Application of Extended Reality (XR) technologies, benefits and challenges faced - A study w.r.t. Yelahanka sub-districts of Bengaluru Urban district

By

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Abstract

Purpose

The major intention of the present study is to know how far the socio economic factor impress the study on XR technologies. Further, the study is also aimed at knowing the benefits of XR technologies, XR application, application of XR technology in education field, major challenges faced by XR technologies, of late XR technologies use has been on the rise to tackle various the areas like training, education safety etc. (Sanika Doolani et al. 2020). The latest developments in augmented reality (AR), virtual reality (VR) and mixed reality (MR) has been on the rise in the use of XR technologies to train the work force. Immersive technologies (XR) in education offer a number of opportunities but the convergence with AI can have a profound impact on considerations for applications at all levels. Universities must be a catalyst for necessary changes in society so that their graduates can be part of the transformation of the whole society. XR technologies are making a rehabilitative the way people experience the physical and virtual environments from observation to immersion.

Approach

A specific known in advance, questionnaire was administered as schedule in order to avoid delay, incompleteness rejection and respecting the Covid-19 pandemic norms. Innumerable students belonging to different streams were interviewed and the necessary data collected. X^2, contingency co-efficient, ANOVA, Kendall's co-efficient of concordance, weighted arithmetic mean and XRI tools' were performed in order to gather the needful data on XR technologies.

Findings

The study found the existence of socio-economic characteristics showing a significant variation and high degree of variation except gender revealing a significant variation with a low degree of relationship. The XR application is found in the areas of remote work, marketing education and retail. The benefits are ranked and include, engages all students, breaks physical barriers and time machine allows students to travel in time. The application of XR technology to the education sector includes providing ways for training centric to educate their students in an immersive learning environment, Virtual reality (VR) provides the user with the perception

of being physically present in a non physical world and XR provides a new space to access the educational space. The challenges include heterogeneous users, privacy and security and effects on health.

Keywords: Immersive, virtual, physical, privacy, challenges, travel, health, heterogeneous, technologies, traditional, support, benefits.

Introduction

Over the past 10 years teaching and learning in higher education has emerged to make greater use of interactive learning environments as well as digital and virtual technologies. The move away from more traditional theory lectures and essential laboratory

practices comes with many benefits for both teacher and students (Pringle J.K., et al. 2010). The recent Covid-19 pandemic and subsequent lock downs, has necessitated more drastic changes in teaching and learning and also highlighted the benefits and drawback of virtual and online learning and teaching tools (Thomson et al. 2020). Education is rapidly developing as it is more capable of adopting high technology and integrating them into instrumental methods (Ahmed Jamah Ahmed Alnagrat (2022). XR technologies are becoming promising technologies which is capable of designing similar experiences that are comparable to real experiences in the physical world. Just 10 years back XR technologies like Augmented Reality (AR), Virtual Reality (VR) and Mixed Reality (MR) were thought of as futurist, sci-fi concepts and only seen in movies. Today XR technologies is transferring several industries and education to revolutionise the way of teaching and learning (XR Guru Immersive learning hub). XR describes all real and virtual combined environments between human and computer input (Ahmed Jamah Ahmed Alngrat (2022). Immersive learning laboratory aims to give students virtual access to areas they would not normally be able to go. XR technology create the illustrates to make people feel as if they are in an entirely new digital world (O'Donnel, 2018).

The use of immersive extended reality is proven to be effective way to augment traditional forms of pedagogy (Brown et al. (2020). XR technologies can help bridge the gap between in-person and online courses and create a space for more collaboration and presence opportunities. But the empirical research on application in higher education is still inadequate (Radiant et al. 2020). Universities are needed now to allocate resources in an intelligent way so as to attain students with life experience in a sustainable environment. They should speed up the transformation of the society in the direction of sustainable development. Society expects from the universities to redesign the activities of present and future generations in such a way that the society impacts very much on personal life, professional life and bright sustainable future.

