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## Interactive spaces in college campuses

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### Abstract

The evolving landscape of education demands environments that go beyond traditional classrooms, embracing spaces that inspire creativity, collaboration, and active engagement. Interactive spaces on college campuses have become essential in fostering these qualities, offering dynamic environments that cater to diverse learning styles and promote holistic development. These spaces, which include maker-spaces, collaborative lounges, and technology-enhanced classrooms, serve as hubs for innovation, community building, and interdisciplinary interaction.

Unlike conventional learning environments, interactive spaces are designed to adapt to the needs of their users by incorporating modular furniture, advanced technology, and flexible layouts. They encourage students to move beyond passive learning, fostering hands-on activities, group problem-solving, and meaningful social connections. By integrating such spaces, institutions create learning ecosystems that mirror the complexity of the modern world, equipping students with the skills needed for future challenges.

Despite their growing presence, interactive spaces face challenges such as design inefficiencies, overcrowding, and resource limitations, which can hinder their effectiveness. This research investigates how thoughtfully designed interactive spaces can enhance student engagement and learning outcomes. It aims to identify key design principles, evaluate their impact on academic performance and collaboration, and address challenges to maximize their potential.

Interactive spaces have the power to transform college campuses into vibrant, student-centered environments that nurture creativity, innovation, and a sense of community. By exploring their role and optimizing their design, this study seeks to provide valuable insights for the development of future educational spaces that truly support and inspire students.

**Keywords:** Campus planning, campus design, interactive spaces, flexible furniture, collaborative learning

### Introduction

The evolving landscape of education demands environments that go beyond traditional classrooms, embracing spaces that inspire creativity, collaboration, and active engagement. Interactive spaces on college campuses have become essential in fostering these qualities, providing students with dynamic environments that cater to diverse learning styles and promote holistic development. These spaces, which include makerspaces, collaborative lounges, and technology-enhanced classrooms, serve as hubs for innovation, community building, and interdisciplinary interaction.

Unlike conventional learning environments, interactive spaces are designed to adapt to the needs of their users,

incorporating modular furniture, advanced technology, and flexible layouts. They encourage students to move beyond passive learning, fostering hands-on activities, group problem-solving, and meaningful social interactions. By integrating such spaces, institutions aim to create a learning ecosystem that mirrors the complexity and demands of the modern world.

Despite their growing presence, the effectiveness of interactive spaces is often constrained by design inefficiencies, resource limitations, and overcrowding. This research investigates how thoughtfully designed interactive spaces can enhance student engagement and learning outcomes. It aims to identify key design principles, understand their impact on academic performance and

collaboration, and address challenges to maximize their potential.

Interactive spaces hold the promise of transforming college campuses into vibrant, student-centered environments that nurture creativity, innovation, and a sense of community. By exploring their role and optimizing their use, this study seeks to contribute valuable insights to the design and development of future educational spaces.

## Materials and Methods

### Materials

#### 1. Flooring

- **Rubberized or Vinyl Flooring:** Durable, slip-resistant, and easy to maintain.
- **Carpets Tiles:** Comfortable, noise-reducing, and customizable for collaborative zones.
- **Polished Concrete:** Modern and industrial, often used in high-traffic areas.

#### 2. Walls and Dividers

- **Writable Surfaces (Whiteboards/Chalkboards):** Facilitates brainstorming and collaboration.
- **Glass Panels:** Encourages openness while maintaining privacy for smaller groups.
- **Acoustic Panels:** Reduces noise for effective communication in busy environments.

#### 3. Furniture

- **Modular Seating:** Flexible arrangements for different group sizes and activities.
- **Standing Desks and High Tables:** Promotes active learning and group discussions.
- **Beanbags and Cushions:** Adds informal, comfortable seating options.

#### 4. Lighting

- **Natural Light Maximization:** Large windows and skylights for a welcoming atmosphere.
- **LED Lighting:** Energy-efficient and adjustable for different activities.
- **Interactive Lighting Systems:** Dynamic lighting to reflect moods or themes.

