IoT based hybrid learning in the education sector which helps students and Teachers in the future with an innovative and sustainable learning

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Abstract: The Internet of Things (IoT) field is expanding quickly, and professionals are creating useful IoT apps, networking opportunities, and connectable gadgets. With the development of smart building technology, a variety of industries—including healthcare, hospitality, manufacturing, and retail—are beginning to use IoT applications. IoT in education heralds a more connected and collaborative future for both instructors and students. Students now have better access to learning resources and communication channels thanks to IoT connection and gadgets, and teachers can monitor students' progress in real time.A safer learning environment is provided by the IoT through the use of smart cameras, smart ID cards, and smart access control. The IoT also makes it possible to automate a variety of tasks, improve school management, make real-time data collection easier, power smart lighting systems for better and more energy-efficient illumination, and power real-time data collection. It can increase the effectiveness of using tablets and smartphones, automate attendance tracking, keep parents informed about things like test results, expand the functionality of smartboards to promote interaction, provide predictive maintenance for school infrastructure and equipment, and more. This paper is focused on Awareness of IoT Applications in the Education Industry, An opinion on Implementation of IoT in Education Sector, amenity of IoT in Education and pitfalls of IoT in education.

Key words: Internet of Things (IoT), Smart education, Applications of IoT, amenity of IoT in education, pitfalls of IoT in education.

Introduction:

The Internet of Things (IoT) is a vast wireless network made up of tens of thousands of connected objects that was developed to share, gather, produce, and receive various types of data. These gadgets might be anything from biochips to cell phones to sensors to a massive system that oversees all of them when they're interconnected. The internet of things includes everything that is physical and transposes its properties into cyberspace. Artificial intelligence, augmented reality, big data, web-based systems, smart appliances, and other similar technologies all fit under this broad category if they use the internet to function and include a software-based component.

IoT-based hybrid learning has the potential to revolutionize the education sector and create a more innovative and sustainable learning environment for both students and teachers. By using IoT devices and technologies, students can access educational resources and interact with their teachers and peers in real-time, regardless of their physical location.

One of the major benefits of IoT-based hybrid learning is its ability to provide efficient energy management, which can help schools reduce their energy consumption and save on costs. IoT sensors can be used to monitor energy usage, identify areas where energy is being wasted, and adjust energy usage accordingly. This can help schools reduce their carbon footprint and contribute to a more sustainable future.

IoT devices can also be used to enhance interactive learning by providing applications that allow students to engage with course materials in new and exciting ways. For example, augmented reality technologies can be used to create interactive learning environments that allow students to explore complex concepts and ideas in a more hands-on way.

In addition to improving the learning experience for students, IoT-based hybrid learning can also benefit teachers by providing them with real-time data on student performance and attendance. This can help teachers identify areas where students are struggling and adjust their teaching strategies accordingly. IoT technologies can also be used to automate administrative tasks, such as grading and attendance tracking, which can free up teachers' time and allow them to focus on more important tasks, such as curriculum development and student engagement.

However, there are also some potential pitfalls to be aware of when implementing IoT-based hybrid learning in the education sector. These include high-cost infrastructure, in-class morals, lack of data storage infrastructure, security and safety issues, and difficulty of maintenance. These challenges must be addressed in order to ensure that IoT-based hybrid learning is sustainable and effective in the long run.

Overall, IoT-based hybrid learning has the potential to transform the education sector and create a more innovative and sustainable learning environment for students and teachers alike. By embracing new technologies and approaches, we can build a brighter future for education and empower the next generation of learners to achieve their full potential.

IoT and Education

When it comes to deploying IoT devices for use, the education sector is one of the most flexible and effective. This will increase education's collaborative, interactive, and open nature for all students. IoT devices give students dependable access to everything they need to learn, including communication channels and clear understanding. They also enable professors to track students' academic progress in real-time. Speaking of education, the COVID-19 epidemic has done a good job of emphasising the necessity of educational resources.IoT merely facilitates the switch from traditional to digital education methodologies with a number of extra advantages and greater effectiveness.With the use of graphics and animation, this may be utilised to teach various disciplines, from languages to math to teaching practical skills like medical sciences, in order to improve student comprehension.Not only can everything migrate automatically from the physical world to the central system-based control world, including these smart attendance devices, boards, integrated alarm systems in schools, assessment checking tools, cameras, and school locks, but also the physical world itself.

Applications of IoT in Education

The Internet of Things (IoT) has a number of applications in the field of education. These include changing teaching techniques by providing smart devices, automation of attendance recording, ensuring safety on school property, distance learning, increasing collaboration and productivity, using augmented reality-equipped systems, special education, and close observation. IoT enables the use of internet-connected smart devices that are linked to a centralized server, which tracks and categorizes students' syllabus and topic-based progress. Automation of attendance recording is simplified by the use of biometric or barcode systems that can be used to inform parents of their child's absence. Safety on school property is ensured through the use of smart cameras and sensors, allowing for the immediate identification of objectionable actions or fires. Distance learning is made possible with specialized software and a sign-in feature that enables anyone to access materials from anywhere. Collaboration and productivity can be increased by using interactive learning, virtual applications, and self-learning materials. Augmented reality systems can provide more information and 3D views of the subject being taught, making it more understandable. Special education can be facilitated through the use of sound- and light-sensitive classrooms, IoT tools, and smart devices. Close observation is made possible through the tracking of students' activities and progress.

Implementation of IoT in Education Sector

IoT (Internet of Things) can be implemented in the education sector to enhance various aspects of teaching and learning. Here are some ways IoT can be used in the education sector:

Handling of Energy - By using IoT, energy resources can be saved by installing sensors and actuators in lights and faucets to enable automatic switching when people are not there.

Accessing classes remotely and securely - IoT contributes to establishing a secure environment for pupils by using sensors installed on campus to help keep an eye on student activity and intervene in cases of bullying or property damage.

Keeping an eye on staff and student health - IoT helps in detecting and tracking student health by physiological signs, which can be used to quickly analyze student health.

Software to improve interactive learning - IoT can make learning more enjoyable and exciting by using tools like voice-to-text converters, virtual classrooms, and IoT-based graphic classrooms.

Smart Boards - Electronic boards, also known as smart boards, can make teaching much simpler and learning more efficient. They are user-friendly and can be used to interact with images.

Monitoring disabilities - IoT can be used to create educational tools to accommodate children with problems like dyslexia.

Exam evaluation and attendance - IoT tools can monitor student attendance and send staff members reports. Students can now take examinations online thanks to IoT.

Improvements in safety - IoT applications are widely used in schools to assist in safeguarding students, including sensors for fire detection and video surveillance.

AR in education - Augmented reality (AR) can be used to bring audio, video, and graphic content to life, aiding in students' learning and conceptual understanding.

Premises temperature control - IoT can regulate temperature and lighting according to the surroundings.

Collection of real-time data - IoT aids in data collection and analytics to create lessons that prioritize student interaction, foster focus, and advance learning.

Safety on school buses - IoT can be used by drivers to keep an eye on the kids on board, track the bus's location, and raise notifications in case of danger.

Ensure that kids arrive home safely - IoT can be used to transmit location information to the child's parents, so parents can remotely monitor their children and receive notifications when their child is in danger.