Statement of the problem

Digital transportation and 5-G spectrum in Bengaluru has been accelerated very much and that too post effect of Covid-19 has created a context that will continue to drive further. The education system was very much impacted by Covid-19 and students for the first time en-mass started attending online classes and participation in workshops, has been restricted very much. The traditional system of education is based on remembrance and board teaching has been widely employed at almost all higher education and at +2 grade. Education is facing voluminous changes in India and Bengaluru the urban science city is not an exception. XR technologies can provide the foundation for a new variety of learning environments and experience while bringing users together to create unique enquiry and practice. Cutting edge XR technology is making an impact in several industries, including education. Across the globe

the educators are realising the immense benefits of using XR technologies in learning and a study predicts the global AR / VR market in education to reach $22.7 billion by 2027 growing at a CAGR 14.6% during 2022-2027 (Holo Pandits, 2022). XR technologies help to reduce overall institutional costs and available for wider audience of learners. XR technologies creates a new opportunity for the students to widen the education knowledge and research. Realising the significance of XR technologies many private and unaided institutions have already introduced XR technologies at Bengaluru.

Review of literature

Ahmat Ustun (2020) found in their research work, XR immersive technologies have massive potentials to enrich teaching and learning in Higher education through their abilities to offer a unique hands on experience that might unattainable with other educational technologies. Further, the researcher has stated that the latest generation of XR technology like Oculus Quest 2 showed a great improvement and enhanced performance. These technologies are relatively affordable, wireless, less revolting and provide a safer experience.

Ahmed Jamah et al. (2020) expressed that there is evidence to support that it provides rich perceptual clues and versatile feedback, facilitates the transfer of virtual experience into real environments, interrupts with content, entertains while learning, and facilities concept learning. The impression of interacting with non-existent objects in an unreal environment is attained by providing high quality data. Further, the researcher expressed that students problem solving skills are improved when they have a sense of being close to that environment and could lose their perception of time, space and reality.

Gupta et al. (2016) generated a language learning VR environment to train Swedish language. They conducted the user studies with a gap of one week and test the learning performance, retention and recall or Swedish words, in a comparative VR and traditional environments. The results revealed that the retention rate of VR was higher than the traditional method. The respondents in the study rated the VR system as more enjoyable and effective for learning.

Gac et al. (2019) prepared a tool to assist a virtual reality learner in a vocational training context. The work pertaining to a global project aiming to create design and assess new VR tools and methodologies for educational training, where teachers can train about safety, strategy and financial resources. It was found in the study that the usability of an immersive tool depends on the clarity and user interface design. The training was enjoyed by young students and the design was welcomed by them.

Senthilkumar Jugathees Perumal (2022) conducted a survey of review of XR solutions and associated challenges in education, training a skill enhancement in different fields through IoE application from the meta verse perspective. The study highlighted the important ideas involved in XR and IoE technology as well as vital features incorporated for training and skill enhancement through Metaverse. The authors contribution helps to know the state-of-art features of XR and IoE devices and their application capabilities.

Objectives of the study

1.   To study the impact of demographics of students on the XR technologies.
2.   To analyse the XR application.
3.   To analyse the benefits of XR technologies.
4.   To study the application of XR technology in education.
5.   To study the challenges of XR technologies.

Hypotheses
1.   There exist no significant variation in the demographics and hence they are not impacting the study.
2.   XR technologies cannot be applied in any field.
3.   There are no benefits of XR technologies.
4.   XR technologies cannot be applied in education field.
5.   There are no challenges faced by XR technologies.

Research Questions
1.   Which are the socio economic characteristics impact the study?
2.   What are the areas of XR application?
3.   What are the benefits of XR technologies?
4.   What is the extent of XR technology application in education sector?
5.   What are the challenges faced by XR technology?

Research Methodology
       Research methodology is a blue print enabling the direction of movement of research process in a methodical manner. Albert Szent Gorgy (2015) stated that "Research is to see what everybody else has seen and to think what nobody has through". Zikmund Million (1988) defined research design as a "master plan" specifying the methods and procedure for collection and analysing the information. Yelahanka sub-district of Bengaluru urban district purposefully selected for the purpose of data collection containing old and Newtown Yelahanka. Four kinds of educational institutions viz., Government institutions aided colleges, permanently unaided colleges, and private universities were covered. The students studying in different streams were met and necessary data was acquired.

Questionnaire design
       A structured open end questionnaire was managed as schedule in order to avoid delay, non-response to clarify the doubts and clear about the terms used. The administration of questionnaire was felt necessary for the kind of survey. The relevant questions which were protested are logically arranged and serially numbered. Five and four point scale depending on the need was followed to enter the opinions of students. Weights were used against the respondent opinion.

Participants
       Yelahanka old and new town was selected and these are the upcoming education centers of Bengaluru Urban districts. 20 students from government colleges both boys and girls, 75 from aided institutions, 65 from permanently unaided and 40 from private university were interviewed for the purpose of data collection. 215 questionnaires were in the hand and out of this 200 were found to be usable.

