

AUGMENTED REALITY-BASED CONCEPT MAP FOR IMMERSIVE ENGLISH LANGUAGE LEARNING

Kalapoorna Nalla, Prajna Pani

Research Scholar, Centurion University of Technology and Management, India kalapoorna@cutm.ac.in
Centurion University of Technology and Management, India, prajna.pani@cutm.ac.in

ABSTRACT

The pandemic has become a catalyst to the rapid transformation of the education system where several innovative approaches and systems have been developed in a short time. AR has risen to the occasion as one of the immersive technology tools to augment learning especially in this age of Education 4.0. With the development of ICT in education to make English classes more engaging and interactive, AR is proving to be a strong tool to improve the English language skills of the students. The correct and judicious usage of the tool, would motivate the students to learn the skills of English in a fun-loving manner in a non-threatening environment. This paper discusses the outcomes of a pilot study conducted in one of the English medium schools of Odisha, India, where the content creators and instructional designers collaborate with the educators and the technical personnel to integrate immersive experiences into the curriculum. Training was given to the teachers who participated in the pilot study regarding the usage of the EducART App, a tool for experience management. The paper reflects on an AR-based concept map for immersive English language learning based on the experience of the students, teachers and administrators. The paper also reiterates the importance of the presence of a teacher who facilitates the learning whereas, augmented reality is a tool through which learning is accentuated and becomes more effective.

Keywords: English; Language; Teaching; AR; Immersive

1. INTRODUCTION

The best way to predict future is to invent it – Alan Kay (2008).

The current practices and teaching methodologies in school have challenges in teaching and learning English language. The New Education Policy 2020 accentuates learning to be experiential through integrated pedagogy and technology and promoting peer tutoring. Mobile Ar is one of the most impactful technologies in the next decade, with powerful mobile devices becoming more affordable (Alakarappa et al., 2017). It is a technology of the new generation that allows users to experience video, picture, audio, 3D objects by scanning a picture on mobile devices (Ro et al., 2018). The pilot study synthesises main findings pertaining to the immersive learning and curricula integration in language teaching and learning in the English medium schools of a tribal district in Odisha. The pilot study was initiated to understand the current practices and teaching methodologies at the school, determine the gaps and challenges of digital learning

from the perspective of teachers and how immersive learning can help address some of these challenges. For the purposes of this pilot study, teachers of three different subjects (English, Mathematics and Science) and twenty students were identified. Purposive sampling method was used for the identification and selection of research subjects. The research was done in four phases: (1) reflection on language learning approaches beginning from the classical period to the disruptive period (2) experience management and immersive learning (3) train the trainers (4) pilot study and major findings. The paper is aligned to the national education policy of India (NEP 2020) guidelines that recognises the importance of leveraging the advantages of technology. The emphasis is on curricular integration of essential subjects, skills, and capacities. The findings were encouraging where 70% of the respondents accepted and agreed that the experience management system platform is able to engage students in immersive tech in a valuable way. Whereas the remaining 30% of the respondents found the use of the platform challenging due to the mobile configuration issues and low internet connectivity. The study shows that there is a future in the augmented reality platform where learning is immersive and inclusive.

2. LITERATURE REVIEW

Language learning approaches from the classical period to the disruptive period have been discussed.