Advantages of IoT in Education

There are several advantages of implementing IoT in education, some of which are:

Personalized learning: IoT technology can help create personalized learning experiences for students by providing customized content and adaptive assessments based on individual needs and preferences.

Improved learning outcomes: IoT-enabled devices and platforms can track student progress and identify areas where they need additional support, thereby improving learning outcomes.

Enhanced student engagement: IoT technology can facilitate interactive and engaging learning experiences, such as virtual and augmented reality, gamification, and collaborative learning.

Cost-effectiveness: IoT technology can help reduce costs associated with traditional classroom setups, such as paper-based assessments and textbooks.

Real-time monitoring: IoT-enabled devices and platforms can monitor student activities, attendance, and performance in real-time, enabling teachers to identify and address issues immediately.

Remote learning: IoT technology can enable remote learning by providing access to online courses, virtual classrooms, and interactive learning resources from anywhere and at any time.

Safety and security: IoT technology can help ensure the safety and security of students and staff by providing real-time monitoring of the school premises, such as surveillance cameras and alert systems.

Drawbacks in involving IoT in education

While IoT has several advantages in education, there are also some potential drawbacks to consider:

Cost: Implementing IoT in education can be expensive, especially if schools and universities need to invest in new infrastructure or upgrade existing systems.

Security: The interconnected nature of IoT devices can also pose security risks. Schools and universities will need to take steps to secure their networks and devices against potential cyber-attacks.

Privacy: IoT devices can collect and store sensitive data about students and staff, including their movements, behaviours, and personal information. Schools and universities will need to be transparent about how this data is collected, stored, and used.

Technical difficulties: IoT devices can sometimes be complex to set up and maintain, requiring specialized technical knowledge and expertise. This can be a challenge for schools and universities with limited IT resources.

Reliance on technology: While technology can enhance learning, it can also create dependency and reduce students' ability to learn independently without technology.

Potential distractions: IoT devices can also be a potential distraction to students during class, particularly if they are not being used for educational purposes.

Review of literature:

Abdelrahman Abuarqoubet al., (2017)This survey paper discusses how to utilize IoT technologies to create a modular approach for smart campuses. It first identifies the key benefits and motivations for developing IoT-enabled campuses. Next, it provides a comprehensive overview of the various types of smart campus applications. Lastly, the paper examines the critical design challenges that must be addressed to achieve a fully functional smart campus.

Mirjana Maksimović (2017), IOT Concept Application in Educational Sector Using Collaboration, in this paper researcher examines the use of Information and Communication Technologies (ICTs), specifically IoT, to improve educational practices, and its potential to contribute to economically, socially, and environmentally sustainable educational environments. To achieve this, collaboration is crucial among institutions, staff members, and students. Only with the full engagement of all stakeholders and their willingness to cooperate and collaborate can the education sector be completely redesigned, supported by technology, and made economically, ecologically, and socio-culturally sustainable. The discussion focuses on the power of collaboration, people, and technology in modernizing the education sector and realizing fully IoT-supported collaborative educational practices and environments.

Mostafa Al-Emran et al., (2019) Numerous review studies have analyzed and synthesized the use of IoT and its applications across various domains. However, there is a lack of comprehensive review studies on the application of IoT in education. Therefore, the main objective of this study is to highlight recent progress in the use of IoT applications in education, while also presenting various opportunities and challenges for future experimentation. Specifically, this review study summarizes the potential benefits of adopting IoT in education, including medical education and training, vocational education and training, Green IoT in education, and wearable technologies in education. The study concludes that the adoption of IoT and its applications in developing countries is still in its early stages, and further research is highly encouraged.

Amit Joshi et al., (2020) IOT Concept Application in Educational Sector Using Collaboration, the study explored the impact of the coronavirus pandemic on the Indian education sector from the perspective of teachers regarding online teaching and assessments. The results revealed four categories of barriers that teachers face when teaching and assessing online. These include issues related to home environment settings, such as a lack of basic facilities, external distractions, and interruptions from family members during teaching and conducting assessments.

Parul Agarwal et al., (2020) Blockchain and IoT Technology in Transformationof Education Sector, researcher understand how technology can solve major educational problems, a literature survey should be conducted. This survey should examine the teaching and learning process with respect to various parameters, including changes in the process, players, and outcomes. It should also identify associated challenges. A detailed analysis of these factors can lead to the conclusion that these technologies have the potential to revolutionize the education sector for the better. Although Blockchain technology is relatively young, its benefits suggest that further research and adoption could significantly change the teaching and learning process.

Swati Jain and Dimple Chawlaet al (2021) The aim of this paper is to provide an introduction to IoT and present practical methods for integrating IoT features into education. It uses a three-dimensional model to classify the impact of IoT on education, with Stakeholders, Applications, and Learning Modes as the dimensions. The paper categorizes IoT applications in education into four areas: campus management, class management, disability accommodation, and improving student learning. The author focuses on how these three dimensions of IoT can contribute to the development of a smarter education model.

Kelum A. A. Gamage et al., (2022) This paper examines the engagement and experience of students in online and hybrid learning environments. Student engagement is crucial for academic success, and this paper identifies areas for improvement in student engagement activities. The study conducted a survey in Sri Lanka to gather students' perceptions of engaging in activities during online and hybrid delivery. The results show that students are highly engaged in their learning, but they hold a pessimistic view of transitioning to a completely online setting.

Syed Hamid Hussain Madni et al., (2022) This research study focuses on the factors that influence the adoption of IoT in E-Learning in higher learning institutions (HLIs) in developing countries. The study designs an E-Learning-based IoT adoption model and categorizes the influencing factors into individual, organizational, environmental, and technological groups. The paper provides a comparative analysis of these factors to determine which ones should be prioritized for efficient IoT-based E-Learning in HLIs. The findings are intended to assist university policymakers and governments in making informed decisions regarding IoT adoption for E-Learning. The study aims to encourage teaching staff and students to incorporate these technologies into their learning, which will ultimately lead to high-quality educational outcomes.

Need of the study:

Currently, every industry is expanding wisely thanks to cutting-edge technology. Together with other sectors, the education industry is advancing with the most recent advancements. Hence, the intimacy of technology has led to numerous developments across numerous industries. The necessity for technology and its importance in the edtech sector slowly began to dawn on the education sector as well. IoT, or the Internet of Things, is a rapidly evolving digital technology in the education industry. Also, it is effectively enhancing the old educational system. Online classes have replaced traditional classroom settings thanks to learning systems. This utilised a central server and specialised personal software to connect live classes, recorded lectures, online problem-solving, etc. This results in a dynamic change in the educational landscape. All the researchers are concentrated on importance of IoT, Use IoT and some other general review topics so we are concentrated to identify the Awareness of IoT Applications in the Education Industry, An opinion on Implementation of IoT in Education Sector, amenity of IoT in Education and pitfalls of IoT in education.

Objectives of the study:

- To Know the awareness of students and teachers on IoT Applications in the Education Industry.
- To analyse the age of the respondents and implementation of IoT Education sector.
- To analyse the gender of the respondents and implementation of IoT Education sector.
- To examine the difference between amenity of IoT in Education and pitfalls of IoT in education.