Study variables: Independent variables:
       The selected demographics constitute independent variable in this study. These demographics include age, education, family income, preference towards XR technologies, visiting library and computer lab and participation in conference and webinars. Further, all known of educational institutions and students are also constitute independent variable.

Dependent Variable
       The dependent variable of the study has XR technologies by computing 24 statements to benefits as stated in Table-3. Table-4 further shows XR technologies are influenced by different statements which decides XR application in educating sector. The dependent variable

in this study hence constitute XR technology. Likert scale 5, 4, 3 point scale was adopted as stated in different tables. The XR application in education sector was computed below.

$$XRI = XR_{SA} + X_{RA} + X_{RN} + XR_{SD}$$

Where **XRE$_{SA}$** = Total number of respondents expressly strongly agree in making extent of application for a statement.

Where **XRE$_{SA}$** = Total number of respondents expressly strongly agree in making extent of application for a statement.

XR$_A$ = The total number of respondents expressed agree in making extent of application ability for a statement.

XR$_N$ = The total number of respondents expressed a neutral in making extent of application ability for a statement.

XR$_{SD}$ = The total number of respondents expressed strongly disagree in making the extent of application of a statement.

Method of Analysis : The study performed x^2, contingency co-efficient, weighted arithmetic mean, ANOVA, Kendall's co-efficient of concordance (w). Ranks in case of weighted arithmetic mean was awarded based on the strength of "WA". In case of ANOVA, w, chi-square 5% level of significance was used as a basis for rejecting null hypotheses.

Sources of data : The present study is based on both the primary and secondary data. Questionnaire was administered as schedule and answers given by the respondents were entered by the data collector. The secondary sources include e-journals, internet and books.

Limitations :

1. The study only confined to Yelahanka, the old and new town.
2. Felt difficult is using XR technologies by the students.
3. The sample is small and any dependency requires further in depth study.

Data presentation and analysis: Demographic profile of dependents – A
Table – 1: *Demographics of Women Respondents*

Demographics of students	x^2	TV@0.05	df	result of x^2	"c"	Result of 'C'
Gender	8.00	3.841	1	Significant	0.196	Low Degree
Age (in years)	102.22	5.991	2	Significant	0.58	High Degree
Education (Studying)	89.46	14.067	7	Significant	0.56	High Degree
Family Income (in INR)	150.6	7.815	3	Significant	0.66	High Degree
Preference towards XR technologies	299.16	7.815	3	Significant	0.77	High Degree
Visiting library	225.44	3.841	1	Significant	0.53	High Degree
Visiting computer lab	355.00	7.815	3	Significant	0.80	High Degree
Participation in conferences and webinars	72.00	3.841	1	Significant	0.51	High Degree

Source: *Field Survey*

Note : x^2 = chi-square
'c' = $\sqrt{(x^2 / x^2 + N)}$
Where 'c' = contingency coefficient
N = Number of observations

When the value 'c' is equal or near 1, it means there is high degree of association between attributes. Contingency co-efficient will always to be less than 1. High degree is considered here if 'c' is 0.50 and above.

Data presented in table – 1 reveals data about demographics of student respondents. There are 80 boys and 120 girl students. There are 134 students in the age group 21-24 years, 35 in between 16-20 years and 31 in between 25-29 years. The education details reveals that 40 studying BCA, 35 PUC, 30 engineering, 65 degree, 13 medical, 11 chartered accountant trainees, 6 were cost accountants. The family income details reveals that 123 households getting a monthly income in between 60K – 80K, 42 in between 40K – 60K, 21 in between 20K – 40K and 14 household s getting monthly income Rs. 80K above. 160 students were regular in showing preference, 28 not regular, 7 occasional and 5 not at all interested. 156 students were visiting library and 44 not visiting library and 165 respondents were regular in attending computer lab 20 not regular, 10 occasional and 5 never visited computer lab. 160 respondents participated in conference and webinars and the remaining 40 not attended any conference and webinar. All the demographics shows significant variation and high degree of relationship except gender which shows low degree of relationships.