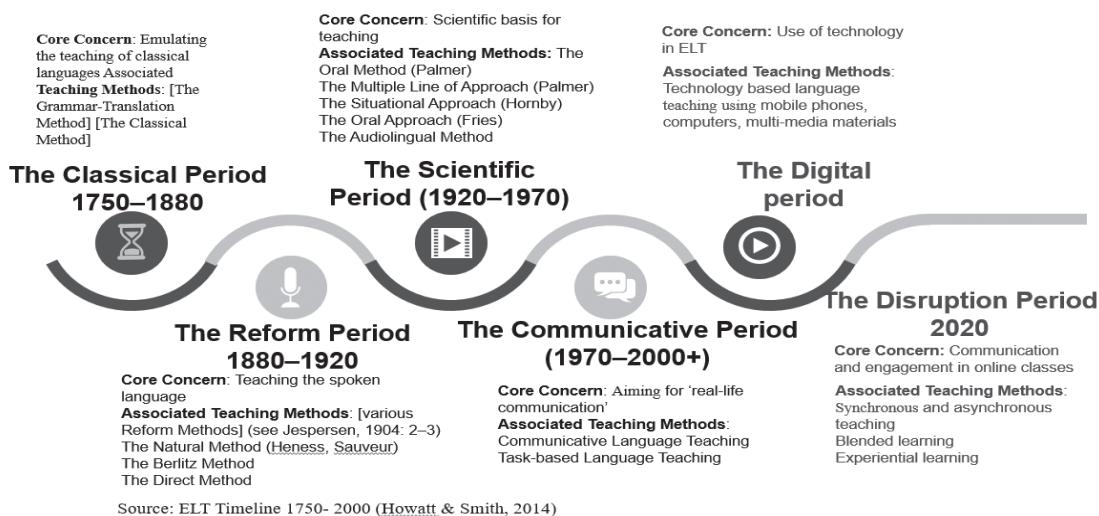


Figure 1: ELT Timeline 1750 -2000 (Howatt & Smith, 2014)

The timeline of English Language teaching gives an overview of its historical developments over the last 250 years. As the name suggests it is based on periods and not on methods. The Classical Period from 1750 to 1880 emulates the teaching of classical languages where the associated teaching methods included the Grammar-Translation Method. The Reform Period from 1880 to 1920 teaches the spoken language through the Natural and Berlitz method. Grammar was dealt with in an inductive manner. The spoken language was actually the spoken version of the written text. In these ways conversations were taught. The Direct Method of teaching English was also prevalent at this time. The Scientific Period from 1920 to 1970 witnessed the

scientific basis of teaching through oral works, creating situations, drilling exercises, also using audio-visual and audio-lingual methods. The Communicative Period from 1970 to 2000+ aimed for real life communication. In this period language teaching became task-based and communication-based. The Digital Age which started in 2000, uses technology in English language teaching using mobile phones, computers and materials relating to multimedia. The period from 2020 has been rather disruptive. The engagement of students in online classes has been very challenging and threatening to the teachers. The associated teaching methods have been synchronous and asynchronous, blended learning and experiential learning. These give an impetus to the experience management system.

Owing to the fast escalation of highly developed educational technologies, the traits of teaching and learning milieus have undergone considerable changes (Chang et al., 2015). As it is observed, the educational sectors are also impacted by the technology-supported teaching and learning process. Though teachers around the world still employ the chalk and board method of teaching, technical aids are also effectively employed often in smart classrooms (Jo & Lim, 2015) throughout the world to sharpen the teaching and learning process. Accordingly, the terms 'digital learning' (Garavaglia et al. 2012; Akyuz & Yavuz 2015) and 'Information and Communication Technology (ICT) learning' (Gunuç & Babacan 2017; Alemi 2016; Markauskaite 2003; Raudeliūnienė et al. 2018) have occupied a prestigious place in education. Acquiring Digital and ICT methods of teaching and learning are effective in accelerating students' education (Kayimbasioglu et al., 2016). Such technology-supported teaching and learning processes are the core concepts of Education 4.0. These sorts of tech-based teaching and learning experience provide self-learning opportunities at a student's own pace. The Industrial Revolution 4.0 provides the advent of the digital age, and claims that educational institutions embrace an education revolution too. Education 4.0 provides the notion of teaching and learning innovation and uses information and technology in its processes (Anggraeni 2018; Gulicheva et al. 2017).

Content and Language Integrated Learning (CLIL) has become the umbrella term describing both learning another (content) subject such as science or mathematics through the medium of a foreign language and learning a foreign language by studying a content-based subject. CLIL assumes that subject teachers are able to exploit opportunities for language learning. CLIL draws on the lexical approach, encouraging learners to notice language while reading. Integrating English to learn the other subjects makes the students to comprehend the language better.

E-Learning has introduced new approaches to instructional delivery where the roles of teacher and student have significantly changed. The integration of information and communication technologies into the education field is in constant progression and generates empirical approaches for educational environment design.

Augmented Reality (AR) gives an experience and opportunity to the learner to explore, engage, be excited, feel enabled and finally be educated of the concept being taught. A combination of a real scene viewed by a user and a virtual scene generated

by a computer that augments the scene with additional information creates interest in the learner. It adds virtual computer generated objects, audio and other sense enhancements to a real-world environment in real time thus enhancing performance and perception. It makes learning immersive and can be easily used on mobile devices without any special equipment. Content created using Augmented Reality holds the attention of the students in their regular schedule (Vadapalli, 2020). AR gives motivation to the students and they can engage themselves into a number of activities assigned by the teacher in a lively and happy manner. It has been observed that students using AR applications are more motivated and acquire the English language skills better when compared to the learning of the language through traditional methods (Wang D, et al., 2021).

