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The Utilization of VR 360-Degree Videos on Immersive Educational YouTube Channels: A New Dimension in Learning

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Abstract:

The creation of the futuristic Metaverse, which seeks to connect users& EduTubers from everywhere and at any time, is being driven by advanced video technology. The incorporation of 360-degree videos on educational YouTube channels adds a layer of interactivity and immersion that traditional videos cannot match, that is characterized by unpredictable user actions, which present both potential and obstacles, as it has two types: non-VR and VR 360° videos. The purpose of the study is to utilize the uses of 360-degree YouTube Kids Videos by analyzing seven 360-degree Educational YouTube channels for kids to explore the immersive interaction on these videos by users' engagements, using qualitative content analysis too. The results found that 360-degree educational 2D animated videos especially songs for nursery and KG have the highest user engagement and views.

Keywords: 360-degree videos, EduTubers, Engagements.

Introduction

In the digital age, education is undergoing a transformative shift as technology continues to reshape traditional teaching methodologies. The tendency to opt for visual aids over text formats among the younger generations stands out (Robles, N., & Barrio, V., 2020). The modern society demands that formal and informal educational settings have access to teaching theories that are appropriate for the learning ecologies brought about by the new digital spaces (Monsalve & Aguasanta, 2020).

YouTube, as one of the world's most popular video-sharing platforms, has evolved from being a mere entertainment hub to a versatile educational resource. In order to bring together them and foster a sense of community, YouTube hosted the YouTube EduCon conference in 2018 and pledged to invest twenty million dollars to support educational video creators. As, the COVID-19 pandemic forced academic institutions to incorporate materials from open sources like YouTube (Lopez, et al., 2022).

Educational content creators on YouTube are leveraging its wide reach and accessibility to deliver instructional materials to diverse audiences. According to Google (2019), YouTube is growing in popularity as more than a million educational videos on the site receive more than one billion daily views. The incorporation of 360-degree videos on educational YouTube channels adds a layer of interactivity and immersion that traditional flat videos cannot match. Learners can explore environments from different angles, essentially being placed at the center of the learning experience. Google Cardboard was what made 360° videos available (Curcio et al., 2016). As the name suggests, it is a straightforward cardboard device (plastic HMDs that are also compatible with cardboard are also common), with two lenses for the user's eyes, into which a smartphone is inserted (Hussein & Nätterdal, 2015).

Literature reviews:

1- The spread of EduTubers phenomenon:

Literature indicates that YouTube is chosen by educators as a preferred learning platform (Srinivasacharlu, 2020), highlighting it as an opportunity for innovation (Anchundia, 2020), and using it within class implementations, or as a complement to this (Tella, et al., 2020). Teachers have given this platform a positive evaluation of its use (Garca-Martn & Cantón, 2019). Additionally, it is feasible to confirm that teachers frequently use YouTube videos for educational goals (Anchundia, 2020), or to increase students' motivation to learn (Ozudogru, 2020), especially those from social minorities or places with low Income (Peppler, et al., 2020).

From a conceptual (Jena, et al., 2020) or procedural (Koto, 2020; Rodgers, et al., 2020) perspective, the literature demonstrates that the educational use of YouTube videos promotes the achievement of subject objectives and academic performance in the sciences (Physics, Chemistry,

and Biology) (Bohloko, et al., 2019; Leonard, 2020; Rose, et al., 2019), Moreover, Lim, et al., 2016, p. 57; Jung & Lee, 2015) suggest that online educational video seems to be common among university students, they regularly and purposefully search YouTube educational channels to learn how to solve certain issues and find solutions. Meanwhile, we must take into consideration that there is a huge difference between the YouTuber and EduTuber. According to Lopez Aguilar (2017), a ''YouTuber'' is a person who is in charge of creating videos and managing his channel. He or she also contributes to the influencers and other individuals who, as a result of their position in the network, have appropriate influence over audiences. They choose some of the themes that are most well-liked by viewers, such as vlogs, video games, or tutorials (Martinez, et al., 2018). While "Edutuber" referrers to Educational YouTubers (Pattier, 2021).