Research Methodology:

Sources of Data:

Present study focused on primary and secondary data, Primary data is collected form the students of engineering colleges and schools of twin cities Hyderabad and secunderabad through questionnaire. Questionnaire is planned with five-point Likert scale to get information on different parameters like Awareness of IoT Applications in the Education Industry, An opinion on Implementation of IoT in Education Sector, amenity of IoT in Education and pitfalls of IoT in education. Secondary data is gathered form different sources like websites,articles, blogs and books.

Nature of Research

The descriptive research was adopted to describe the data and characteristicsabout the Students and Faculty of the study. It answers the questions awareness and opinion. Although the data description is factual, accurate and systematic, the research cannot deeply describe what caused a situation. Thus, it describes the data and characteristics about the Students and Faculty attributes,awareness and opinion of IoT in Education sector.

Sampling procedure:

The procedure adopted in the present study is convenient sampling, the sample respondent list of students and teachersof different schools and colleges was collected from twin cities of Hyderabad and secunderabad.

Sample Size

Number of sampling schools and colleges selected from the population is called the size of the sample. The researcher issued 200 questionnaires to various students and teachers in twin cities of Hyderabad and secunderabad. Among those 200 questionnaires, got back only 185 out of which 12 were incomplete and finally 173 has taken for the research in a usable condition.

Hypothesis:

H_{01}: there is no relation regarding awareness on IoT Applications in the Education Industry and age of the respondents.

H_{02}: there is no relation regarding awareness on IoT Applications in the Education Industry and gender of the respondents.

H_{03}: there is no relation between age of the respondents and implementation of IoT Education sector.

H_{04}: there is no relation between gender of the respondents and implementation of IoT Education sector.

H_{05}: there is no relation between amenity of IoT in Education and pitfalls of IoT in education.

Distribution of Respondents by Gender

This analysis is helpful in identifying a particular gender group who are more familiar. It is found from the table that 60 respondents accounting for 34.7 per cent are males while remaining 113 representing 65.3 per cent are females. Thus, females are more in number than their counterparts.

Table. 1- Distribution of Respondents by Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	60	34.7	34.7	34.7
	Female	113	65.3	65.3	100.0
	Total	173	100.0	100.0	

Distribution of Respondents by Age

Age reflects maturity of mind. An aged person behaves better than a person with less or mediocre age. Table 2 presents distribution of 173 sample respondents by age. It is noticed from the table that almost 30.6 per cent of the respondents are aged between 41-50 years followed by 30.1 per cent who comes under age group of 31-40 years. Thus, as many as 60.7 per cent of the sample respondents are middle-aged persons between 31-50 years of age. There are 23.1 per cent of the respondents whose age in between 21-30 years. Respondents above51 years are 10.4 per cent and Respondents between10-20 years are only 5.8 per cent Thus, it can be concluded that majority of the respondents are middle-aged persons.

Table. 2- Distribution of Respondents by Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10 to 20 Years	10	5.8	5.8	5.8
	21 to 30 Years	40	23.1	23.1	28.9
	31 to 40 Years	52	30.1	30.1	59.0
	41 to 50 Years	53	30.6	30.6	89.6
	51 Years Above	18	10.4	10.4	100.0
	Total	173	100.0	100.0	

Descriptive Statistics of Respondents by Age and Gender

The table shows descriptive statistics for two variables, age and gender, based on a sample of 173 observations.For the variable age, the mean is 3.17 and the standard deviation is 1.079. The variance is 1.164. The skewness is negative (-0.115), indicating that the distribution of age is slightly skewed to the left. The kurtosis is negative as well (-0.725), indicating that the distribution is slightly flatter than a normal distribution.

For the variable gender, the mean is 1.65 and the standard deviation is 0.477. The variance is 0.228. The skewness is negative (-0.649), indicating that the distribution of gender is slightly skewed to the left. The kurtosis is negative as well (-1.597), indicating that the distribution is flatter than a normal distribution, and has relatively fewer extreme values compared to a normal distribution.

Note that the values for skewness and kurtosis are given in terms of their standard errors. These standard errors can be used to test whether the skewness and kurtosis values are significantly different from zero, which can be helpful for determining whether the distributions are truly non-normal.

Table. 3- Descriptive Statistics of Respondents by Age and Gender

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	173	3.17	1.079	1.164	-.115	.185	-.725	.367
Gender	173	1.65	.477	.228	-.649	.185	-1.597	.367

Awareness onSmart Boards

The table shows the frequency and percentage of respondents' awareness level regarding Smart Boards. A total of 173 individuals were surveyed.Out of these, 10 respondents (5.8%) were "Highly Unaware" of Smart Boards, while 15 respondents (8.7%) were "Unaware". 58 respondents (33.5%) indicated that they were "Neither Aware nor Unaware", and 68 respondents (39.3%) were "Aware" of Smart Boards. The remaining 22 respondents (12.7%) were "Highly Aware" of Smart Boards.

Table. 4-Awareness onSmart Boards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	10	5.8	5.8	5.8
	Unaware	15	8.7	8.7	14.5
	Neither Aware or Unaware	58	33.5	33.5	48.0
	Aware	68	39.3	39.3	87.3
	Highly Aware	22	12.7	12.7	100.0
	Total	173	100.0	100.0	

Awareness on Attention to Attendance

The table shows the awareness level of individuals regarding Attention to Attendance. A total of 173 respondents were surveyed, out of the total respondents, 13 (7.5%) were highly unaware, 21 (12.1%) were unaware, 53 (30.6%) were neither aware nor unaware, 70 (40.5%) were aware, and 16 (9.2%) were highly aware.

Table. 5-Awareness onAttention to Attendance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	13	7.5	7.5	7.5
	Unaware	21	12.1	12.1	19.7
	Neither Aware or Unaware	53	30.6	30.6	50.3
	Aware	70	40.5	40.5	90.8
	Highly Aware	16	9.2	9.2	100.0
	Total	173	100.0	100.0	

Awareness on Significant Safety

The table shows the frequency and percentage distribution of respondents' awareness regarding significant safety. The data is based on a sample size of 173 respondents.Out of the total respondents, 11 (6.4%) were classified as "Highly Unaware" regarding significant safety, 20 (11.6%) were "Unaware," 55 (31.8%) were "Neither Aware nor Unaware," 69 (39.9%) were "Aware," and 18 (10.4%) were "Highly Aware."The cumulative percent column shows the cumulative percentage of respondents falling in each category up to that point. For example, 17.9% of respondents were either "Highly Unaware" or "Unaware," and 49.7% of respondents were either "Highly Unaware," "Unaware," or "Neither Aware nor Unaware."Overall, the data suggests that a majority of respondents were aware of significant safety, with only a small percentage being "Highly Unaware" or "Unaware.".

Table. 6-Awareness onSignificant Safety

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	11	6.4	6.4	6.4
	Unaware	20	11.6	11.6	17.9
	Neither Aware or Unaware	55	31.8	31.8	49.7
	Aware	69	39.9	39.9	89.6
	Highly Aware	18	10.4	10.4	100.0
	Total	173	100.0	100.0	

Awareness on Mobile Applications

A total of 173 individuals were surveyed, The results show that the majority of participants (38.2%) were Aware of mobile applications, followed by Neither Aware or Unaware (32.4%), Unaware (11.0%), Highly Aware (10.4%), and Highly Unaware (8.1%). This suggests that a significant proportion of the participants were familiar with mobile applications, while a smaller portion were not.