Immersive learning sustains the attention and engagement of a student eradicating ubiquitous distractions in today's technology world. It uses an artificial or simulated but a safer environment and simplifies abstract learning scenarios. Galvanising virtual environment, it is interactive, based on a learner-centric model and advocating the Experience Management System.

Perceived usefulness and perceived ease of use can be followed to motivate people to embrace technology (Pani, 2020). The ease can be easily obtained by downloading the EducART app. The app is a dedicated tool for students and teachers to explore immersive learning content in the form of AR experiences. It helps students to understand and teachers to explain by helping students to visualise difficult and complex concepts. The app once downloaded on the mobile, uses the device camera to scan a target marker which triggers an AR experience. It also uses the Markerless technology where objects are placed virtually a surface.

The Experience Management System is a platform where the operational database of the AR is connected with the feedback of the users helping to identify and improve the experience gaps by analysing the emotions and beliefs for a holistic experience.

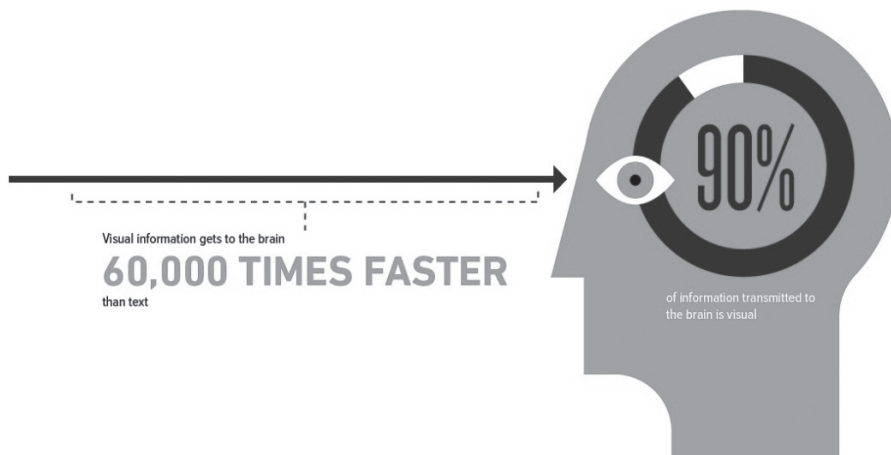


Figure 2: We are more visually wired (MacCoy, 2019)

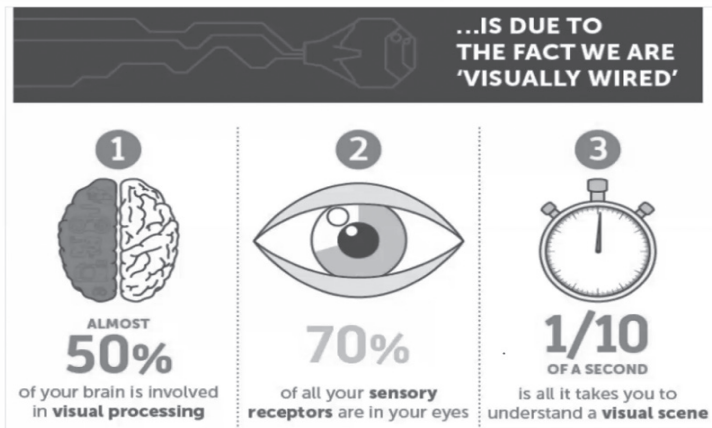


Figure. 3: A synopsis of how we are visually wired (Desjardins, 2016)

Figure 2 and Figure 3 give a visual expression as to how the human brain is wired visually (Desjardins, 2016 & MacCoy, 2019). Thus, the AR becomes an ideal medium through which learning becomes more impactful.

OBJECTIVES

- To observe the effectiveness of EduCart App, a tool for experience
- To incorporate immersive learning experiences to the curriculum in school
- To design an AR-based concept map for immersive teaching and learning

3. METHODOLOGY

A Pilot Study was conducted in 6th standard in one of the English medium schools of Odisha, India where teachers of three different subjects (English, Mathematics and Science) and 20 students were identified. The lesson plans were shared with the content creators so that the assets could be prepared for the immersive learning.

