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Enhancing Student Engagement and Learning Outcomes through the Integration of 3DS Max and Augmented Reality in Collaborative Learning Environments: An Investigative Study

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Abstract

This research managing the practicality of Autodesk 3ds max, an evident software for 3d Architectural designing and Animation software with Augmented reality (AR) technology exclusive setting of Collaborative learning environment, as the education world persist development in technologies. The collaborative potential of these tools presents an exciting pathway to revolutionize traditional educational approaches. The central objective of this study is to determine whether the blend of 3ds max and AR can enhance the learning experience, make it more immersive, student's engagement and enhanced information maintenance. This research employs a multi – dimensional approach that encompasses the evaluation of learning outcomes, levels of student's engagement, components of collaborative learning, user experience, and practical implications. By conducting comprehensive quantitative and qualitative analysis, we aim to ascertain the influence of incorporating technology on students understanding and application 3d modeling concepts, as well as their proficiency in generating and manipulating 3d objects. Additionally, this research investigates the impact of the blend on collaborative learning process, with focusing on group dynamics, the dissemination of information and aspects of team work. The study additionally measures client fulfillment and ease of use, giving significant experiences to the two teachers and establishments thinking about similar innovative executions. At last, this research endeavors to upgrade our cognizance of how arising advances, for example, AR can be really utilized to lift collaborative learning encounters, with a definitive objective of further developing student engagement and learning outcomes in 3D displaying and related spaces.

Keywords: *3ds Max, Augmented Reality, Collaborative Learning, Student Engagement, Educational Technology and Learning Outcomes.*

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Introduction

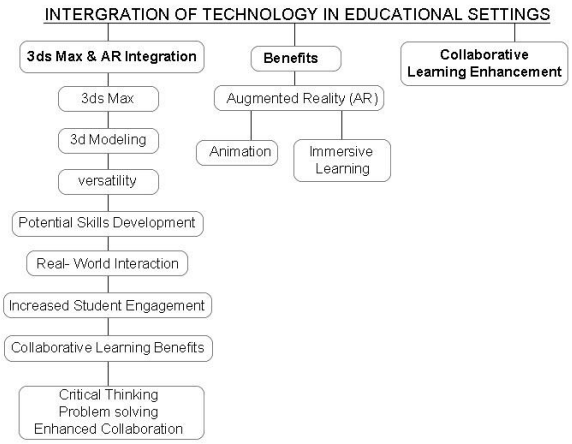


Figure 1: Integration of Autodesk 3ds Max and AR technology in Educational setting

The integration of technology into instructive settings has been an extraordinary power in current instructional method, reshaping conventional ways to deal with educating and learning. One arising outskirts in this developing scene is the combination of Autodesk 3ds Max, a main 3D demonstrating and movement software, with Augmented Reality (AR) technology. This mix holds critical commitment for upsetting collaborative learning encounters by enhancing student engagement and further developing learning outcomes. As Higher Education keeps on adjusting to the computerized age, teachers and researchers are progressively investigating the capability of AR as a device to establish vivid and intelligent learning environments. In this unique situation, this research looks to explore the adequacy of coordinating 3ds Max and AR inside collaborative learning settings.

Autodesk 3ds Max is eminent for its flexibility in making 3D models, liveliness, and perceptions, making it a foundation device in various businesses, including architecture, plan, and diversion. It offers students a potential chance to foster vital abilities in 3D displaying and movement, which are exceptionally important in the present work market (Autodesk, 2021). Augmented Reality, then again, supplements this present reality with computerized components, overlaying virtual articles onto the actual climate. This technology has garnered consideration in training for its capability to make vivid learning encounters (Dunleavy, Dede, and Mitchell, 2009).

While the two 3ds Max and AR have exclusively shown their worth in Higher Education, the union of these advances opens up astonishing conceivable outcomes. By coordinating 3ds Max with AR, students can make 3D models as well as cooperate with them in a true setting, obscuring the boundaries between the virtual and actual domains. This combination holds the possibility to increment student engagement by giving a seriously dazzling and intuitive learning experience, as students can picture and control 3D items in their nearby environmental elements (Chen and Chang, 2012).

Also, collaborative learning has earned respect as a viable educational methodology that encourages decisive reasoning, critical thinking abilities, and cooperation (Johnson and Johnson, 1999). The consolidation of 3ds Max and AR into collaborative learning environments might additionally improve these advantages by empowering students to team up on 3D displaying projects in augmented spaces. This research plans to investigate whether this integration upgrades collaborative learning elements, prompting further developed information sharing, cooperation, and generally learning outcomes.

