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Role of Simulation-Based Learning in Skill Development of Students: An Empirical Study in Context of ICT-Driven Education World

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Abstract
In the age of ICT-driven education, simulation-based learning is essential for students' skill development. Students can practice and apply theoretical knowledge in a safe, controlled setting by using realistic and immersive scenarios created by simulations, which make use of cutting-edge technology. By letting students actively interact with the content, this approach improves critical thinking, problem-solving, and decision-making abilities. By bridging the gap between classroom instruction and real-world application in fields like business, engineering, and medical, simulation-based learning offers a hands-on experience that traditional approaches frequently do not. Additionally, it helps students retain information better and get a deeper knowledge of the material, preparing them for challenges in their industries in the future. Overall, simulation-based learning is an effective instrument that greatly aids in the development of critical abilities and is consistent with the dynamic and participatory character of contemporary education. 213 students were surveyed to know the factors that determines different role of Simulation-based learning in Skill Development of Students and found that Enhanced Engagement, Skill Development, Adaptability and Customization and Collaborative Learning Opportunities are the factors that determines different role of Simulation-based learning in Skill Development of Students.

Keywords: ICT-driven education, Simulation-based learning, Skill development, Theoretical knowledge, Immersive scenarios, Critical thinking, Problem-solving, Real-world application.

Introduction

In the setting of an ICT-driven educational environment, simulation-based learning (SBL) has "garnered significant attention" in educational research due to its transformative impact on skill development. Effective teaching approaches must be prioritized, as Bhaskar et al. (2023) emphasized "inhibiting factors" that influenced the adoption of SBL among management educators. They disclosed that the effective application of SBL depended heavily on elements like faculty training, curricular integration, and technology infrastructure. Overcoming these obstacles increased student engagement and learning results in addition to improving educators' preparedness. Institutions should use SBL's advantages in developing practical skills and preparing students for real-world issues in management education by methodically tackling these impediments.

Mehar and Arora (2021) looked into how SBL improves learning outcomes in a variety of subject areas, with a focus on higher education and the arts. They emphasized how SBL can produce immersive, dynamic learning environments that draw students in and keep them interested. Through the incorporation of simulations, educators are able to bridge the gap between theory and practice, leading to a deeper knowledge and command of the fundamental abilities required to succeed in contemporary educational and professional settings. Students can encounter a variety of scenarios and circumstances because to SBL's interactive nature, which equips them to confidently handle issues in the real world. This method not only increases participation but also develops “critical thinking and problem-solving skills”, which are essential for success in ICT-driven fields. Even though there are challenges with online and simulation-based learning, still it will long last as an alternative arrangement (Mittal, 2021a).

The use of simulation-based learning in computer and networking education was thoroughly investigated by Asadi et al. (2024). They emphasized how SBL may be broadly applied to help students improve their technical skills and problem-solving abilities. They also emphasized the importance of SBL in educating students for the dynamic challenges of ICT-driven sectors, where professional preparation necessitates practical, hands-on experience, through a synthesis of the literature and bibliometric analysis. Through the use of virtual environments that closely mimic real-world situations, SBL develops critical thinking and adaptability in addition to technical competencies—two qualities that are vital in the quickly changing digital ecosystem. By providing interactive simulations that actively engage students and enable thorough knowledge application in ICT-related subjects, SBL goes beyond standard teaching approaches (Mittal, 2021b).

Literature Review

Diwakar et al. (2020) assert that the use of "virtual laboratories" has brought about a substantial transformation in "learning assessments" by offering immersive environments in which students can apply and practice their theoretical knowledge in real-world situations. This method not only helps students grasp things more deeply but also improves ICT abilities, which are essential for modern jobs. By incorporating virtual laboratories into the curriculum, instructors can better prepare their students for professional settings where ICT competency is crucial by giving them access to practical learning opportunities that close the knowledge gap between theory and practice.