#### 5. Technology Integration

- **Interactive Screens and Projectors:** Supports presentations and group activities.
- **Charging Stations:** Easily accessible power outlets integrated into furniture.
- **IoT Devices:** For environmental control and feedback (e.g., smart thermostats, occupancy

sensors).

## Green and Sustainable Elements

- **Biophilic Design Materials:** Live plants, green walls, and natural wood to enhance mental well-being.
- **Recycled or Upcycled Materials:** Sustainable and eco-friendly furniture and decor.

## Methods

### 6. Participatory Design

Engage students, faculty, and staff to co-design spaces based on their needs and preferences.

### Zoning and Layout

- Create distinct zones for different activities, such as quiet study areas, collaboration spaces, and relaxation zones.
- Use open layouts for adaptability and transparent spaces for inclusivity.

### Universal Design

Ensure accessibility for all users, including ramps, wide pathways, and adjustable furniture.

### Technology Integration

- Install AV systems, interactive panels, and wireless connectivity to foster digital engagement.
- Use app-based systems to manage bookings and feedback.

### Flexibility and Modularity

Design spaces with movable walls, furniture, and plug-and-play technology to support different activities.

### Human-Centered Design

- Focus on ergonomics, comfort, and mental well-being.
- Incorporate sensory elements like colors, textures, and acoustics that enhance focus and reduce stress.

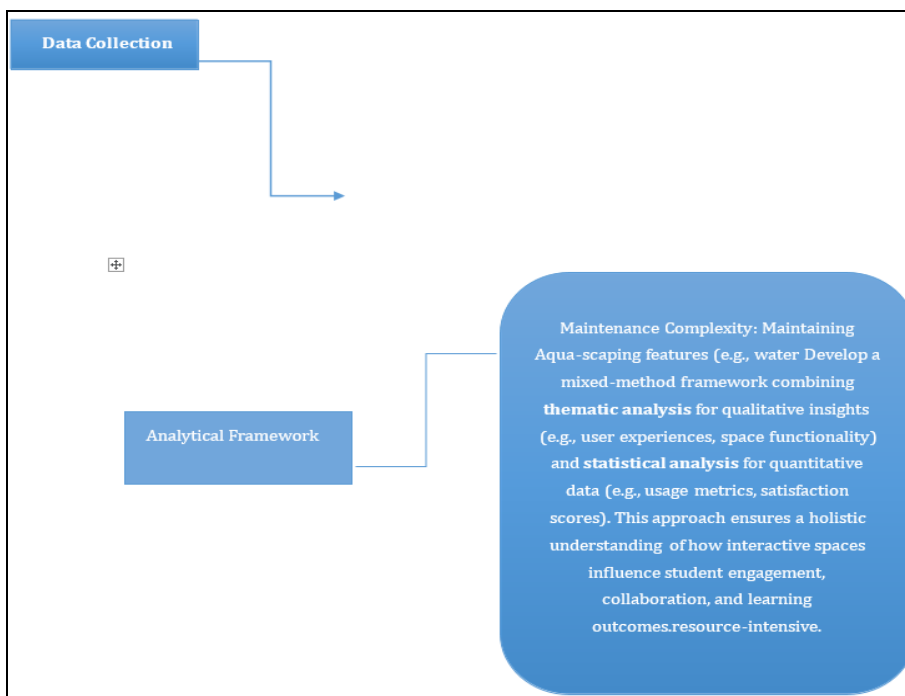
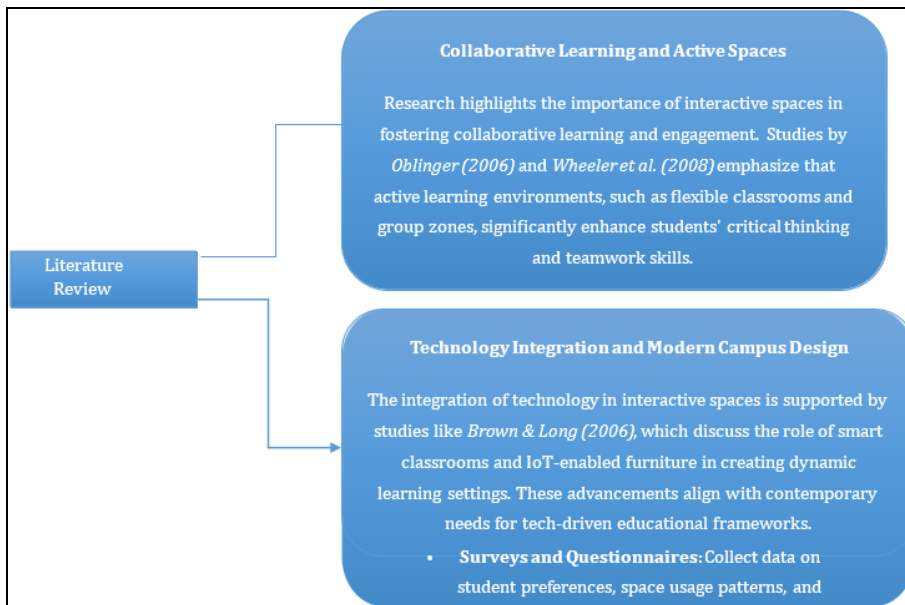
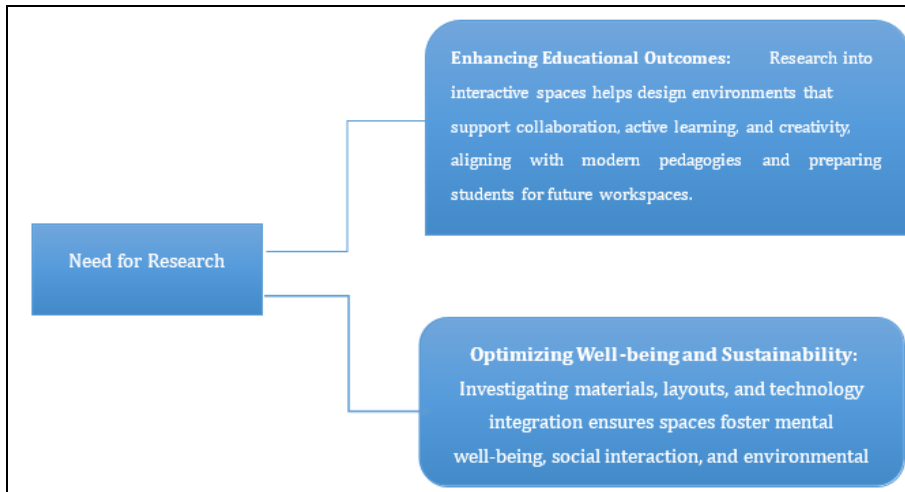
### 7. Sustainability Practices