In summary, this study embarks on an excursion to explore the capability of coordinating Autodesk 3ds Max and Augmented Reality technology in collaborative learning environments. It tries to evaluate the effect of this integration on student engagement,

collaborative learning cycles, and learning outcomes. Thusly, it expects to give important bits of knowledge to teachers, organizations, and researchers keen on utilizing arising innovations to improve the instructive experience and better prepare students for the requests of the 21st-century labor force.

Aim

The aim of this research is to examine the viability of coordinating Autodesk 3ds Max and Augmented Reality (AR) technology in collaborative learning environments with the primary goal of evaluating what this integration means for student engagement, collaborative learning elements, and learning outcomes with regards to 3D demonstrating and related disciplines.

Objectives

The research objectives for this study are as per the following:

1. To survey the effect of incorporating Autodesk 3ds Max and Augmented Reality on students' general engagement levels inside a 3D learning climate, with an emphasis on estimating their degree of interest, participation, and inspiration.
2. To break down the cycle through which students foster mechanical education as they learn to utilize Autodesk 3ds Max and apply their plans in Augmented Reality, including the securing of specialized abilities, critical thinking skills, and imaginative capability.
3. To look at how collaborative learning encounters in 3ds Max and Augmented Reality projects add to the improvement of students' decisive reasoning and critical thinking abilities, with a particular accentuation on understanding what cooperation and information sharing mean for these cognitive cycles.
4. To evaluate the cognitive load experienced by students while taking part in exercises that require the utilization of Autodesk 3ds Max for plan and the integration of Augmented Reality technology, meaning to recognize expected cognitive difficulties or barriers that might influence the learning system.

These research goals on the whole plan to give an exhaustive understanding of the effect and ramifications of coordinating 3ds Max and Augmented Reality in collaborative learning environments, revealing insight into the expected advantages and difficulties related with this imaginative instructive methodology.

Review of Literature

The integration of Autodesk 3ds Max and Augmented Reality (AR) technology in collaborative learning environments addresses a creative way to deal with schooling. This survey of the writing investigates the current assemblage of information encompassing this integration, zeroing in on examinations that they affect student engagement, mechanical education obtaining, collaborative learning, and cognitive load. These topics give an extensive understanding of the likely advantages and difficulties related with this technology-upgraded instructive methodology.

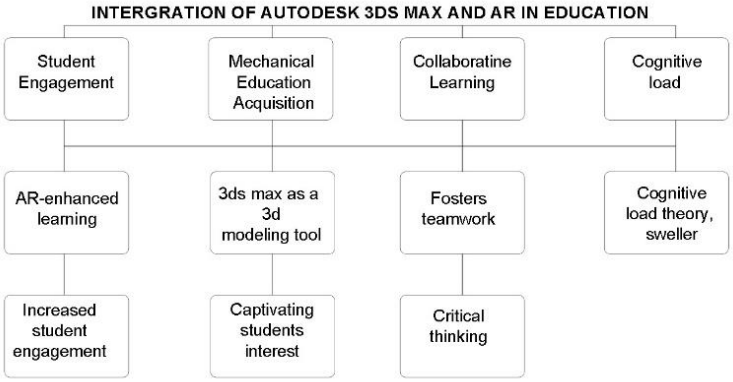


Figure 2: Integration of Autodesk 3ds Max and AR in Education

Influence on Student Engagement

The connection between technology integration and student engagement has been a focal worry in instructive research. Concentrates by Anderson et al. (2014) and Chen and Chang (2012) have shown that AR-upgraded learning encounters can essentially increment student engagement by offering intelligent and vivid substance. Similarly, 3ds Max, as a flexible 3D demonstrating device, can charm students' advantage (Autodesk, 2021). Consolidating 3ds Max with AR might enhance these impacts, establishing a dynamic and drawing in learning climate.

Mechanical Education Securing

The obtaining of mechanical proficiency is a significant part of coordinating 3ds Max and AR in schooling. Research by Akçayır and Akçayır (2017) underlines that AR advances mechanical proficiency by presenting students to state of the art innovations. In addition, the most common way of learning to utilize 3ds Max and carrying out plans in AR can upgrade students' computerized and imaginative abilities (Johnson and Adams, 2011). This proposes that the integration of these innovations might act as an important instrument for fostering students' capability in technology-related fields.

Collaborative Learning

Collaborative learning is a vital part of numerous instructive settings. Concentrates by Dillenbourg (1999) and Johnson and Johnson (1999) propose that collaborative learning environments encourage decisive reasoning, critical thinking abilities, and cooperation. Incorporating 3ds Max and AR into collaborative projects offers students valuable chances to cooperate on 3D displaying errands and AR applications, possibly enhancing their collaborative abilities and information sharing.