Table. 7-Awareness onMobile Applications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	14	8.1	8.1	8.1
	Unaware	19	11.0	11.0	19.1
	Neither Aware or Unaware	56	32.4	32.4	51.4
	Aware	66	38.2	38.2	89.6
	Highly Aware	18	10.4	10.4	100.0
	Total	173	100.0	100.0	

Awareness on Evolving Methodologies

The table shows the awareness of respondents regarding evolving methodologies. The data includes the frequency, percentage, valid percentage, and cumulative percentage for each category.Out of the 173 respondents, 11 (6.4%) reported being highly unaware of evolving methodologies, while 16 (9.2%) reported being unaware. 55 (31.8%) respondents reported that they were neither aware nor unaware. On the other hand, 69 (39.9%) respondents reported being aware, and 22 (12.7%) reported being highly aware of evolving methodologies.

Table. 8-Awareness onEvolving Methodologies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	11	6.4	6.4	6.4
	Unaware	16	9.2	9.2	15.6
	Neither Aware or Unaware	55	31.8	31.8	47.4
	Aware	69	39.9	39.9	87.3
	Highly Aware	22	12.7	12.7	100.0
	Total	173	100.0	100.0	

Awareness on Automated Attendance Recording

The table shows the frequency and percentage of respondents' awareness regarding automated attendance recording. The data is based on the responses of 173 participants.Out of the total respondents, 11 (6.4%) are highly unaware of automated attendance recording, while 17 (9.8%) are unaware. 54 respondents (31.2%) neither aware nor unaware of automated attendance recording.On the other hand, 70 participants (40.5%) are aware of automated attendance recording. And, 21 participants (12.1%) are highly aware of it.The cumulative percentage indicates the proportion of respondents who fall under each category and all categories below it. For instance, 16.2% of respondents are either highly unaware or unaware of automated attendance recording, while 87.9% of respondents are aware or highly aware of it.

Table. 9-Awareness onAutomated Attendance Recording

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	11	6.4	6.4	6.4
	Unaware	17	9.8	9.8	16.2
	Neither Aware or Unaware	54	31.2	31.2	47.4
	Aware	70	40.5	40.5	87.9
	Highly Aware	21	12.1	12.1	100.0
	Total	173	100.0	100.0	

Awareness on Safety in Premises

The table presents the results of a survey on the level of awareness of safety in premises among the respondents. The data shows the frequency, percent, valid percent, and cumulative percent of the responses.There were 173 respondents in total. The majority of the respondents, 39.9% (69 individuals), reported that they were aware of safety in premises. 12.7% (22 individuals) reported that they were highly aware, while 31.2% (54 individuals) were neither aware nor unaware.On the other hand, 9.8% (17 individuals) reported that they were unaware, and 6.4% (11 individuals) were highly unaware of safety in premises. The cumulative percent column shows the proportion of respondents up to a particular response category, which indicates that 87.3% of the respondents were aware or highly aware of safety in premises, while 16.2% were unaware or highly unaware.

Table. 10-Awareness onSafety in Premises

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	11	6.4	6.4	6.4
	Unaware	17	9.8	9.8	16.2
	Neither Aware or Unaware	54	31.2	31.2	47.4
	Aware	69	39.9	39.9	87.3
	Highly Aware	22	12.7	12.7	100.0
	Total	173	100.0	100.0	

Awareness on Distance Learning

The table presents the results of a survey on awareness of distance learning among the respondents. The table shows that out of 173 respondents, 15 (8.7%) are Highly Unaware of distance learning, 16 (9.2%) are Unaware, 54 (31.2%) are Neither Aware or Unaware, 66 (38.2%) are Aware, and 22 (12.7%) are Highly Aware. The Valid Percent column shows the percentage of responses within each category, while the Cumulative Percent column shows the percentage of responses up to and including each category.Overall, the majority of the respondents (87.3%) are either Aware or Highly Aware of distance learning, while a smaller percentage (17.9%) are Unaware. The highest percentage of respondents fall in the Neither Aware or Unaware category, indicating that a significant proportion of the sample has not formed an opinion on distance learning

Table. 11-Awareness onDistance Learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	15	8.7	8.7	8.7
	Unaware	16	9.2	9.2	17.9
	Neither Aware or Unaware	54	31.2	31.2	49.1
	Aware	66	38.2	38.2	87.3
	Highly Aware	22	12.7	12.7	100.0
	Total	173	100.0	100.0	

Awareness on Enhanced Interaction and Productivity

The table presents the results of a survey conducted to assess the level of awareness among respondents regarding enhanced interaction and productivity. A total of 173 respondents participated in the survey.Out of the total respondents, 6.9% were "Highly Unaware," 9.2% were "Unaware," 34.1% were "Neither Aware or Unaware," 37.0% were "Aware," and 12.7% were "Highly Aware."

Table. 12-Awareness onEnhanced Interaction and Productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	12	6.9	6.9	6.9
	Unaware	16	9.2	9.2	16.2
	Neither Aware or Unaware	59	34.1	34.1	50.3
	Aware	64	37.0	37.0	87.3
	Highly Aware	22	12.7	12.7	100.0
	Total	173	100.0	100.0	

Awareness on AR Equipped Systems

The table shows the frequency and percentage of respondents' awareness about AR (Augmented Reality) equipped systems. The data is based on a sample of 173 respondents.Out of the total respondents, 8 (4.6%) were highly unaware of AR equipped systems, while 14 (8.1%) were unaware. 66 (38.2%) respondents neither aware nor unaware of AR equipped systems. 67 (38.7%) respondents were aware of AR equipped systems, and 18 (10.4%) were highly aware.

Table. 13-Awareness onAR Equipped Systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	8	4.6	4.6	4.6
	Unaware	14	8.1	8.1	12.7
	Neither Aware or Unaware	66	38.2	38.2	50.9
	Aware	67	38.7	38.7	89.6
	Highly Aware	18	10.4	10.4	100.0
	Total	173	100.0	100.0	

Awareness on Special Education

The table presents the frequency and percentage distribution of responses to a question on awareness about special education among a group of participants.There were 173 participants in total, out of the 173 participants, 12 (6.9%) were "Highly Unaware" of special education, 19 (11.0%) were "Unaware", 53 (30.6%) were "Neither Aware or Unaware", 73 (42.2%) were "Aware", and 16 (9.2%) were "Highly Aware".

Table. 14-Awareness onSpecial Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	12	6.9	6.9	6.9
	Unaware	19	11.0	11.0	17.9
	Neither Aware or Unaware	53	30.6	30.6	48.6
	Aware	73	42.2	42.2	90.8
	Highly Aware	16	9.2	9.2	100.0
	Total	173	100.0	100.0	

Awareness on Close Monitoring

The table shows the frequency and percentage distribution of responses from a group of people regarding their awareness of close monitoring.There were 173 respondents, and they were asked to rate their level of awareness on a scale from "Highly Unaware" to "Highly Aware."of the respondents, 5.2% indicated that they were "Highly Unaware" of close monitoring, while 8.7% said they were "Unaware."The majority of respondents, 31.2%, indicated that they were "Neither Aware nor Unaware" of close monitoring.However, 39.3% of the respondents said they were "Aware" of close monitoring, and 15.6% reported that they were "Highly Aware."In summary, a significant proportion of respondents were either unaware or had no opinion about close monitoring, while a relatively smaller proportion was highly aware.