The influence of simulations on "perceived learning outcomes" was highlighted by Chaurasia (2017). It shows that interactive simulations improve learner engagement and retention while also accurately simulating real-world circumstances. This is especially important when it comes to skill development, as students can gain practical experience through simulations and build competences that are necessary for their future careers. Simulations help students develop critical thinking, problem-solving, and decision-making skills—all of which are essential in the fast-paced job market of today—by immersing them in realistic circumstances.

The potential of "virtual labs" in science education was examined by Tardia (2023), who emphasized how these tools might be used to create "immersive learning environments". In addition to promoting experiential learning, these kinds of settings give students the chance to thoroughly investigate ideas and put them to use. The empirical data highlights the revolutionary potential of simulation-based learning in preparing students for success in India's "ICT-driven educational landscape" by bridging the knowledge gap between theory and practice. Through the use of virtual labs, educators can improve student learning by giving them the chance to actively experiment and explore, equipping them to successfully navigate the obstacles of the contemporary digital age.

In the setting of India's ICT-driven educational system, simulation-based learning is essential to students' skill development. Tyagi et al. (2024) suggest a higher education strategy to "advanced learning and teaching" that incorporates technology, policy, and capacity-building. A crucial "teaching-learning tool" that improves the educational process by offering practical instruction in a safe setting is simulation. This method gives students the practical skills they need for their future employment in ICT-intensive professions, in addition to preparing them for obstacles they may face in the real world. According to Swaika et al. (2018), simulation plays a crucial role in medical education, particularly when it comes to interns' learning. The study emphasizes how clinical situations are replicated in simulations, giving interns the opportunity to hone their abilities and practice procedures under supervision. Immersion experiences like these boost confidence and preparedness to manage a variety of patient circumstances in addition to improving technical competencies. Simulation-

based learning bridges the gap between classroom learning and real-world application by giving students from all disciplines a platform to apply theoretical knowledge to real-world scenarios within the framework of broader skill development.

Theodoulou et al. (2018) emphasized how well learners may improve their procedural knowledge and technical proficiency using simulations. Teachers can build dynamic learning environments that accommodate various learning styles and encourage active engagement by integrating simulations into the curriculum. This highlights how simulation-based learning may be revolutionary in India's ICT-driven educational system, where students are empowered to acquire the necessary skills for successful jobs in their professions.

A key component of students' skill development in India's ICT-driven educational environment is simulation-based learning. An new undergraduate interprofessional simulation-based skills training program in obstetrics and gynecology was assessed by Gorantla et al. (2019), who also highlight the program's influence on improving medical students' clinical competencies. This program encourages collaborative learning and interprofessional communication, two skills that are crucial in contemporary healthcare settings, in addition to preparing students for real-world clinical experiences. In their investigation of the variables affecting the adoption of simulation-based learning in environments with limited resources, Seethamraju et al. (2022) emphasized the significance of faculty support and training. Despite resource limitations, they emphasized the benefits and challenges of implementing simulation-based learning approaches to improve educational outcomes. A scalable approach to providing high-quality education across a range of geographic and socioeconomic backgrounds is simulation-based learning, particularly in the Indian context, where access to advanced educational resources may be uneven.

Bhullar and Aggarwal (2022) emphasized the importance that this approach plays in helping students develop their entrepreneurial abilities. They see simulation as an effective tool for hands-on learning, giving students the chance to practice making decisions, assessing risks, and formulating business strategies in a make-believe corporate setting. This demonstrates how simulation-based learning may change students by giving them the real-world knowledge and entrepreneurial spirit needed to succeed in an ICT-driven economy. Through innovative digital approaches to learning and teaching, educators in India may cultivate future innovators and leaders who can propel economic growth and societal transformation by incorporating simulation into entrepreneurship education.

Simulation-based learning environments, according to Chatpinyakoop et al. (2022), give students immersive experiences that mimic real-world circumstances. This method fosters important competences including adaptive problem-solving and decision-making skills in addition to improving technical ability. Students get practical insights and a deeper grasp of complicated subjects through hands-on simulations, which are essential for success in today's linked world. This demonstrates how simulation-based learning has a transformative effect on giving Indian students the abilities they need to prosper in the digital age, which is marked by quick technical breakthroughs and complex global issues.