Data presentation and analysis – B

Table – 2: *XR application*

Areas of application	SA	A	N	DA	SDA	T
Retail	16	7	-	2	1	26
Remote work	25	15	2	3	2	47
Training	15	8	2	1	1	27
Marketing	20	13	2	2	2	39
Real estate	13	5	-	1	1	20
Education	21	12	2	3	3	41
Total	110	60	8	12	10	200

Source: *Field Survey*

Note : SA – Strongly Agree, A – Agree, N – Neutral, DA – DisAgree, SDA – Strongly Disagree

Hypotheses

H0	There is no significant variation in the data	Reject
H1	There is significant variation in the data	Accept

ANOVA Table

Source of variation	SS	df	MS	F-ratio	5% F limit (from F-Table)
Between the sample	1370.91	(5-1)=4	1370.91/4 =	342.7275/6.72 = 51.00	
Within the sample	168.00	(30-5)=25	168/25 = 6.72		$(4, 25) = 2.76$
Total	1538.91	(30-1) = 29			

Source: *Field Survey*

ANOVA Analysis

The above ANOVA table reveals that the calculated value of F = 51 which is bigger than the TV = 2.76 at 5% level of significance with d.f. being $V_1 = 4$ and $V_2 = 25$, ANOVA fails to accept H_0 and accepts H_1. Therefore, it is concluded that there are different areas of XR technology application.

Table – 2 highlights data about XR application. 110 students out of 200 expressed strongly agree, 60 agree, 8 stood neutral, 12 disagree and 10 strongly disagree. Out of 110 who said strongly agree 25 stated about remote work, 21 education, 20 marketing, 16 retail, 15 training and 13 real estate. Out of 60 who said agree 16 pointed at remote work, 13 marketing, 12 education, 8 training, 7 retail and 5 real estate. Out of 8 who stood neutral, 2 respondents in remote work, training, marketing and education. Out of 12, 3 each spoke about remote work, education and 2 each retail and marketing. Out of 10 who said strongly disagree 3 felt about education and 2 each about remote work and marketing. ANOVA statistical tool fails to accept H_0 and accepts H_1 and hence it is concluded that there exist significant variation in the data.

Table – 3: *Benefits of XR – Weighted Arithmetic mean*

Benefits	Weight Likert scale	5 SA	4 A	3 N	2 DA	1 SDA	T	WA
I. Virtual reality : Global teleportation	F	140	44	14	2	-	200	XV
	fw	700	176	42	4	-	922	61.47
Contextual learning	f	167	26	4	3	-	200	V
	fw	835	104	12	6	-	957	63.80
The time machine effect allows students to trend in time	f	170	28	2	-	-	200	III
	fw	850	112	6	-	-	968	64.53
Contextual learning	f	156	40	4	-	-	200	VI
	fw	780	160	12	-	-	952	63.47
Multisensory experiences	f	124	69	-	5	2	200	XXII
	fw	620	276	-	-	2	898	59.87
Contextualised learning	f	160	32	-	4	4	200	XIII
	fw	800	128	-	8	4	940	62.66
Virtual rehearsal	f	120	63	8	6	3	200	XIII
	Fw	600	212	24	12	3	940	62.66
Focused immersion	f	168	24	2	2	4	200	VII
	fw	840	96	6	4	4	950	63.33
Remote presence	f	160	35	-	-	5	200	IX
	fw	800	140	-	-	5	945	63.00
Breaks physical barriers	f	170	30	-	-	-	200	II
	fw	850	120	-	-	-	970	64.66
II. Augmented reality : Not requires a lot of resources since they do not get damage or lost	f	140	56	4	-	-	200	XVIII
	fw	700	224	12	-	-	936	62.40
Widens students purification	f	145	50	2	3	-	200	XVI
	fw	725	200	6	6	-	937	62.47
	f	150	41	3	6	-	200	XV

		SA	A	N	DA	SDA	Total	WA/Rank
Creates fun and excitement for students	fw	750	164	9	12	-	938	62.53
Enhanced memory	f	172	23	5	-	-	200	IV
	fw	860	92	15	-	-	967	64.47
Provides interactive lessons for the students	f	160	32	6	-	2	200	VIII
	fw	800	128	18	-	2	948	63.20
AR in education improves and enhances sensory development	f	141	50	7	-	2	200	XVI
	fw	705	200	21	-	2	926	61.73
Increases learning activity	f	162	32	3	3	1	200	XVI
	fw	810	128	9	4	1	952	62.47
Visiting the past, present and future	f	140	51	4	2	3	200	XX
	Fw	700	204	12	4	3	923	61.53
III. Mixed Reality : Engages all students	f	190	5	-	2	3	200	I
	fw	950	20	-	4	3	977	65.13
No geographical limitation	f	150	50	-	-	-	200	XXIII
	fw	750	120	-	-	-	870	58.00
Students and teacher can move back in time interacting with objects animals and human beings	f	153	36	5	2	4	200	XI
	fw	765	144	15	4	4	942	62.80
Can be used to teach any topic	f	155	36	6	3	-	200	X
	fw	775	144	18	6	-	943	62.87
All round approach and rejects socio economic and geographical disputes	f	148	44	8	-	-	200	XII
	fw	740	176	24	-	-	940	62.67