Table. 15-Awareness onClose Monitoring

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Unaware	9	5.2	5.2	5.2
	Unaware	15	8.7	8.7	13.9
	Neither Aware or Unaware	54	31.2	31.2	45.1
	Aware	68	39.3	39.3	84.4
	Highly Aware	27	15.6	15.6	100.0
	Total	173	100.0	100.0	

Descriptive Statisticsrespondents awareness on IoT Applications in the Education Industry

The table shows the descriptive statistics of respondents' awareness of various IoT applications in the education industry. The data is based on a sample of 173 respondents, and the statistics include the mean, standard deviation, variance, skewness, and kurtosis for each application.The first column lists the various IoT applications being assessed, including smart boards, attention to attendance, significant safety, mobile applications, evolving methodologies, automated attendance recording, safety in premises, distance learning, enhanced interaction and productivity, AR equipped systems, special education, and close monitoring.The second column shows the mean score for each application, indicating the average level of awareness among the respondents. For instance, the highest mean score of 3.51 is for the "close monitoring" application, while the lowest mean score of 3.32 is for "attention to attendance" and "mobile applications."The third column shows the standard deviation, which measures the amount of variation or dispersion in the scores. The standard deviation values range from 0.947 to 1.095, with the lowest value indicating that the responses for the "AR equipped systems" application were relatively consistent, and the highest value indicating greater variability in the responses for the "distance learning" application.The fourth column shows the variance, which is a measure of how spread out the data is from the mean. The variance values range from 0.896 to 1.2, with the lowest value indicating that the scores for the "AR equipped systems" application are tightly clustered around the mean, while the highest value indicates a greater spread of scores for the "distance learning" application.The fifth column shows the skewness, which measures the degree of symmetry in the distribution of scores. A negative skewness value indicates that the distribution is skewed to the left, while a positive skewness value indicates that the distribution is skewed to the right. All of the applications have negative skewness values, indicating that the majority of respondents had higher levels of awareness.The sixth column shows the standard error of the skewness value, which is a measure of the variability in the skewness estimate. The seventh column shows the kurtosis value, which measures the degree of peakedness or flatness of the distribution of scores. The kurtosis values range from -0.165 to 0.346, with most of the applications having kurtosis values close to zero, indicating a relatively normal distribution.

Table. 16-Descriptive Statisticsrespondents awareness on IoT Applications in the Education Industry

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Smart Boards	173	3.45	1.014	1.027	-.577	.185	.141	.367
Attention to Attendance	173	3.32	1.050	1.102	-.576	.185	-.165	.367
Significant Safety	173	3.36	1.029	1.058	-.552	.185	-.076	.367
Mobile Applications	173	3.32	1.066	1.137	-.549	.185	-.162	.367
Evolving Methodologies	173	3.43	1.036	1.073	-.599	.185	.060	.367
Automated Attendance Recording	173	3.42	1.035	1.071	-.601	.185	.032	.367
Safety in Premises	173	3.43	1.041	1.083	-.588	.185	.006	.367
Distance Learning	173	3.37	1.095	1.200	-.590	.185	-.140	.367
Enhanced Interaction and Productivity	173	3.39	1.049	1.100	-.539	.185	-.017	.367
AR Equipped Systems	173	3.42	.947	.896	-.521	.185	.346	.367
Special Education	173	3.36	1.028	1.057	-.636	.185	-.006	.367
Close Monitoring	173	3.51	1.026	1.054	-.578	.185	.080	.367

Efficient Energy Management

The table represents the frequency and percentage of responses to a question about the importance of efficient energy management.Out of 173 respondents, 13 (7.5%) rated it as "Very Unimportant," 19 (11%) rated it as "Unimportant," 50 (28.9%) rated it as "Neither Important nor Unimportant," 76 (43.9%) rated it as "Important," and 15 (8.7%) rated it as "Very Important."The cumulative percentage shows the proportion of respondents who rated the importance of efficient energy management as either important or very important, which is 91.3%.

Table. 17-Efficient Energy Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	13	7.5	7.5	7.5
	Unimportant	19	11.0	11.0	18.5
	Neither Important or unimportant	50	28.9	28.9	47.4
	Important	76	43.9	43.9	91.3
	Very Important	15	8.7	8.7	100.0
	Total	173	100.0	100.0	

Accessing classes remotely and securely

The table shows the results of a survey on the importance of accessing classes remotely and securely. The survey had a total of 173 respondents, and they were asked to rate the importance of accessing classes remotely and securely on a scale from "Very Unimportant" to "Very Important". The results show that, 14 respondents (8.1%) rated accessing classes remotely and securely as "Very Unimportant".11 respondents (6.4%) rated accessing classes remotely and securely as "Unimportant".54 respondents (31.2%) rated accessing classes remotely and securely as "Neither Important nor Unimportant".59 respondents (34.1%) rated accessing classes remotely and securely as "Important".35 respondents (20.2%) rated accessing classes remotely and securely as "Very Important".Overall, the majority of respondents (54.3%) rated accessing classes remotely and securely as either "Important" or "Very Important".

Table. 18- Accessing classes remotely and securely

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	14	8.1	8.1	8.1
	Unimportant	11	6.4	6.4	14.5
	Neither Important or unimportant	54	31.2	31.2	45.7
	Important	59	34.1	34.1	79.8
	Very Important	35	20.2	20.2	100.0
	Total	173	100.0	100.0	

Monitoring health of students and staff

The table shows the results of a survey conducted on the perceived importance of monitoring the health of students and staff. The respondents were asked to rate the importance of monitoring health using a five-point Likert scale ranging from "Very Unimportant" to "Very Important".Out of the 173 respondents, 8 (4.6%) rated monitoring health as "Very Unimportant", while 9 (5.2%) rated it as "Unimportant". A total of 65 (37.6%) respondents rated monitoring health as "Neither Important nor unimportant".On the other hand, 64 (37.0%) respondents rated monitoring health as "Important", and 27 (15.6%) rated it as "Very Important". The cumulative percentage shows the proportion of respondents who rated monitoring health at or below a certain level of importance.

Table. 19- Monitoring health of students and staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	8	4.6	4.6	4.6
	Unimportant	9	5.2	5.2	9.8
	Neither Important or unimportant	65	37.6	37.6	47.4
	Important	64	37.0	37.0	84.4

	Very Important	27	15.6	15.6	100.0
	Total	173	100.0	100.0	

Applications to enhance interactive learning

The table shows the results of a survey where respondents were asked to rate the importance of applications to enhance interactive learning. There were 173 valid responses.The table includes the following categories:Very Unimportant: 8 respondents (4.6% of the total) rated the applications as very unimportant.Unimportant: 18 respondents (10.4% of the total) rated the applications as unimportant.Neither Important or unimportant: 64 respondents (37.0% of the total) indicated that the applications were neither important nor unimportant to them.Important: 63 respondents (36.4% of the total) rated the applications as important.Very Important: 20 respondents (11.6% of the total) rated the applications as very important.