On the same context, Science on YouTube: Successful Edutubers is an article written by Pattier in (2021) based on his analysis of 41 educational YouTube channels that teaches science. The study suggests that youtubers' participation in other social networks contributes to the success of the channels under study, as 85.4% of them are also active on Twitter, 68.3% are on Instagram, and 78% are on Facebook. Higher levels of reciprocity are also apparent among educhannels that target the same audience, probably as a result of these audiences having fewer specialized educhannels (Kaiser & Rauchfleisch, 2020). Another study made by Quintana et al., (2022), called Nano-Influencers Edutubers: Perspective on Centennial Generation Families in Spain, which include 1,228 questionnaires, also 20 of them was examined as a sample of the empirical data, as it was noticed that the majority of teachers (59.4%) approves with the trend of teaching tools, while 40.6% of respondents claim that teachers don't have or don't use a YouTube channel during educating. Although there is a huge gender gap among Edutubers.

According to Regueira et al., in (2020), number of existing EduTubers originates from the teaching profession and that women include (66.6%) of those who work within this sector. In contrast, a study called The Gender Gap among Edutubers and the Factors Significantly Influencing It; found that the male EduTubers higher than female EduTubers including (76%), while female (24%) (Pattier, 2021). The study claims that the reason for that the women typically display themselves to a lesser extent, and provide fewer videos; As, they choose to collaborate with other EduTubers to create channels more often than men; and they resort less frequently to using the community function of channels which permits an interaction with the audience.

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Moreover, women clearly show a preference for long shots over close-ups in their videos. And unlike males, they less frequently maintain connections to other YouTube channels that create a network among the EduTubers themselves. On the same context, women used to edit fewer videos, have a tendency to utilize close-ups less frequently, do not employ humor as frequently as males in their multimedia resources, and use kid's language more frequently than men.

While, Verdu, et al., statistics for the most popular YouTube channels in (2020), show an opposite pattern in terms of these factors, with YouTubers typically adopting a humorous and approachable demean our, using a youthful or standardized language, attempting to appeal to a wide general audience, also creating a clear resource editing process so that their audience can spend more time watching (Rodgers et al., 2020; Long & Waugh, 2016).

Other literature examines the advantages of focusing on Edutubers' knowledge, skills, and attitudes (López, Maza-Córdoba & Tusa, 2020), analyses the statistical information provided by YouTube (Saurabh, & Gautam, 2019), suggests rubrics to analyze and evaluate videos (Neumann & Herodotou, 2020), and provides guidelines for the creation of videos based on competencies and didactic content (Rodgers et al., 2020).

2- The use of VR 360- degree Environment in Education:

Educators were figuring out how to use the current slate of instructional tools to engage students in meaningful ways (Adedoyin & Soykan, 2020). As it serves as a supporting technology for the emerging Metaverse concept (Makransky, et al., 2019), as VR 360-degree videos appear to be a fascinating answer. So, the development of 360° videos has exploded in recent years. It attracted a lot of interest and is being thoroughly investigated in a variety of multimedia applications, from games to education. Some of the first VR 360-degree environment experiences students had been historical in nature, such as archaeological, museum, also field trips to distant sites (Harrington, 2009; Klippel et al., 2019). According to Ardisara & Fung in (2018), VR 360° videos are starting to gain acceptance in several fields where a high level of realism is required such as health sciences, biology, and engineering, as well as in education .

As, studies show the important of relying on educational VR Environment videos (Jlala et al., 2010; Pinsky and Wipf, 2000; Brown, et al., 1997), as employing a brief informational video featuring a patient who is undergoing surgery to educate patients about elective surgery under regional anesthesia decreases patients' anxiety and has benefits in terms of time efficiency, usability, and accessibility (Jlala et al., 2010). Meanwhile, users find VR 360° videos to be easy to use because navigation is accomplished by focusing on embedded hot spots in the scene and keeping that position for approximately two seconds (Miller, & Bugnariu, 2016).