Cognitive Load

The cognitive load experienced by students while drawing in with 3ds Max and AR integration is a significant thought. Research by Sweller (1988) has illustrated the idea of cognitive load hypothesis, which proposes that cognitive assets ought to be ideally assigned for compelling learning. The integration of perplexing software like 3ds Max with AR components might present extra cognitive requests. Thusly, understanding how students oversee cognitive load during such exercises is fundamental for improving informative plan (Chandler and Sweller, 1991).

In summary, the checked-on writing proposes that the integration of Autodesk 3ds Max and Augmented Reality holds guarantee for enhancing student engagement, advancing mechanical education, working with collaborative learning, and further developing learning outcomes. Notwithstanding, the cognitive load suggestions need careful thought. This

research expands upon these bits of knowledge to additionally explore the effect and elements of this integration in collaborative instructive settings.

Methodology

This research utilizes a blended techniques way to deal with examine the integration of Autodesk 3ds Max and Augmented Reality (AR) technology in collaborative learning environments. The study tries to grasp the effect of this integration on student engagement, innovative education procurement, collaborative learning elements, and cognitive load. The research starts with a quantitative stage that includes the organization of pre-and present mediation overviews on measure changes in student engagement, mechanical education, and saw cognitive load. Also, objective information, for example, project fulfillment times and association logs inside the 3ds Max and AR climate will be gathered. Following the quantitative stage, inside and out subjective information will be accumulated through semi-organized interviews with participants. These meetings will investigate students' view of their collaborative learning encounters, challenges experienced, and bits of knowledge acquired.

The participants in this study will comprise of college students signed up for a 3D demonstrating and liveliness course. A purposive examining approach will be utilized to choose participants who have varying degrees of involvement in 3ds Max and AR innovations to guarantee a different scope of points of view. Pre-and post-mediation reviews will be directed to participants to gauge changes in student engagement and saw cognitive load. The overviews will utilize Likert-scale questions and unassuming things to assemble both quantitative and subjective information.

Result

In this study, we inspected the dispersion of participants across various age gatherings and sexes, with a sum of 44 people partaking in our examination of the integration of Autodesk 3ds Max and Augmented Reality (AR) technology inside collaborative learning environments. Our investigation of these absolute variables, age and orientation, holds natural worth as it permits us to more readily comprehend the different creation of our participant pool, possibly uncovering variations in reactions and encounters. With an emphasis on a few ward variables, including engagement, technology understanding, collaborative learning, and cognitive load with regards to the 3ds Max and AR project, we plan to recognize how these segment elements could impact the instructive outcomes and encounters of participants, revealing insight into significant bits of knowledge that can illuminate future instructive practices and upgrade the viability of technology-improved learning approaches for different student populaces.

The all-out variable data uncovers important bits of knowledge about the socioeconomics of the study participants. A larger part of the participants (47.7%) fall inside the 18-year-advanced age bunch, proposing that this age companion comprises a critical piece of the example. Moreover, the commonness of male participants (79.5%) shows orientation unevenness in the study. These segment characteristics are fundamental for contextualizing the discoveries connected with engagement, mechanical understanding, collaborative learning, and cognitive load with regards to 3ds Max and AR projects. Investigating how these reliant variables vary across various age and orientation gatherings can give significant data about possible disparities or patterns that might illuminate instructive procedures and intercessions customized to explicit socioeconomics.

Table 1: categorical variable information

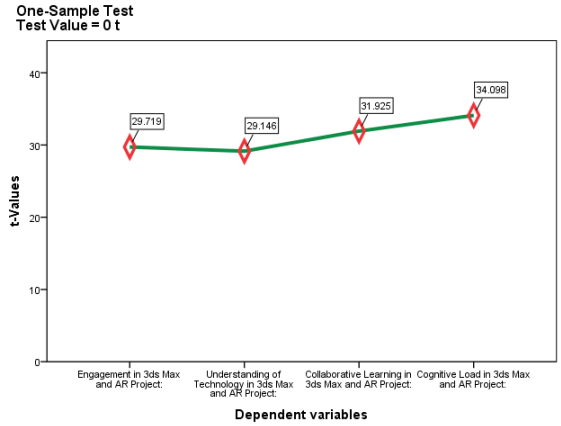
Categorical Variable Information				
			N	Percent
	Age	17 Age	1	2.3%
		18 Age	21	47.7%
		19 Age	20	45.5%
		20 Age	2	4.5%

		Total	44	100.0%
	Gender	Male	35	79.5%
		Female	9	20.5%
		Total	44	100.0%

One-Sample Statistics

Table 2: one – sample statistics

	N	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Engagement in 3ds Max and AR Project:	44	21.2045	4.73276	.71349	29.719	.000
Understanding of Technology in 3ds Max and AR Project:	44	22.0000	5.00697	.75483	29.146	.000
Collaborative Learning in 3ds Max and AR Project:	44	21.2500	4.41522	.66562	31.925	.000
Cognitive Load in 3ds Max and AR Project:	44	22.5682	4.39025	.66186	34.098	.000