Table. 20- Applications to enhance interactive learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	8	4.6	4.6	4.6
	Unimportant	18	10.4	10.4	15.0
	Neither Important or unimportant	64	37.0	37.0	52.0
	Important	63	36.4	36.4	88.4
	Very Important	20	11.6	11.6	100.0
	Total	173	100.0	100.0	

Usage of Smart Boards

The table shows the frequency and percentage of responses from a group of individuals regarding the importance of using smart boards.Out of the 173 respondents, 11 (6.4%) considered the use of smart boards as very unimportant, while 15 (8.7%) thought it was unimportant. 51 (29.5%) respondents thought it was neither important nor unimportant. On the other hand, 67 (38.7%) respondents found the use of smart boards important, while 29 (16.8%) considered it very important.

Table. 21- Usage of Smart Boards

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	11	6.4	6.4	6.4
	Unimportant	15	8.7	8.7	15.0
	Neither Important or unimportant	51	29.5	29.5	44.5
	Important	67	38.7	38.7	83.2
	Very Important	29	16.8	16.8	100.0
	Total	173	100.0	100.0	

Monitoring students Attendance and exams assessment

The table represents the results of a survey about the perceived importance of monitoring students' attendance and exams assessment.A total of 173 respondents were included in the survey, and they were asked to rate the importance of monitoring students' attendance and exams assessment on a five-point scale ranging from "Very Unimportant" to "Very Important."Out of the total respondents, 8.7% rated monitoring students' attendance and exams assessment as "Very Unimportant," 17.3% rated it as "Unimportant," 30.1% rated it as "Neither Important or unimportant," 36.4% rated it as "Important," and 7.5% rated it as "Very Important."

Table. 22- Monitoring students Attendance and exams assessment

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Very Unimportant	15	8.7	8.7	8.7
	Unimportant	30	17.3	17.3	26.0
	Neither Important or unimportant	52	30.1	30.1	56.1
	Important	63	36.4	36.4	92.5
	Very Important	13	7.5	7.5	100.0
	Total	173	100.0	100.0	

Augmented Reality in education

The table presents data on the perceived importance of Augmented Reality (AR) in education, based on the responses of 173 individuals. The data is summarized using frequency and percentage distributions.Out of the total respondents, 5.8% felt that AR in education was "Very Unimportant," while 10.4% found it "Unimportant." About one-third of the respondents (32.9%) felt that AR was "Neither Important nor Unimportant." On the other hand, 37% of the respondents believed that AR in education was "Important," while 13.9% considered it "Very Important."

Table. 23- Augmented Reality in education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	10	5.8	5.8	5.8
	Unimportant	18	10.4	10.4	16.2
	Neither Important or unimportant	57	32.9	32.9	49.1
	Important	64	37.0	37.0	86.1
	Very Important	24	13.9	13.9	100.0
	Total	173	100.0	100.0	

Temperature Control in premises

The table provides information on the responses of a sample of individuals regarding the importance of temperature control in premises.There was a total of 173 respondents, the table shows the frequency, percent, valid percent, and cumulative percent for each response option.The largest group of respondents, 36.4% of the total, rated temperature control as "Important". The next largest group, at 27.7%, thought it was "Neither Important nor Unimportant".Smaller groups rated temperature control as "Very Important" (17.3%) or "Unimportant" (9.2%). The same percentage rated it as "Very Unimportant" (9.2%).

Table. 24- Temperature Control in premises

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	16	9.2	9.2	9.2
	Unimportant	16	9.2	9.2	18.5
	Neither Important or unimportant	48	27.7	27.7	46.2
	Important	63	36.4	36.4	82.7
	Very Important	30	17.3	17.3	100.0
	Total	173	100.0	100.0	

Real time data collection

The table shows the results of a survey on the importance of real-time data collection, with 173 participants. The respondents were asked to rate the importance of real-time data collection on a scale from "very unimportant" to "very important."The table displays the frequency, percentage, valid percentage, and cumulative percentage of each response category.of the 173 participants, 15 (8.7%) rated real-time data collection as "very unimportant," while 16 (9.2%) rated it as "unimportant." A total of 54 respondents (31.2%)

considered real-time data collection to be "neither important nor unimportant." On the other hand, 54 participants (31.2%) rated real-time data collection as "important," and 34 (19.7%) rated it as "very important."

Table. 25- Real time data collection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	15	8.7	8.7	8.7
	Unimportant	16	9.2	9.2	17.9
	Neither Important or unimportant	54	31.2	31.2	49.1
	Important	54	31.2	31.2	80.3
	Very Important	34	19.7	19.7	100.0
	Total	173	100.0	100.0	

Travelling in Bus with Safety

The table shows the results of a survey on the importance of safety while travelling in a bus. A total of 173 respondents participated in the survey and provided their opinions on the importance of safety.The table shows that the majority of respondents, 38.7%, consider safety to be important while travelling in a bus, and 16.8% of respondents consider it to be very important. On the other hand, 5.8% of respondents considered safety to be very unimportant, and 8.1% considered it to be unimportant. The largest group of respondents, 30.6%, stated that safety was neither important nor unimportant.

Table. 26- Travelling in Bus with Safety

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Unimportant	10	5.8	5.8	5.8
	Unimportant	14	8.1	8.1	13.9
	Neither Important or unimportant	53	30.6	30.6	44.5
	Important	67	38.7	38.7	83.2
	Very Important	29	16.8	16.8	100.0
	Total	173	100.0	100.0	

Descriptive Statistics of implementation of IoT Education sector

The table shows the descriptive statistics for the implementation of IoT (Internet of Things) in the education sector. The data is based on the responses of 173 participants who provided ratings on a scale of 1 to 5 for 10 different IoT applications.The first column lists the names of the IoT applications, and the second column shows the number of participants (N) who responded to the survey. The third column provides the mean score for each application, which is the average rating given by the participants. The fourth column shows the standard deviation (Std. Deviation), which measures the amount of variation or spread in the ratings. The fifth column shows the variance, which is the square of the standard deviation.The skewness column measures the degree of asymmetry in the distribution of the ratings. A negative skewness value indicates that the distribution is skewed to the left, and a positive skewness value indicates that the distribution is skewed to the right. A skewness value of zero indicates a symmetrical distribution.The kurtosis column measures the degree of peakedness in the distribution of the ratings. A positive kurtosis value indicates a more peaked distribution with heavier tails, while a negative kurtosis value indicates a flatter distribution with lighter tails.Overall, the table shows that the mean scores for all the IoT applications are above 3, indicating that the participants rated all applications as at least moderately important. The standard deviations range from 0.974 to 1.163, indicating that there is some variation in the ratings for each application.In terms of skewness and kurtosis, most of the distributions are approximately symmetrical with skewness values close to zero and kurtosis values close to 3. However, a few applications such as "Monitoring health of students and staff" and "Monitoring students Attendance and exams assessment" show some positive skewness and kurtosis, indicating that there may be a relatively large number of participants who rated them as very important.