According to Juera (2024), skills development in India's ICT-driven education landscape is being revolutionized by simulation-based mobile (SiM) learning applications. These cutting-edge apps use mobile technology to create immersive learning environments that go beyond the confines of the traditional classroom. SiM learning allows students to actively interact with course material by imitating real-world settings on mobile devices, improving their technical proficiency and digital literacy. Because of the adaptability of SiM platforms, students can access instructional modules at any time and from any location, meeting a variety of schedules and learning preferences. This practical method fosters creativity and innovation in learners while also deepening their comprehension of complex ideas. SiM applications foster an entrepreneurial attitude by promoting experimentation and exploration, equipping students to confidently embrace technological innovations and traverse dynamic sectors.

Objective

To know the factors that determine different roles of Simulation-based learning in the Skill Development of Students.

Methodology

213 students were surveyed to know the factors that determines different role of Simulation-based learning in Skill Development of Students. "Random sampling method" and "Factor Analysis" were used to collect and analyze the data.

Findings

In 213 student's males are 59.6% and 40.4% are female. Among them 33.4% are below 18 years of age, 45.5% are between 18-25 years of age and rest 22.1% are above 25 years of age. 32.4% of the students from schools, 26.8% from college, 33.3% from university and rest 7.5% from other educational institutes.

Table 1 "General Details"

"Variables"	**"Respondents"**	**"Percentage"**
Gender		
Male	127	59.6
Female	86	40.4
Total	**213**	**100**
Age (years)		
Below 18	69	32.4
18-25	97	45.5
Above 25	47	22.1
Total	**213**	**100**
Organization		
School	69	32.4
College	57	26.8
University	71	33.3
Others	16	7.5
Total	**213**	**100**

Table 2 "KMO and Bartlett's Test"

"Kaiser-Meyer-Olkin Measure of Sampling Adequacy"		.847
"Bartlett's Test of Sphericity"	"Approx. Chi-Square"	2395.905
	"df"	136
	"Sig."	.000

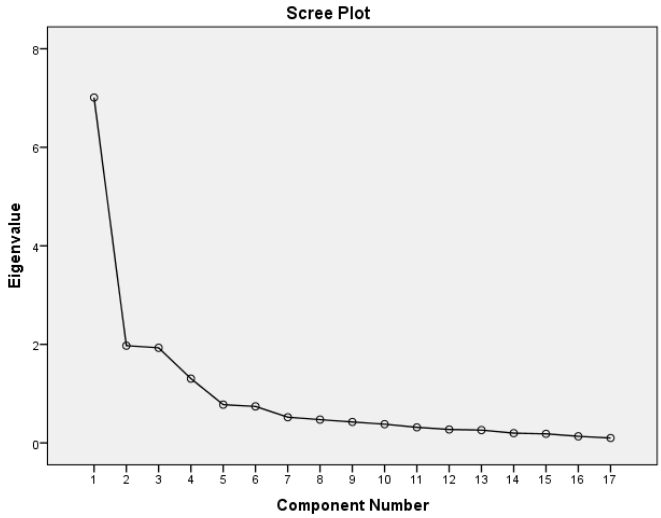
KMO value in table 2 is 0.847 and the "Barlett's Test of Sphericity" is significant.

"Table 3 Total Variance Explained"

"Component"	**"Initial Eigen values"**			**"Rotation Sums of Squared Loadings"**		
	"Total"	**"% of Variance"**	**"Cumulative %"**	**"Total"**	**"% of Variance"**	**"Cumulative %"**
1	7.010	41.238	41.238	3.748	**22.048**	22.048
2	1.974	11.611	52.849	3.323	**19.547**	41.594
3	1.931	11.358	64.207	2.842	**16.715**	58.310
4	1.305	7.675	71.882	2.307	**13.572**	**71.882**
5	.776	4.567	76.449			
6	.741	4.359	80.808			
7	.521	3.066	83.875			
8	.473	2.781	86.656			
9	.425	2.502	89.157			
10	.380	2.234	91.392			

11	.316	1.857	93.249			
12	.273	1.604	94.852			
13	.260	1.531	96.383			
14	.197	1.161	97.544			
15	.184	1.084	98.628			
16	.134	.790	99.418			
17	.099	.582	100.000			

In "principal component analysis" it is found that 17 variables form 4 Factors. The factors explained the variance of 22.048%, 19.547%, 16.715% and 13.572% respectively. The total variance explained is 71.882%.