The aim of the research was to integrate English Language Teaching and Learning into other subjects as per the National Education Policy (2020). This integration of subjects helped the students to understand and learn the language more effectively.

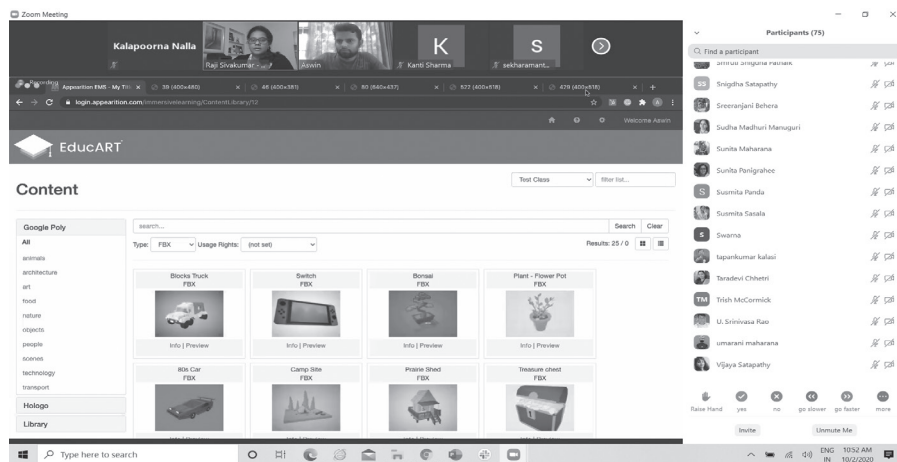


Figure 4: Training was given to the teachers and students as to how to use the EduCart app

A focus group discussion was conducted to find the teaching methods and digital tools that the school is currently using. The main purpose was to gain a better understanding of the effectiveness of such tools in achieving the learning outcomes and explore how immersive experiences can further amplify the student's ability to understand complex concepts. A survey link was shared to be answered by students to understand their needs. There was a process and system walkthrough followed up by a discussion on the lesson plan and teaching methodology. Login credentials were shared with the teachers and content designers to explore different content assets that are available for their use. During this pilot project the participants underwent training on how to create and set up experiences on the platform using different types of media such as 3D Objects, videos, web links, and text. The following questions were taken into consideration while designing immersive experiences:

RQ1. Are immersive experiences the best option?

RQ2. How will students demonstrate what they have learnt?

RQ3. Can they be integrated into existing lessons and activities to enhance the learning experiences?

Pilot Project

The project status and the project timeline were on track with no concerns. The following observations were made:

1. Teachers needed further guidance of the Experience Management platform on the UI/UX component of the 3D models. This is to ensure that students can easily interact with the experiences and be more engaged.

2. The majority of the students used mobile data. Downloading a fully online app like EducART 3D might consume a lot of their data. The Experience Management System suggested to continue using EducART Pro App for the pilot as it is a smaller file in size. However, this means that the students have the internet during the pilot sessions. During deployment, a mix of online and offline capabilities may be considered to address the needs of the teachers and the students.

3. The mobile device of the Science teacher of Grade 6 did not support AR Core, which means the teacher cannot augment markerless experiences. This might be true for most students as well. The Experience Management System provided guidelines on minimum basic hardware requirements that the System can support.

4. The school team explored the use of the content in multiple sessions to get more meaningful feedback from the students.

Immersive Learning Integrated into Lessons and Activities:

Immersive Learning in English Class

A story cube was prepared for the English Class. It had target markers on each side of the cube to reveal the story, as well as give more information about the characters in the story. The story cube was designed and shared with the students. This was a way to engage the students more in the learning (as shown in Figure 5).