Source: *Field Survey*

Likert scale: SA - Strongly Agree, A - Agree, N - Neutral, DA - Disagree, SDA - Strongly Disagree

Weights : 5 + 4 + 3 + 2 + 1 = 15
Weighted average = Total / sum of weights

Table – 3 indicates data about benefits of XR technologies. These benefits vary from global teleportation to all round approach and rejects socio economic geographical disputes. To measure the benefits of XR technologies weighted arithmetic mean statistical tool was performed "WA" highlights about the relative importance of benefits which are stated in the table. The ranking was awarded based on the strength of 'fw. Further, 'fw' is divided by the sum of 'w' (5 + 4 + 3 + 2 + 1) = 15. Accordingly the first relative important rank was awarded to engages all students, the second rank was given to breaks physical barriers and third rank was awarded to time machine effect allows students to travel in time. The remaining statements were ranked depending upon the strength of 'WA'.

Table – 4: *Application of XR Technology in Education*

Field of application	Extent of participation				XRI	Rank	x^2	TV @ 5%	df	Result of x^2	"c"	Result of C
	SA	A	N	SD								
Immersive learning technology aims to give student virtual success	138	60	2	0	720	7	252.96	7.815	3	Significant	0.74	High Degree
Hands on lab practices for engineering students problems solved by virtual lab to distance learners	120	65	4	11	684	9	175.24	7.815	3	Significant	0.68	High Degree
VR based lab allows students to learn frim their mistake without damaging machinery	140	50	5	5	725	5	243.00	7.815	3	Significant	0.74	High Degree
VR provides the user with the perception of being physically present in a non physical world	145	55	-	-	745	2	281.00	7.815	3	Significant	0.76	High Degree
VR provides ways for trading centric to educate their students in an immersive learning environment	130	58	8	4	780	1	206.88	7.815	3	Significant	0.71	High Degree
VR application in physics was developed to visually present neutrino data	122	78	-	-	722	6	219.36	7.815	3	Significant	0.72	High Degree
XR is used in medical learning patient treatment, medical marketing, educating the people about a disease	130	55	15	-	715	8	203.00	7.815	3	Significant	0.70	High significant

Nuclear engineering students can now enter the reactor and operate	128	43	12	17	682	10	173.32	7.815	3	Significant	0.68	High degree
XR provides a new space to access the educational space	150	45	-	5	740	3	291.00	7.815	3	Significant	0.76	High Degree
XR technologies connect remote learners in an virtual environment designed to recreate a physical classroom	145	43	8	4	729	4	259.08	7.815	3	Significant	0.75	High Degree

Source: *Field Survey*
Note: *XRI – Extended Reality Index*

Table – 4 depicts data about application of XR technologies in education. XR1 was computed by multiplying weights and Likert scale. The sum XRI was obtained and ranked as per strength of XRI. The first rank was awarded VR provides ways for training centric to educate their students in an immersive learning environment. The second rank was awarded to VR provides the user with the perception of being physically present in a non physical world and the third rank was awarded XR provides a new space to access the educational space. The remaining field of application statements were ranked depending upon the strength of XRI. All the statements shows significant and high degree of relationship and hence all statements rejects H0 and accepts H1.