The graph above depicts the Eigen values generated from the "Total Variance Explained table" for an elbow with 4 components.

"Table 4 Rotated Component Matrix"

"S. No."	**"Statements"**	**"Factor Loading"**	**"Factor Reliability"**
	Enhanced Engagement		**.908**
1	Simulations make learning interactive and engaging.	.866	
2	Simulations provide opportunities to practice skills in scenarios that mimic real-life situations	.845	
3	Simulations adapt to the individual learner's pace and style	.844	
4	Allow students to engage with learning materials from anywhere at any time	.782	
5	Engage students with different technological resources	.710	
	Skill Development		**.908**
6	Simulations help in developing practical skills	.895	
7	Help students to apply theoretical knowledge in simulated environments	.842	
8	Help students to think critically and solve problems	.830	
9	Help students to build competences for professional field	.655	
	Adaptability and Customization		**.850**
10	Stimulations make education more personalized and effective	.889	

11	Help educators to create different scenarios to address specific learning objectives and outcomes	.876	
12	Allows each learner to progress at their own speed	.657	
13	Simulations adapt in real-time based on a student's performance	.589	
	Collaborative Learning Opportunities		**.745**
14	Help students to develop teamwork and communication skills	.779	
15	Students are able to learn from each other's experiences and perspectives	.717	
16	Stimulation fosters teamwork and cooperation	.712	
17	Collaborative simulations help build relationships and a sense of community among students	.696	

Table 4 is showing factors that determines different role of Simulation-based learning in Skill Development of Students. Enhanced Engagement is the factor which includes the variables like simulations make learning interactive and engaging, provide opportunities to practice skills in scenarios that mimic real-life situations, adapt to the individual learner's pace and style, allow students to engage with learning materials from anywhere at any time and engage students with different technological resources. Skill Development is one of the factors which consists of variables like simulations help in developing practical skills, help students to apply theoretical knowledge in simulated environments, help students to think critically and solve problems and help students to build competences for professional field. Factor Adaptability and Customization includes the variables like stimulations make education more personalized and effective, help educators to create different scenarios to address specific learning objectives and outcomes, allows each learner to progress at their own speed and simulations adapt in real-time based on a student's performance. Collaborative Learning Opportunities is the fourth factor and its supporting variables are stimulating based learning help students to develop teamwork and communication skills, students are able to learn from each other's experiences and perspectives, stimulation fosters teamwork and cooperation and collaborative simulations help build relationships and a sense of community among students.

"Table 5 Reliability Statistics"

"Cronbach's Alpha"	"N of Items"
.905	17

Total reliability is 0.905 for 4 constructs including seventeen items.

Conclusion

To sum up, simulation-based learning is an essential tool in today's educational environment, particularly in India's ICT-driven educational system. It provides students with opportunities for hands-on learning that connect theory to practical skills—a necessary combination in sectors like information and communication technology (ICT). Students can actively participate and apply knowledge in a controlled but realistic environment by mimicking real-world circumstances. This method fosters "critical thinking, problem-solving skills, and adaptability"—all of which are essential in the fast-paced work market of today. Furthermore, through immersive experiences, simulation-based learning improves retention and accommodates a variety of learning styles. The integration of novel techniques can enable students to become proficient, competitive, and flexible professionals as India continues to embrace digital revolution in education. resulting in the development of a generation capable of navigating and leading in a world dominated by technology. It is found through the study that Enhanced Engagement, Skill Development, Adaptability and Customization and Collaborative Learning Opportunities are the factors that determines different role of Simulation-based learning in Skill Development of Students.

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