Table. 27- Descriptive Statistics of implementation of IoT Education sector

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Efficient Energy Management	173	3.35	1.038	1.078	-.687	.185	-.017	.367
Accessing classes remotely and securely	173	3.52	1.129	1.274	-.615	.185	-.093	.367
Monitoring health of students and staff	173	3.54	.974	.948	-.528	.185	.391	.367
Applications to enhance interactive learning	173	3.40	.981	.962	-.424	.185	.037	.367
Usage of Smart Boards	173	3.51	1.071	1.147	-.612	.185	-.012	.367
Monitoring students Attendance and exams assessment	173	3.17	1.079	1.164	-.396	.185	-.546	.367
Augmented Reality in education	173	3.43	1.041	1.083	-.494	.185	-.090	.367
Temperature Control in premises	173	3.43	1.158	1.340	-.587	.185	-.312	.367
Real time data collection	173	3.44	1.163	1.352	-.491	.185	-.391	.367
Travelling in Bus with Safety	173	3.53	1.049	1.100	-.605	.185	.071	.367

Descriptive Statisticsamenity of IoT in Education

The table provides descriptive statistics for the perceived amenity of IoT (Internet of Things) in education. The data is based on the responses of 173 participants who provided ratings on a scale of 1 to 5 for five different amenity aspects of IoT in education.The first column lists the names of the amenity aspects, and the second column shows the number of participants (N) who responded to the survey. The third column provides the mean score for each amenity aspect, which is the average rating given by the participants. The fourth column shows the standard deviation (Std. Deviation), which measures the amount of variation or spread in the ratings. The fifth column shows the variance, which is the square of the standard deviation.The skewness column measures the degree of asymmetry in the distribution of the ratings. A negative skewness value indicates that the distribution is skewed to the left, and a positive skewness value indicates that the distribution is skewed to the right. A skewness value of zero indicates a symmetrical distribution.The kurtosis column measures the degree of peakedness in the distribution of the ratings. A positive kurtosis value indicates a more peaked distribution with heavier tails, while a negative kurtosis value indicates a flatter distribution with lighter tails.The table shows that the mean scores for all the amenity aspects are above 3, indicating that the participants rated all aspects as at least moderately useful. The standard deviations range from 1.050 to 1.158, indicating that there is some variation in the ratings for each amenity aspect.In terms of skewness and kurtosis, most of the distributions are approximately symmetrical with skewness values close to zero and kurtosis values close to 3. However, the "Efficient management of the school system" and "Includes Safety Concerns" amenity aspects show some negative skewness and kurtosis, indicating that there may be a relatively large number of participants who rated them as not very important.

Table. 28- Descriptive Statistics of Amenity of IoT in Education

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Efficient management of the school system	173	3.18	1.084	1.175	-.403	.185	-.528	.367
Real-time information collection	173	3.40	1.050	1.103	-.506	.185	-.100	.367
Improvisations in Resource Management	173	3.44	1.158	1.341	-.601	.185	-.303	.367
Global connections	173	3.44	1.133	1.283	-.492	.185	-.281	.367
Includes Safety Concerns	173	3.40	1.088	1.184	-.478	.185	-.251	.367

Descriptive Statistics of Pitfalls of IoT in education

Table 29 displays the descriptive statistics of the pitfalls of IoT in education. The table includes five different pitfalls of IoT in education, and for each of them, the table provides the following descriptive statistics: N (number of respondents), mean, standard deviation, variance, skewness, standard error, and kurtosis.The five pitfalls of IoT in education presented in the table are: high-cost infrastructure, in-class morals, lack of data storage infrastructure, security and safety issues, and difficulty of maintenance.The mean values for these pitfalls range from 3.30 to 3.64, indicating that, on average, respondents perceive these issues to be moderately important. The standard deviations are all around 1.0, indicating that there is a considerable amount of variability in respondents' perceptions of these issues. Skewness values range from -0.643 to -0.424, indicating that the distribution of responses is slightly negatively skewed. Finally, the kurtosis values range from -0.520 to 0.966, indicating that the distributions are relatively platykurtic (i.e., flatter than a normal distribution).

Table. 29- Descriptive Statistics of Pitfalls of IoT in education

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
High-cost infrastructure	173	3.36	1.088	1.185	-.616	.185	-.138	.367

In-class morals	173	3.64	.869	.755	-.633	.185	.966	.367
Lack of data storage infrastructure	173	3.38	1.091	1.191	-.643	.185	-.097	.367
Security and safety issues	173	3.33	1.137	1.292	-.460	.185	-.393	.367
Difficulty of maintenance	173	3.30	1.147	1.316	-.424	.185	-.520	.367

Correlation between Age and IOTApplications Awareness

H_{01}: there is no relation regarding awareness on IoT Applications in the Education Industry and age of the respondents.

The table shows the correlation between two variables, "Age" and "IOTApplications Awareness", based on a sample of 173 observations.The Pearson correlation coefficient between Age and IOTApplications Awareness is -0.135, indicating a weak negative correlation between these two variables.The p-value associated with this correlation coefficient is 0.077, which is greater than the commonly used significance level of 0.05. This means that there is no strong evidence to reject the null hypothesis that there is no correlation between Age and IOTApplications Awareness in the population from which the sample was drawn.Overall, this suggests that there is only a weak association between Age and IOTApplications Awareness, and any relationship between these variables is likely to be small and not statistically significant.

Table. 30- Correlation between Age and IOTApplications Awareness

		Age	IOTApplications Awareness
Age	Pearson Correlation	1	-.135
	Sig. (2-tailed)		.077
	N	173	173
IOTApplications Awareness	Pearson Correlation	-.135	1
	Sig. (2-tailed)	.077	
	N	173	173

Correlation between gender and IOT Applications awareness

H_{02}: there is no relation regarding awareness on IoT Applications in the Education Industry and gender of the respondents.

The table shows the correlation between gender and IOT Applications awareness, based on a sample of 173 individuals.In this table, the Pearson correlation coefficient between gender and IOT awareness is very weak, with a value of 0.001 for both variables. This suggests that there is no meaningful linear relationship between gender and IOTApplications awareness in this sample.The p-value, or the significance level, indicates the probability of observing such a weak correlation by chance, assuming that there is no real relationship between the variables in the population. In this case, the p-value is very high (0.995), suggesting that the weak correlation is likely due to random variation and not a true relationship in the population.Therefore, based on this analysis, we can conclude that there is no significant relationship between gender and IOT Applications awareness in this sample.

Table. 31-Correlation between gender and IOT Applications awareness

		Gender	IOTApplications Awareness
Gender	Pearson Correlation	1	.001
	Sig. (2-tailed)		.995
	N	173	173
IOTApplications Awareness	Pearson Correlation	.001	1
	Sig. (2-tailed)	.995	
	N	173	173

Correlation between age and Opinion on implementation of IOT Applications

H_{03}: there is no relation between age of the respondents and implementation of IoT Education sector.

The table shows the correlation between two variables, age and Opinion on implementation of IOTApplications, based on a sample of 173 individuals.The Pearson correlation coefficient measures the strength and direction of the linear relationship between two continuous variables. In this case, the Pearson correlation coefficient between age and Opinion on implementation of IOTApplications is -0.057, which indicates a weak negative correlation between the two variables.The p-value associated with this correlation coefficient is 0.454, which is greater than the conventional significance level of 0.05. Therefore, we do not have sufficient evidence to reject the null hypothesis of no correlation between age and Opinion on implementation of IOTApplications.In summary, based on this sample, there is a weak negative correlation between age and Opinion on implementation of IOTApplications, but we cannot conclude that this correlation is statistically significant.

Table.32-Correlation between age and Opinion on implementation of IOT Applications

		Age	Opinion on implementation of IOTApplications
Age	Pearson Correlation	1	-.057
	Sig. (2-tailed)		.454
	N	173	173
Opinion on implementation of IOTApplications	Pearson Correlation	-.057	1
	Sig. (2-tailed)	.454	
	N	173	173

Correlation between gender and opinion on the implementation of IoT applications

H_{04}: there is no relation between gender of the respondents and implementation of IoT Education sector.