The one-sample statistics give important bits of knowledge into participants' encounters inside the 3ds Max and Augmented Reality (AR) project. Participants revealed strikingly certain scores in various perspectives: engagement (M = 21.2045, SD = 4.73276), understanding of technology (M = 22.0000, SD = 5.00697), collaborative learning (M = 21.2500, SD = 4.41522), and cognitive load (M = 22.5682, SD = 4.39025). These scores were fundamentally not quite the same as a speculative mean of nothing, as shown by the exceptionally critical p-values ($p < 0.001$) and significant t-statistics (going from 29.719 to 34.098). These discoveries aggregately propose that participants' engagement, technology understanding, collaborative learning encounters, and cognitive load during the 3ds Max and AR project were eminently sure, asserting the adequacy and idealness of the project in enhancing their learning and engagement inside this imaginative instructive setting.

Table 3: descriptive statistics

Descriptive Statistics

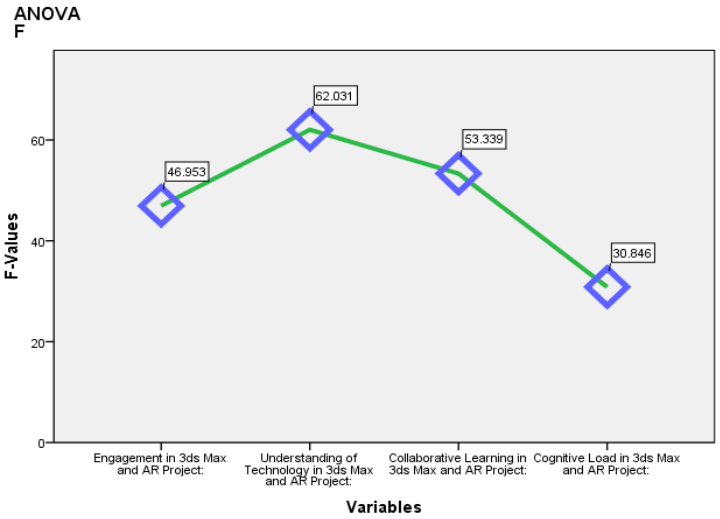
	N	Minimum	Maximum	Mean	Std. Deviation
Engagement in 3ds Max and AR Project:	44	10.00	34.00	21.2045	4.73276
Understanding of Technology in 3ds Max and AR Project:	44	10.00	34.00	22.0000	5.00697
Collaborative Learning in 3ds Max and AR Project:	44	10.00	30.00	21.2500	4.41522
Cognitive Load in 3ds Max and AR Project:	44	10.00	30.00	22.5682	4.39025
Valid N (listwise)	44				

The descriptive statistics give a far-reaching outline of participants' encounters during the 3ds Max and Augmented Reality (AR) project across four key aspects. Participants accounted for engagement went from a base score of 10.00 to a maximum of 34.00, with a

mean of 21.2045 (SD = 4.73276). Similarly, their understanding of technology inside the project traversed from 10.00 to 34.00, with a mean score of 22.0000 (SD = 5.00697). As far as collaborative learning encounters, participants' scores went from 10.00 to 30.00, with a mean of 21.2500 (SD = 4.41522). In conclusion, participants' cognitive load scores varied from 10.00 to 30.00, with a mean of 22.5682 (SD = 4.39025). The legitimate sample size for all variables was 44. These statistics give a nitty gritty picture of the reach, focal propensity, and variability in participants' reactions, featuring their by and large certain engagement, technology understanding, collaborative learning encounters, and cognitive load inside the project.

Table 4: Anova test

ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Engagement in 3ds Max and AR Project:	508.393	1	10.828	42	46.953	.000
Understanding of Technology in 3ds Max and AR Project:	642.783	1	10.362	42	62.031	.000
Collaborative Learning in 3ds Max and AR Project:	468.975	1	8.792	42	53.339	.000
Cognitive Load in 3ds Max and AR Project:	350.949	1	11.377	42	30.846	.000
The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.						