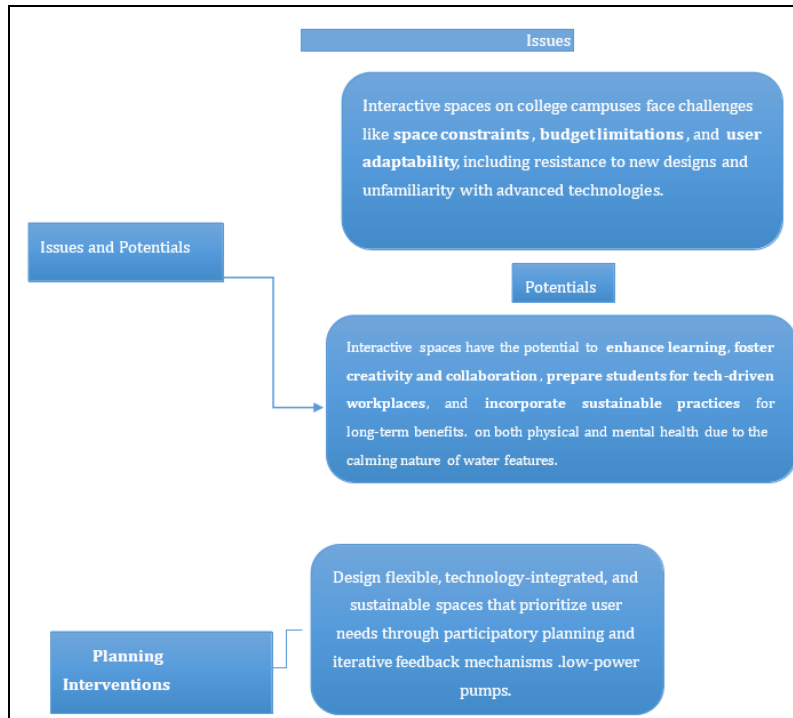
- Optimize energy use with LED lighting and automated systems.
- Use materials that meet environmental certifications like LEED or WELL.