The table shows the correlation between gender and opinion on the implementation of IoT applications based on data from 173 respondents. The Pearson correlation coefficient between gender and opinion on IoT implementation is 0.048, indicating a very weak positive correlation. The p-value of 0.527 is not statistically significant at the 0.05 level, suggesting that the observed correlation could have occurred by chance. Therefore, there is no strong evidence to suggest that there is a relationship between gender and opinion on the implementation of IoT applications based on the available data.

Table. 33-Correlation between gender and opinion on the implementation of IoT applications

		Gender	Opinion on implementation of IOTApplications
Gender	Pearson Correlation	1	.048
	Sig. (2-tailed)		.527
	N	173	173
Opinion on implementation of IOTApplications	Pearson Correlation	.048	1
	Sig. (2-tailed)	.527	
	N	173	173

Correlation matrix between two variables IOT opinion on amenity and IOT opinion on pitfalls

H_{05}: there is no relation between amenity of IoT in Education and pitfalls of IoT in education.

The correlation coefficient between "IOTopiniononamenity" and itself is 1, which is expected as it's the correlation of a variable with itself. The correlation coefficient between "IOTopiniononamenity" and "IOTopiniononpitfalls" is 0.3, which indicates a positive correlation between the two variables.The p-value for both correlations is less than 0.01, which means that the correlation is statistically significant at a 99% confidence level, indicating that the observed correlation is unlikely to occur by chance.Overall, the results suggest that there is a positive correlation between the opinions on the amenities and the pitfalls of the Internet of Things. This means that as the opinions on amenities improve, the opinions on the pitfalls of IoT also improve, and vice versa. However, it's important to note that correlation does not imply causation, and further analysis is required to determine the nature of this relationship.

Table. 34- Correlation matrix between two variables IOT opinion on amenity and IOT opinion on pitfalls

		IOTopiniononamenity	IOTopiniononpitfalls
IOTopiniononamenity	Pearson Correlation	1	.300**
	Sig. (2-tailed)		.000
	N	173	173
IOTopiniononpitfalls	Pearson Correlation	.300**	1
	Sig. (2-tailed)	.000	
	N	173	173
**. Correlation is significant at the 0.01 level (2-tailed).			

Findings:

Findings of Awareness of IoT Applications in the Education Industry:

- Respondents have the highest level of awareness regarding smart boards (mean=3.45) and the lowest level of awareness regarding AR equipped systems (mean=3.42).
- The majority of respondents are aware of the significance of safety (mean=3.36) and safety in premises (mean=3.43) when it comes to IoT applications in the education industry.
- Respondents have a moderate level of awareness regarding attention to attendance (mean=3.32), mobile applications (mean=3.32), and special education (mean=3.36).

- Respondents are moderately aware of the potential of IoT applications in distance learning (mean=3.37), close monitoring (mean=3.51), and evolving methodologies (mean=3.43).
- Overall, respondents have a positive perception of IoT applications in education, with mean scores ranging from 3.32 to 3.51.

Findings of the implementation of IoT in the education sector based on different applications. The major findings are as follows:

- Accessing classes remotely and securely has the highest mean (3.52) among all the IoT applications in education, indicating that it is perceived as a highly beneficial implementation of IoT in education.
- Monitoring health of students and staff (mean=3.54) and travelling in bus with safety (mean=3.53) are also considered highly beneficial IoT applications in education.
- Monitoring students' attendance and exams assessment has the lowest mean (3.17), indicating that it is not perceived as highly beneficial compared to other IoT applications in education.
- The skewness values for all IoT applications in education are negative, indicating that the data is skewed towards higher ratings, meaning that most respondents agree that these IoT applications are beneficial.

Findings of amenity of IoT in Education sector:

- Efficient management of the school system has a mean score of 3.18 and a standard deviation of 1.084, indicating a moderate level of awareness among the respondents.
- Real-time information collection has a mean score of 3.40 and a standard deviation of 1.050, indicating a moderate level of awareness among the respondents.
- Improvisations in Resource Management has a mean score of 3.44 and a standard deviation of 1.158, indicating a moderate level of awareness among the respondents.
- Global connections have a mean score of 3.44 and a standard deviation of 1.133, indicating a moderate level of awareness among the respondents.
- Including Safety Concerns has a mean score of 3.40 and a standard deviation of 1.088, indicating a moderate level of awareness among the respondents.

Findings of Pitfalls of IoT in education:

- In-class morals received the highest mean score of 3.64, indicating that it is perceived as the most significant pitfall of IoT implementation in education.
- High-cost infrastructure received a mean score of 3.36, indicating that it is also perceived as a significant challenge in IoT implementation in education.
- Lack of data storage infrastructure and security and safety issues received mean scores of 3.38 and 3.33, respectively, indicating that they are also perceived as challenges in IoT implementation in education.
- Difficulty of maintenance received a mean score of 3.30, indicating that it is also perceived as a pitfall of IoT implementation in education.

Findings based on Hypothesis testing:

- a weak negative correlation between age and IOT applications awareness ($r = -0.135$), but the p-value of 0.077 is slightly above the conventional threshold for statistical significance ($p < 0.05$).

- a very weak positive correlation between gender and IOT applications awareness ($r = 0.001$), but the p-value of 0.995 indicates that this correlation is not statistically significant.
- The correlation between age and opinion on implementation of IoT applications is weak and not statistically significant ($r = -0.057$, $p = 0.454$). Therefore, there is no clear relationship between age and opinion on implementation of IoT applications.
- a very weak positive correlation between gender and opinion on the implementation of IoT applications ($r = 0.048$), but the p-value of 0.527 indicates that this correlation is not statistically significant.
- a moderate positive correlation between IOT opinion on amenity and IOT opinion on pitfalls ($r = 0.300$, $p < 0.01$). This indicates that individuals who have a more positive opinion of the amenity aspects of IoT applications are also likely to have a more positive opinion of the potential pitfalls associated with these applications.

Conclusion:

In conclusion, the results indicate that respondents have a moderate to high level of awareness regarding IoT applications in education. The findings suggest that IoT has significant potential to enhance various aspects of the education industry, such as safety, attendance, and productivity. The findings suggest that implementing IoT applications in education has the potential to bring significant benefits, especially in accessing classes remotely and securely, monitoring the health of students and staff, and ensuring safety in transportation.

The respondents seem to have a moderate level of awareness about the amenity of IoT in education, with an emphasis on resource management and global connections. However, there is still room for improvement in terms of awareness of real-time information collection and safety concerns. The implementation of IoT in education faces some challenges and potential pitfalls, including high-cost infrastructure, in-class morals, lack of data storage infrastructure, security and safety issues, and difficulty of maintenance. It is essential to address these issues to ensure the successful implementation of IoT in education.

Age may be a weak predictor of an individual's awareness of IOT applications, with younger individuals tending to have higher levels of awareness. However, further research with a larger sample size may be needed to confirm this relationship.gender is not a significant predictor of an individual's awareness of IOT applications.no clear relationship between age and opinion on implementation of IoT applications.gender is not a significant predictor of an individual's opinion on the implementation of IoT applications.there is a significant positive correlation between IOT opinion on amenity and IOT opinion on pitfalls.

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