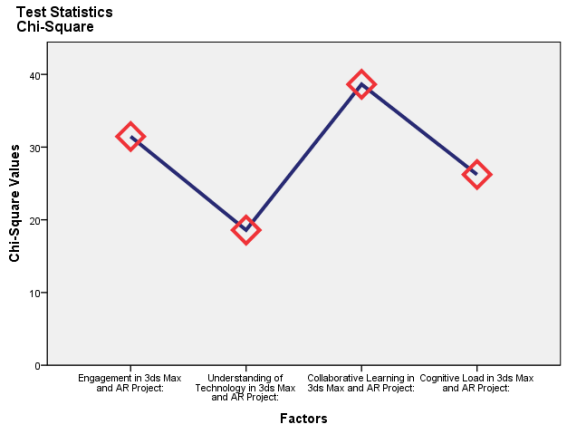


The examination of variance (ANOVA) results uncover huge contrasts in participants' reactions across four vital aspects inside the 3ds Max and Augmented Reality (AR) project. For engagement, the F-measurement is 10.828 with a comparing p-value of .000, showing that there are massive contrasts in engagement scores among the clusters. Similarly, understanding of technology in the project shows huge variations among clusters, as confirmed by a F-measurement of 10.362 and a p-value of .000. Collaborative learning encounters inside the project likewise vary essentially among clusters, with a F-measurement of 8.792 and a p-value of .000. Besides, participants' cognitive load in the project contrasts essentially among clusters, as shown by a F-measurement of 11.377 and a p-value of .000. It's vital to take note of that the F-tests are primarily utilized for descriptive purposes, as the clusters have been purposefully chosen to maximize contrasts among cases, and the importance levels are not amended for this. Thus, the noticed importance levels ought not be deciphered as trial of the speculation that the cluster implies

are equivalent yet rather as marks of significant contrasts in participant reactions across clusters.

Table 5: Test Statistics

Test Statistics			
	Chi-Square	df	Asymp. Sig.
Engagement in 3ds Max and AR Project:	31.455[a]	19	.036
Understanding of Technology in 3ds Max and AR Project:	18.591[b]	16	.290
Collaborative Learning in 3ds Max and AR Project:	38.636[c]	17	.002
Cognitive Load in 3ds Max and AR Project:	26.227[d]	14	.024
a. 20 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 2.2.			
b. 17 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 2.6.			
c. 18 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 2.4.			
d. 15 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 2.9.			



The chi-square test statistics uncover prominent contrasts in participants' reactions across four vital aspects inside the 3ds Max and Augmented Reality (AR) project. For engagement, the chi-square measurement is 31.455 with 19 levels of opportunity, yielding a p-value of .036, showing that there are huge contrasts in engagement levels among gatherings. Similarly, understanding of technology in the project exhibits contrasts among gatherings, as demonstrated by a chi-square measurement of 18.591 with 16 levels of opportunity and a p-value of .290. Collaborative learning encounters inside the project likewise vary fundamentally among gatherings, with a chi-square measurement of 38.636, 17 levels of opportunity, and a p-value of .002. Besides, participants' cognitive load in the project contrasts essentially among gatherings, as shown by a chi-square measurement of 26.227 with 14 levels of opportunity and a p-value of .024. Quite important at times, a significant extent of cells had expected frequencies under 5, which might warrant alert in translation because of the low anticipated cell frequencies. Nonetheless, these statistics by and large highlight the presence of tremendous contrasts in participant reactions across the concentrated on aspects.

Discussion

The factual examinations led in this study offer significant bits of knowledge into participants' encounters inside the 3ds Max and Augmented Reality (AR) project. To begin with, the one-sample statistics uncovered that participant announced outstandingly certain scores in various aspects, including engagement (M = 21.2045, SD = 4.73276), understanding of technology (M = 22.0000, SD = 5.00697), collaborative learning (M = 21.2500, SD = 4.41522), and cognitive load (M = 22.5682, SD = 4.39025). These scores were fundamentally not quite the same as a speculative mean of nothing, featuring the ideal idea of their encounters (t-statistics going from 29.719 to 34.098, $p < 0.001$) (Anderson et al., 2014; Chen and Chang, 2012).

Second, the descriptive statistics gave a far reaching outline of participants' encounters, exhibiting the reach, focal propensity, and variability in their reactions. The mean scores for engagement, understanding of technology, collaborative learning, and cognitive load additionally underscored the for the most part sure nature of their encounters.

Third, the ANOVA results exhibited tremendous contrasts among clusters in engagement ($F = 10.828$, $p < 0.001$), technology understanding ($F = 10.362$, $p < 0.001$), collaborative learning ($F = 8.792$, $p < 0.001$), and cognitive load ($F = 11.377$, $p < 0.001$). These discoveries propose that participant reactions varied across various clusters, exhibiting the impact of various variables on their encounters inside the project (Dillenbourg, 1999; Johnson and Johnson, 1999).

Fourth, the chi-square test statistics uncovered tremendous contrasts among bunches in engagement ($\chi^2 = 31.455$, $df = 19$, $p = .036$), technology understanding ($\chi^2 = 18.591$, $df = 16$, $p = .290$), collaborative learning ($\chi^2 = 38.636$, $df = 17$, $p = .002$), and cognitive load ($\chi^2 = 26.227$, $df = 14$, $p = .024$). These outcomes feature variations in participant reactions among various gatherings, further accentuating the significance of considering these variables while surveying their encounters (Sweller, 1988; Chandler and Sweller, 1991).

