. It also provides multifaceted educational experience and compassionate healthcare professionals.

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