### 8. Prototyping and Iterative Feedback

Pilot the interactive space concept with temporary setups and gather user feedback for improvements.

## Research Methodology





**Literature review case study**

**1. Hunt Library, North Carolina State University (NCSU) Overview**

The Hunt Library at NCSU is a ground breaking example of how technology-driven interactive spaces can redefine student learning and engagement. Designed as a "learning commons," it features flexible study zones, advanced technology, and creative spaces like maker spaces and visualization labs.

**Key Features**

- Modular furniture and adaptable layouts for collaborative work.
- High-tech tools, including a 3D visualization lab and a digital media suite.
- Maker-space with 3D printers, laser cutters, and prototyping tools.
- Automated book retrieval system (Book Bot) to free up space for interactive areas.

**Impact**

The library has significantly boosted interdisciplinary collaboration, student engagement, and the application of technology in learning. Surveys revealed that students felt more motivated and connected in these spaces, enhancing

both academic performance and social integration.

**2. The design factory, Aalto University, Finland overview:**

The Design Factory at Aalto University is a multi-functional space designed to facilitate project-based learning and innovation. It supports collaboration between students, faculty, and industry professionals, making it a hub for interdisciplinary and real-world problem-solving.

**Key Features**

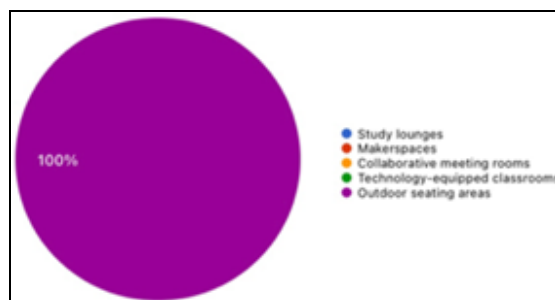
- Open-plan spaces that encourage interaction and teamwork.
- Prototyping labs equipped with advanced tools and resources.
- Flexible zones for brainstorming, informal meetings, and formal presentations.
- Integration of industry projects to provide hands-on learning experiences.

**Impact**

The Design Factory has been praised for its ability to nurture creativity and prepare students for industry challenges. Students reported improved problem-solving skills, increased collaboration ration across disciplines, and a stronger sense of community.

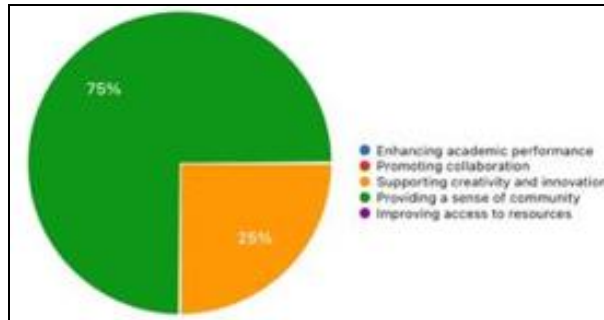
**Results & Findings**

**Section B: Use of interactive spaces: Which interactive spaces do you use most often? (Select all that apply)**



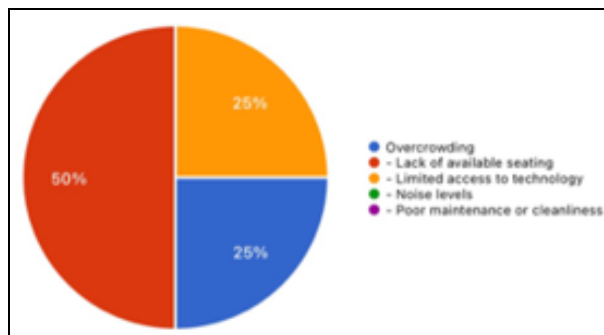
**Section C: Perceived benefits: How do you rate the impact of interactive spaces on the following aspects? (Use a scale of 1-5: 1 = No Impact, 5 = Significant impact)**