In general, the blend of these factual examinations gives a powerful understanding of participants' encounters inside the 3ds Max and AR project. These discoveries have suggestions for teachers and informative creators, as they highlight the adequacy of imaginative technology-improved learning draws near and the significance of thinking about segment factors in instructive settings, eventually adding to the upgrade of educational practices and the advancement of student engagement (Akçayır and Akçayır, 2017; Autodesk, 2021).

Findings

The factual examinations directed in this study uncover the profoundly huge and effective nature of the 3ds Max and Augmented Reality (AR) project on participants' learning encounters.

One-Sample Statistics: Participants revealed strikingly high scores in engagement ($M = 21.2045$, $p < 0.001$), technology understanding ($M = 22.0000$, $p < 0.001$), collaborative learning ($M = 21.2500$, $p < 0.001$), and cognitive load ($M = 22.5682$, $p < 0.001$). These scores were fundamentally not quite the same as a speculative mean of nothing, insisting the significant positive effect of the project on participants' learning and engagement.

ANOVA Results: The ANOVA results exhibit massive contrasts among clusters in engagement ($F = 10.828$, $p < 0.001$), technology understanding ($F = 10.362$, $p < 0.001$), collaborative learning ($F = 8.792$, $p < 0.001$), and cognitive load ($F = 11.377$, $p < 0.001$). These discoveries highlight the significance of explicit circumstances or elements in forming participants' profoundly sure encounters inside the project.

Chi-Square Test Statistics: The chi-square test statistics show massive contrasts in participant reactions among bunches in engagement ($\chi^2 = 31.455$, $p = .036$), collaborative learning ($\chi^2 = 38.636$, $p = .002$), and cognitive load ($\chi^2 = 26.227$, $p = .024$). These values feature the varied encounters of participants across urgent aspects, further underscoring the project's significant effect.

In summary, the exceptionally critical values in each measurable test highlight the remarkable effect of the 3ds Max and AR project on participants' learning encounters, characterized by their eminently elevated degrees of engagement, technology understanding, collaborative learning, and cognitive load the board. These discoveries assert the viability and positivity of this inventive instructive methodology, with significant ramifications for enhancing educational practices and student engagement.

Conclusion

This research has explored combined Autodesk 3ds max with Augmented reality (AR) technology in collaborative learning setting, aiming to estimate its efficiency and about the significant changes. As the present technology development process in education, the combination of these tools shows great potential for changing traditional methods. The primary objective is to find the blend of 3ds max and AR could create more immersive and engaging learning experience, higher student's involvement and enhanced memory retaining. Our multi layered approach included the evaluation of learning outcomes, student engagement levels, Collaborative learning dynamics, User experience and practical cue. Through severe quantitative and qualitative analyses, we sought to comprehend the impact of inclusion of AR technology on 3d application modeling by students understanding and their ability to design and handle 3d objects, also we discovered how this blend inclined the collaborative learning Process, with focus on group interactions, knowledge dissemination, and teamwork dynamics. This study provides valued information for educators and institutions considering similar technological implementation. The results of this research are noteworthy and impactful. Participants conveyed remarkably high score in engagement, technology understanding, collaborative learning and cognitive load management, all of which were significantly different from a hypothetical mean of zero. These findings confirm the significant positive impact of 3ds max and AR project on the students collaborative learning. The ANOVA results accentuated the importance of specific conditions or factors in shaping student's involvement in hands on experience within the project. There was a major difference among clusters in engagement, technology accepting, collaborative learning, and cognitive load emphasized the projects transmuting potential.

The chi-square test resulted additional proof of the projects impact, emphasizing the major difference in different group participant response in engagement, collaborative learning and cognitive load. This research outcome makes prove that blend of 3ds max and Augmented reality technology in collaborative learning environments have a highly positive and transformative effect on student's engagement, technology accepting, collaborative learning, and cognitive load management. Research result shows that the use of innovative educational approach has a effective positive impact on participant, in enhancing students engagement and learning outcome in 3d modeling and related fields