Figure 5: The sides of the cube have video and images to make the lesson more interactive

Immersive Learning in Science Class

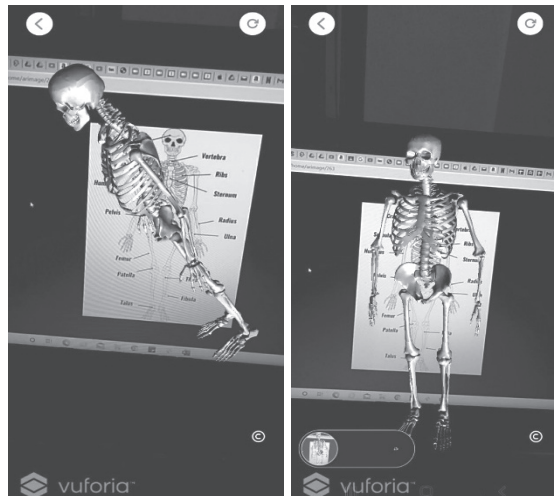


Figure 6: AR of the skeletal system

The Science teacher who always used to find it difficult to teach the skeletal system to the Grade 6, found it easy and engaging for the students through the AR.

Immersive Learning in Math Class

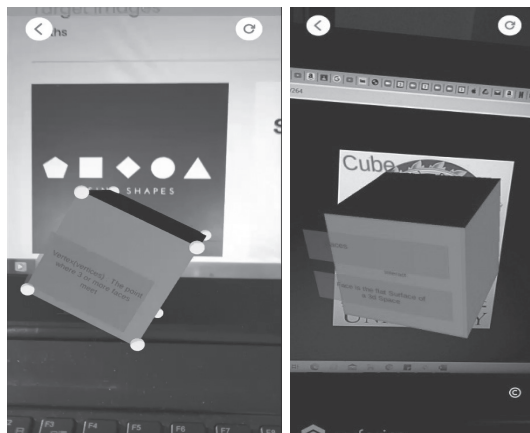


Figure 7: AR of the 3D models of the shapes

The Math teacher always felt challenged to explain the concept of the 3D forms of the various shapes.

Ethical considerations were taken into account when conducting the pilot study. The permission was duly taken from the principal of the school, the concerned subject teachers and the students involved in the pilot. The names and the identity of the participants have not been revealed anywhere.

Observations:

The following observations were made during the pilot project:

- Teachers understood how to incorporate AR in their existing lesson plans
- Teachers and students were excited to use AR as an immersive technology in their lessons
- There was immense engagement of the students contributing to the learning outcomes
- Students understood the language through the AR models hence improving their vocabulary
- Students gave demo sessions to their peers to explain the difficult concepts using improved language

4. FINDINGS:

The paper discusses the main findings of the pilot study on augmented reality for immersive English learning.

Objective: To observe the effectiveness of EduCart App, a tool for experience

RQ1: Are immersive experiences the best option?

The teachers and the students agreed in their feedback that the immersive experiences are effective in teaching and understanding concepts that are otherwise difficult to teach and understand.

RQ 2. How will the students demonstrate what they have learnt?

The students felt empowered when they used the app and learnt on their own through the Experience Management System. They even ventured into peer teaching which consolidated their own learning. Using the language English to explain difficult concepts improved their vocabulary and comprehensive skills.

Feedback was collected from the teachers as well as the students through a questionnaire. It was interesting to note the feedback.



Figure 8: A synopsis of the feedback from the students

The following are the points of feedback shared by the students:

- Seventy percent of the respondents accepted and agreed that the experience management system platform is able to engage students in immersive tech in a valuable way.

- Whereas the remaining 30% of the respondents found the use of the platform challenging due to the mobile configuration issues and low internet connectivity.

- The comprehensive skills of the studnets were enhanced.

As for the feedback from the teachers, 100% of them supported the integration of immersive technology and augmented reality in teaching and learning (Figure 10).



Figure 9: Recommendation of the teachers for AR

The points of feedback shared by the teachers were as follows:

- His/her teaching benefited from using EducART.
- Through AR, the teacher was able to make the students understand the 3D form of difficult shapes like hexagon, oval, etc.
- Student engagement seems to have benefited from using EducART.
- Student demonstrated understanding of the topic when using EducART.
- The language skills improved as there was a sense of motivation.
- EducART is easy and intuitive to use.
- The user is somewhat satisfied with the ease and amount of time spent for integrating it into lessons.
- There were sufficient and appropriate training opportunities.
- Augmented reality is effective and important in meeting his/her teaching need.

The subject teachers in their feedback on the pilot class expressed their joy as the learning outcomes were realised with ease and effectivity. The concepts which were challenging for the teachers to take to classes were handled with a lot of interest and engagement. The students found the classes extremely grasping and learnt the concepts very quickly.