4 responses



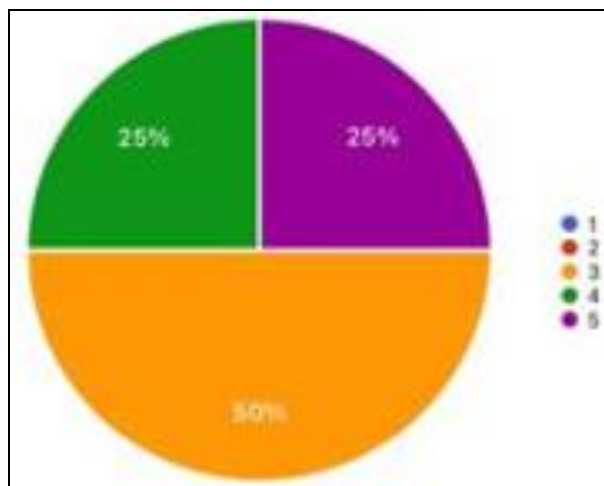
**Section D: Challenges and Suggestions: Have you faced any challenges while using interactive spaces? (Select all that apply)**

4 responses



**Section E: General feedback: In your opinion, how important are interactive spaces to your overall academic and social experience on campus? (Use a scale of 1-5: 1 = Not important, 5 = extremely important)**

4 responses



**Inferences from the questionnaire results**

**Section B:** All respondents (100%) indicated a preference for using study lounges as their most frequently utilized interactive space.

**Section C:** The majority of respondents (71%) perceive interactive spaces as having a significant impact on enhancing academic performance, fostering collaboration, and promoting creativity.

**Section D:** The most common challenge faced by

respondents (50%) when using interactive spaces is poor maintenance or cleanliness, followed by overcrowding and limited access to technology, each at 25%.

**Section E:** Half of the respondents (50%) consider interactive spaces extremely important to their overall academic and social experience on campus.

**Final results**

The study on interactive spaces in college campuses highlights their transformative potential in enhancing

student engagement and learning. These spaces, characterized by flexible layouts, advanced technology, and collaborative design, foster creativity, innovation, and community building. The research reveals that interactive spaces significantly improve academic performance, encourage interdisciplinary collaboration, and support diverse learning styles.

### Key findings include

**Enhanced Engagement:** Students reported feeling more motivated and actively involved in learning activities within interactive spaces.

**Improved Collaboration:** Group projects and interdisciplinary discussions flourished due to the adaptability and accessibility of these environments.

**Design Features:** Modular furniture, access to cutting-edge tools, and well-lit, open areas were identified as critical elements for success.

**Challenges:** Overcrowding, inadequate maintenance, and underutilized resources were barriers to optimal functionality.

The study concludes that well-designed interactive spaces are vital for modern educational environments. Recommendations include prioritizing adaptable layouts, investing in technology, and addressing maintenance challenges to maximize the potential of these spaces. By adopting these strategies, institutions can create vibrant, student-centered campuses that prepare learners for future challenges while fostering creativity and innovation.

### Conclusion

The research on interactive spaces in college campuses highlights their pivotal role in enhancing student engagement, fostering collaboration, and enriching the overall academic and social experience. These spaces, when designed thoughtfully, serve as dynamic hubs that promote creativity, interdisciplinary interaction, and hands-on learning. The findings indicate that students overwhelmingly value interactive spaces, with study lounges emerging as the most frequently utilized area. However, challenges such as overcrowding, limited access to technology, and poor maintenance often hinder their optimal functionality.

By addressing these challenges through improved design principles, resource allocation, and regular upkeep, institutions can unlock the full potential of interactive spaces. Incorporating modular layouts, advanced technologies, and accessible resources can further enhance their impact. Overall, interactive spaces hold the promise of transforming college campuses into vibrant, student-centered ecosystems that not only support academic excellence but also nurture innovation and community building. This research underscores the need for continuous investment and innovation in creating environments that meet the evolving needs of students and the demands of modern education.

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