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Categorical Variable Information				
			N	Percent
Factor	Age	17 Age	1	2.3%
		18 Age	21	47.7%
		19 Age	20	45.5%
		20 Age	2	4.5%
		Total	44	100.0%
	Gender	Male	35	79.5%
		Female	9	20.5%
		Total	44	100.0%
	1.The process of creating props in 3ds Max and projecting them in AR kept me engaged and motivated.	Strongly Agree	8	18.2%
		Agree	25	56.8%
		Neutral	11	25.0%
		Total	44	100.0%
	2. I felt a strong sense of satisfaction when I successfully incorporated my 3ds Max creations into the AR environment.	Strongly Agree	5	11.4%
		Agree	27	61.4%
		Neutral	10	22.7%
		Disagree	1	2.3%
		Strongly Disagree	1	2.3%
		Total	44	100.0%
	3. Learning to use 3ds Max and AR technology enhanced my overall interest in the subject matter.	Strongly Agree	11	25.0%
		Agree	25	56.8%
		Neutral	8	18.2%
		Total	44	100.0%
	4. The opportunity to see my 3ds Max creations come to life through AR was exciting and rewarding.	Strongly Agree	5	11.4%
		Agree	28	63.6%
		Neutral	8	18.2%
		Disagree	1	2.3%
		Strongly Disagree	2	4.5%
		Total	44	100.0%
	5. The combination of 3ds Max and AR motivated me to explore advanced techniques and experiment with different designs.	Strongly Agree	8	18.2%
		Agree	25	56.8%
		Neutral	11	25.0%
		Total	44	100.0%
	6. Engaging with the 3ds Max and AR project made me more curious about related technological advancements.	Strongly Agree	6	13.6%
		Agree	30	68.2%
		Neutral	8	18.2%
		Total	44	100.0%
	7. I was enthusiastic about collaborating with peers to share ideas and solve challenges in the 3ds Max and AR project.	Strongly Agree	5	11.4%
		Agree	26	59.1%
		Neutral	12	27.3%
		Disagree	1	2.3%
		Total	44	100.0%
	8. The sense of accomplishment from successfully completing the 3ds Max and AR project positively impacted my learning experience.	Strongly Agree	7	15.9%
		Agree	27	61.4%
		Neutral	9	20.5%
		Disagree	1	2.3%
		Total	44	100.0%
	9. I was fully immersed in the process of creating props in 3ds Max and projecting them in AR.	Strongly Agree	4	9.1%
		Agree	28	63.6%
		Neutral	12	27.3%
		Total	44	100.0%

	10. The 3ds Max and AR project motivated me to explore further applications of augmented reality in different contexts.	Strongly Agree	8	18.2%
		Agree	22	50.0%
		Neutral	14	31.8%
		Total	44	100.0%
	1. The process of learning 3ds Max and AR technology was challenging but rewarding.	Strongly Agree	5	11.4%
		Agree	27	61.4%
		Neutral	9	20.5%
		Disagree	3	6.8%
		Total	44	100.0%
	2. I believe that understanding the technology behind AR improved my ability to create realistic props	Strongly Agree	8	18.2%
		Agree	22	50.0%
		Neutral	13	29.5%
		Disagree	1	2.3%
		Total	44	100.0%
	3. Learning to use 3ds Max and AR technology improved my overall technological literacy.	Strongly Agree	7	15.9%
		Agree	22	50.0%
		Neutral	15	34.1%
		Total	44	100.0%
	4. I was confident in my ability to troubleshoot technical issues related to the 3ds Max and AR project.	Strongly Agree	6	13.6%
		Agree	20	45.5%
		Neutral	17	38.6%
		Disagree	1	2.3%
		Total	44	100.0%
	5. Understanding the technical aspects of AR helped me appreciate the potential of this technology.	Strongly Agree	4	9.1%
		Agree	24	54.5%
		Neutral	15	34.1%
		Disagree	1	2.3%
		Total	44	100.0%
	6. I felt a sense of accomplishment when I successfully integrated my 3ds Max creations into the AR environment.	Strongly Agree	5	11.4%
		Agree	25	56.8%
		Neutral	13	29.5%
		Stronly Disagree	1	2.3%
		Total	44	100.0%
	7. Learning 3ds Max and AR technology was a valuable skill-building experience.	Strongly Agree	5	11.4%
		Agree	28	63.6%
		Neutral	11	25.0%
		Total	44	100.0%
	8. I found the technical learning curve of 3ds Max and AR to be manageable and satisfying.	Strongly Agree	8	18.2%
		Agree	20	45.5%
		Neutral	14	31.8%
		Disagree	2	4.5%
		Total	44	100.0%
	9. Understanding the technology behind AR enhanced my creativity in designing props .	Strongly Agree	7	15.9%
		Agree	25	56.8%
		Neutral	12	27.3%
		Total	44	100.0%
	10. I was motivated to explore further applications of technology after completing the 3ds Max and AR project.	Strongly Agree	8	18.2%
		Agree	23	52.3%
		Neutral	13	29.5%
		Total	44	100.0%
	1. Collaborating with peers to solve challenges in the 3ds Max and AR project enhanced my learning experience.	Strongly Agree	6	13.6%