According to the Science teacher, “It’s user-friendly. Hence, it allows children to operate with ease. And by this it helps them to explore on their own.” According to another teacher, “It is interesting and very useful to make the concept clearer to the students.”

Objective: To incorporate immersive learning experiences to the curriculum in school

RQ3: Can the immersive experiences be integrated into the lessons and activities to enhance the learning experiences?

The content creators created assets and experiences in collaboration with the teachers and the instructional designer.

The findings of the pilot gives scope to incorporate immersive learning in the curriculum. They are as follows:

- The learning outcomes were realised with ease and effectivity.
- The concepts which were challenging for the teachers to take to classes were handled with a lot of interest and engagement.

- English language was easily integrated in learning other subjects
 - The students found the classes extremely grasping and learnt the concepts very quickly.
 - The language used by the students had new vocabulary
 - The students willingly and enthusiastically participated in the interactive sessions
- Objective: To design an Ar-based Concept Map for immersive teaching and learning
- The findings of the pilot study have been used as the basis for the designing of the Concept Map.

The Experience Creator or content creator is an important role in the ecosystem of integrating immersive technology into a curriculum. In this role, the content creator worked with the educators in terms of understanding their lesson plans and teaching strategies. The content creators used the Experience Management System Platform to develop experiences that are relevant and specific to learning outcomes. Whilst not fully a technical role, there is a level of technical understanding needed.

There was an introduction session with the team of the experience management system where the educators got an opportunity to understand the mechanism of the platform which would assist them in their teaching of complex ideas. When ‘Thinking’ and ‘Doing’ combine then ‘Learning’ happens



Figure 10: Screenshot of the session to show the relationship between Thinking and Doing

Figure 11 shows the collaborative process and method elucidating the benefits of using the Experience Management System.

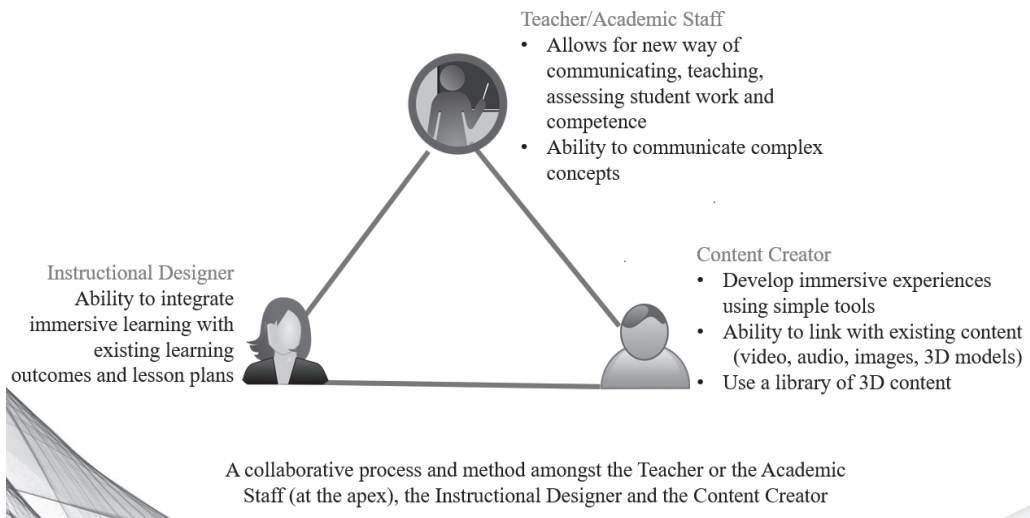


Figure 11: Concept Map

The pilot study justifies the concept map for English Language Learning as shown in Figure 11. The Teacher or the Academic Staff, the Instructional Designer and the Content Creator are for creating immersive learning for the students through AR. Each plays a role for creating a better experience and hence the collaboration of the three adds a lot of value to the acquisition of the skills of the language English.

5. CONCLUSION

The pilot study has brought forth the effectiveness of AR in learning. The use of English language to understand and to explain have been enhanced. The integration of the subjects have been useful in learning and using the vocabulary of the language. The students peer tutored through the app giving them confidence in the use of the language.

Immersive technologies are best used hand in hand with educators. Immersive technologies complement and bring rich interactive content into the hands of the students.