Table – 5: *Challenges of XR technologies*

Types of challenges	SA	A	SWA	RT	RT^2
Heterogeneous uses	45	18	4	67	4489
Privacy and security	28	10	2	40	1600
Legal concerns	10	2	1	13	169
Effects on health	10	4	1	15	225
Staff support for match making or needs and content	9	5	1	15	225
Danger of behavioral modeling simulation sickness eco system, reality blurring may exist	8	2	2	12	144
Not easy enough for fast production by most users and especially faculties.	8	3	1	12	144
Quality control of physical experiences	9	4	2	15	225
High cost	8	2	1	11	121
Total	135	50	15	200	7342

Source: *Field Survey*

Note : SA - Strongly Agree, A - Agree, SWA - Somewhat Agree, RT - Row Total

$SSR = \Sigma RT^2 - (\Sigma RT)^2 / N = 7342 - (200)^2 / 9 = 7342 – 4444.44 = 2897.56$

$W = 12 \times SSR / K^2 N (N^2 - 1) = 12 \times 2897.56 / 9 \times 9 (81-1) = 34770.72 / 6480 = 5.37$

Test the significance of W by using the chi-square statistic.
x^2 = k (n-1) w = 3 (9-1) 5.37 = 3 x 8 x 5.37 = 128.88

Decision

At 8 d.f. with 0.5 level of significance the TV = 15.507. The calculated value being 128.88 higher than the critical table value and hence 'w' fails to accept H_0 and accepts H_1. Therefore it is concluded that there exist significant relationship between the challenges and XR technologies

Table – 5 reveals data about challenges of XR technologies. These challenges vary from heterogeneous user to high cost. Out of 135 respondents 135 stated strongly agree, 50 agree, 15 somewhat agree. Out of 135 respondents who said strongly agree 45 said about heterogeneous users, 28 spoke about privacy and security, 10 each about legal concerns and effects on health. Further, 9 each felt about staff support for match making of needs and content and quality control of physical experiences, 8 each regarding danger of behavioural modelling simulation sickness, ecosystem etc., and not easy enough for fast production by most users and especially faculty. Out of 50 who said agree 18 spoke about heterogeneous users, 10 about privacy and security and 5 about staff support for match making of needs and content. Out of 15 who said somewhat agree 4 spoke about heterogeneous users and 2 each about privacy and security and danger of modelling simulation sickness, ecosystem, reality blurring may exist. Further 2 more spoke about quality control of physical experiences. "W" fails to accept H0 and accepts H1 and hence it is concluded that there exist significant relationship between challenges and technologies.

Summary, discussion and findings

The major intention of the present study is to know how far the demographics impact the study on XR technologies. Further, this study also aimed at studying the challenges of XR technologies, benefits of XR technologies, application of XR technologies and application of XR technologies to the field of education. The socio economic characteristics except gender reveal significant and high degree of relationship. The major application of XR technologies found in area of remote work, marketing, training and retail. ANOVA fails to accept H_0 and accepts H_1 and hence there exists significant variation in the data. Further, the study reveal about the ranking of WA and accordingly the first ranking was awarded to engages all students, the second rank was given to breaks physical barriers and the third rank was awarded to the time machine effect allows students to travel in time. The application of XR technology in education found very much in the area of VR provides ways for training centres to educate their students in an immersive learning environment and for this first rank was awarded based upon XR Index (XRI), the second rank was awarded to VR provides the users with the perception of being physically present in a non physical world and the third rank is awarded XR provides a new space to access the educational space. The major challenges faced include heterogeneous users, privacy and security aid effects on health, staff support for match making of needs and content and quality central of physical experiences. The survey technique was performed and respondents were met in respective colleges and data was gathered. The participants belongs to Yelahanka subdistrict of Bengaluru Urban District and includes both old and new towns. The findings of the study is presented, analysed and discussed by using appropriate qualitative techniques like x^2, contingency co-efficient, weighted arithmetic mean, ANOVA, Kendall's Coefficient of concordance and XR Index.

Conclusion

The development of science and technology encourages the educators to continuously explore and apply new technology, methods and practice in teaching, so as to further develop the quality and efficiency of education. XR technologies has impacted the people experience the physical and virtual environments from observation of immersion (Stephanio Hui - Wen Chauh. 2019). XR – the next generation computing platform has changed the way work is executed, learn, connect, a play by bridging the physical world to a digital one (Rauschnabel et al. 2017). Teachers may require to undergo experience to install XR technologies in the classrooms. The effectiveness XR depends upon the realism of the simulation, use of hardware and software, providing something not available any other way enhances in learners time on talk. The demographics of the participants reveals a significant variation and except gender showing high degree of relationship. XR application is found in remote work, education, marketing and retail. Furthermore, the study found the benefits like engages all students breaks physical barriers and the time machine effect allows students to travel in time. The application in education sector is found that VR provides ways for training centric to educate their students in an immersive learning environment, VR provides the user with the perception of being physically present in a non-physical world and XR provides a new space to access the educational space.

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