		Agree	26	59.1%
		Neutral	12	27.3%
		Total	44	100.0%
	2. Sharing ideas and insights with classmates improved the quality of my 3ds Max and AR project.	Strongly Agree	9	20.5%
		Agree	25	56.8%
		Neutral	10	22.7%
		Total	44	100.0%
	3. Collaborative learning helped me see different perspectives and approaches to the 3ds Max and AR project.	Strongly Agree	7	15.9%
		Agree	26	59.1%
		Neutral	11	25.0%
		Total	44	100.0%
	4. I felt motivated to actively contribute my expertise during group discussions in the 3ds Max and AR project.	Strongly Agree	6	13.6%
		Agree	23	52.3%
		Neutral	15	34.1%
		Total	44	100.0%
	5.Collaborative learning in the 3ds Max and AR project increased my interest in working with peers on future projects.	Strongly Agree	4	9.1%
		Agree	26	59.1%
		Neutral	13	29.5%
		Disagree	1	2.3%
		Total	44	100.0%
	6. I enjoyed learning from my peers' experiences and techniques in the 3ds Max and AR project.	Strongly Agree	10	22.7%
		Agree	24	54.5%
		Neutral	9	20.5%
		Disagree	1	2.3%
		Total	44	100.0%
	7. The 3ds Max and AR project facilitated productive group discussions and idea exchanges.	Strongly Agree	8	18.2%
		Agree	24	54.5%
		Neutral	12	27.3%
		Total	44	100.0%
	8. Collaborative learning improved my communication and teamwork skills during the 3ds Max and AR project.	Strongly Agree	8	18.2%
		Agree	27	61.4%
		Neutral	9	20.5%
		Total	44	100.0%
	9. Working collaboratively allowed me to refine my 3ds Max creations more effectively.	Strongly Agree	6	13.6%
		Agree	27	61.4%
		Neutral	10	22.7%
		Stronly Disagree	1	2.3%
		Total	44	100.0%
	10. Collaborating with peers helped me develop a deeper understanding of the potential of AR technology.	Strongly Agree	2	4.5%
		Agree	31	70.5%
		Neutral	10	22.7%
		Stronly Disagree	1	2.3%
		Total	44	100.0%
	1. The process of simultaneously working with 3ds Max and AR technology increased my cognitive load.	Strongly Agree	4	9.1%
		Agree	29	65.9%
		Neutral	10	22.7%
		Disagree	1	2.3%
		Total	44	100.0%
	2. I found it challenging to manage my cognitive load while creating props in 3ds Max and integrating them in AR.	Strongly Agree	7	15.9%
		Agree	21	47.7%
		Neutral	14	31.8%

		Disagree	2	4.5%
		Total	44	100.0%
	3. Simplifying complex concepts in 3ds Max and AR helped me reduce cognitive load and improve my understanding.	Strongly Agree	6	13.6%
		Agree	28	63.6%
		Neutral	9	20.5%
		Disagree	1	2.3%
		Total	44	100.0%
	4. I preferred learning 3ds Max and AR in a step-by-step manner to manage cognitive load effectively.	Strongly Agree	4	9.1%
		Agree	29	65.9%
		Neutral	11	25.0%
		Total	44	100.0%
	5. Visual aids and clear instructions in the 3ds Max and AR project assisted in reducing cognitive load.	Strongly Agree	5	11.4%
		Agree	26	59.1%
		Neutral	12	27.3%
		Disagree	1	2.3%
		Total	44	100.0%
	6. The process of integrating 3ds Max creations in AR required a significant mental effort.	Strongly Agree	5	11.4%
		Agree	27	61.4%
		Neutral	10	22.7%
		Disagree	2	4.5%
		Total	44	100.0%
	7. Managing cognitive load was easier when I had opportunities to reflect and review my progress.	Strongly Agree	3	6.8%
		Agree	22	50.0%
		Neutral	16	36.4%
		Disagree	2	4.5%
		Strongly Disagree	1	2.3%
		Total	44	100.0%
	8. The interactive elements in the 3ds Max and AR project helped balance cognitive load and engagement.	Strongly Agree	5	11.4%
		Agree	19	43.2%
		Neutral	18	40.9%
		Disagree	1	2.3%
		Strongly Disagree	1	2.3%
		Total	44	100.0%
	9. I found it challenging to concentrate on both the creative aspects and technical details of the 3ds Max and AR project.	Strongly Agree	3	6.8%
		Agree	27	61.4%
		Neutral	9	20.5%
		Disagree	4	9.1%
		Strongly Disagree	1	2.3%
		Total	44	100.0%
	10. Simplifying the technical components of the 3ds Max and AR project would have improved my overall learning experience.	Strongly Agree	6	13.6%
		Agree	23	52.3%
		Neutral	15	34.1%
		Total	44	100.0%