- Based on the pilot study conducted, the findings show that AR, new in the educational institutions, is going to be the new normal.
- Despite the challenges, it needs to be adopted by the educational institutions as one of the ways to improve English language skills in various concerns.
- Educators need to learn and understand the potential benefit in using immersive technology to elevate the learning graph.

The research has been done in one school. There is a scope for the research to be conducted in more schools not just in Odisha but in different states of India.

Acknowledgements

We acknowledge the help of the Centurion University of Technology and Management, Odisha to conduct the pilot study. Our deep sense of appreciation goes to the students and teachers of Centurion Public School.

REFERENCES

- A. P. R. Howatt & Richard Smith (2014). The History of Teaching English as a Foreign Language, from a British and European Perspective, *Language & History*, 57:1, 75-95, DOI: 10.1179/1759753614Z.00000000028
- Anggraeni, Candradewi Wahyu. 2018. Promoting Education 4.0 in English for Survival Class: What are the Challenges? *Metathesis-Journal of English Language, Literature, and Teaching* 2: 12–24.
- Chang, Hsin-Yi, Chia-Yu Wang, Min-Hsien Lee, Hsin-Kai Wu, Jyh-Chong Liang, Silvi W. Y. Lee, Guo-Li Chiou, Hao-Chang Lo, Jing-Wen Lin, Chung-Yuan Hsu, and et al. 2015. A Review of Features of Technology-Supported Learning Environments based on Participants' Perceptions. *Computers in Human Behavior* 53: 223–37.
- Jo, Jaechoon, and Heuseok Lim. 2015. A Study on Effectiveness of Smart Classrooms through Interaction Analysis. *Advanced Science Letters* 21: 557–61.
- Garavaglia, Andrea, Valentina Garzia, and Livia Petti. 2012. Quality of the Learning Environment in Digital Classrooms: An Italian Case Study. *Procedia—Social and Behavioral Sciences* 46: 1735–39.

- Gulicheva, Elena, Evgeny Lisin, Marina Osipova, and Asset Khabdullin. 2017. Leading factors in the formation of innovative education environment. *Journal of International Studies* 10: 129–37.
- Wang, D.; Md Khambari, M.N.; Wong, S.L.; Razali, A.B. Exploring Interest Formation in English Learning through XploreRAFE+: A Gamified AR Mobile App. *Sustainability* 2021, 13, 12792. <https://doi.org/10.3390/su132212792>
- Akyuz, Serhat, and Fatih Yavuz. 2015. Digital Learning in EFL Classrooms. *Procedia–Social and Behavioral Sciences* 197: 766–69.
- Gunuç, Selim, and Nuri Babacan. 2017. Technology Integration in English Language Teaching And Learning. *The Journal of Teaching English for Specific and Academic Purposes* 5: 349–58.
- Kayimbasioglu, Dervis, Bora Oktekin, and Huseyin Haci. 2016. Integration of Gamification Technology in Education. *Procedia Computer Science* 102: 668–76
- Markauskaite', Lina. 2003. Critical Review of Research Findings on Information Technology in Education. *Informatics in Education* 2: 65–78.
- Raudeliunienė, Jurgita, Vida Davidavičienė, and Arturas Jakubavičius. 2018. Knowledge management process model. *Entrepreneurship and Sustainability Issues* 5: 542–54.
- McCoy Erin, 2019. <https://killervisualstrategies.com/blog/how-our-brains-are-hardwired-for-visual-content.html>
- Desjardins Jeff, 2016. 13 Scientific Reasons Explaining Why You Crave Infographics, <https://www.visualcapitalist.com/13-scientific-reasons-infographics/>
- Pani Prajna & Ray Anubha, 2020. Where Do We GO from Here and How, *Gedrag & Organisatie Review* - ISSN:0921-5077, Volume 33 : Issue 02 – 2020, <http://lemma-tijdschriften.nl/>
- M. Suresh & Vadapalli Lakshmi , 2020. Role of Augmented Reality in English Language Learning Environment, *Journal of Critical Reviews*, ISSN- 2394-5125, VOL 7, ISSUE 19, 2020
- Alakärppä, Ismo, et al., 2017. “Using Nature Elements in Mobile AR for Education with children.” *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*, 2017.
- Ro, Young K., et al., 2018. “Augmented Reality Smart Glasses: Definition, Concepts and Impact on Firm Value Creation.” *Augmented Reality and Virtual Reality*, edited by Timothy Jung, Springer, 2018, pp. 169-181.