However, hand-tracking devices are thought to be an even more natural manner of interacting. VR 360- Degree videos are captured using panoramic cameras, which are able to take pictures not only from a small field of view but also from a full circle or, more precisely, from a sphere. It is remarkable how simple it is for anyone to create 360° videos with just a 360° camera and no prior experience or specialized knowledge. They undergo the same processing and editing as a typical video. Both head-mounted displays (HMDs) and mobile phones can be used by users to view those (Rupp, et al., 2016). According to Carr-Chellman and Duchastel (2001), the reason why videos work so well as both entertaining media and teaching tools is that viewers/trainees can, at least to some extent, relate to what they see in the video. As, the ability to understand an educational video rely not only on the educational material's readability but also on the narrative's ability to convey the educational concepts (Fisch et al., 2001).

3- The Effect of VR 360- degree YouTube's educational videos:

While existing literature has explored various dimensions of user engagement and presence, the incorporation of 360-degree videos as a catalyst for these phenomena remains relatively un-explored. YouTube, being a prominent platform for video content consumption, provides an ideal backdrop for investigating the effects of 360-degree videos on user engagement and presence.

A study tried to measure The Effect of System Immersion on Place Illusion and Co-Presence in 360-Degree Video Reporting, as it found that the impression of co-presence depends on the viewing circumstance, as when we face a character in a 360-degree environment noticeably vary. Also, VR headsets succeed in this compared to mobile viewing because the more immersive the technical system, the greater the experience of co-presence (Pérez-Seijo, et al., 2022), according to Argyriou et al., in (2017), The sense of immersion and presence appear to be strong in 360° recordings because they show the real environment, not a computer-generated or virtual representation of it, as the presence is the sensation of "being here," or of existing in a virtual environment, and it is significant depends on number of reasons (Falah et al., 2014).

Another study made by Drake, E. (2022), to understand how VR influences learning in the K-12 school system may have a big impact on how educators build VR technology and software to improve students' educational experiences, as well as future VR innovations in education, as the findings showed that using VR-based instruction has the potential to contribute to knowledge improvement and memory retention. In the same context, Fokides, & Arvaniti, P.A. in (2020), evaluates the effectiveness of VR 360-degree videos when teaching primary school subjects related to environmental education, as it confirmed that 360-degree videos are an efficient way to increase the environmental awareness of kids in primary schools. Also, according to Maas & Hughes in (2020), virtual reality and augmented reality may assist pupils concentrate on their work while covid-19 shutting out distracting factors, as the success of VR blended learning in K-12, schools has created a platform for launching VR with blended learning in other learning institutions.

In related Context, the majority of studies found that 360- degree videos learning was enjoyable and increased motivation to study (Pham, et al., 2018; Ritter, et al., 2019; Lee et al., 2017; Wu et al., 2019; Xie et al., 2019). Moreover, researchers have concentrated on the higher degrees of enjoyment and amusement that 360-degree videos provide (Lee, et al., 2017) and on the factors that influence users' motivation to interact with the content (King-Thompson, 2017; Xie et al., 2019).

On the other hand, VR 360- degree videos on Youtube can reduce unnecessary cognitive load so that working memory is better used for processing information according to cognitive theory of multimedia learning (Wynder, 2018); (Mayer et al., 2001). In addition, the use of multimedia in learning has an impact on how each student's working memory functions given their varied backgrounds and linguistic abilities (Wynder, 2018). As, Hove & Meij in 2015, analyzed the physical characteristics of 75 YouTube videos that provide general factual and conceptual knowledge but are not academic in character, like lectures, that are also approved, And they discovered that the popularity of the video rises with higher resolution, more static and moving pictures more on-screen text, more subtitles in various languages, more background music, less background noise, and higher speaking rates. Therefore, using virtual reality in education has a various advantage, including interactive technology that can be used, visualization that stimulates the imagination, immersive, direct feedback, promoting learning motivation, and the ability to adapt to different personal learning patterns (Chow et al., 2017); (Proserpio & Gioia, 2007); (Sanchez-Vives & Slater, 2005); (Yusoff et al., 2011;(Zhang et al., 2017).

Despite the fact that these immersive videos are becoming a growing trend, also, have positive effects in education, research are limited in examining the effects of it on primary school students (Minocha et al., 2017; Wu et al., 2019), several researchers have noted that they may have limitations on user experience, when watching 360-degree 360 videos, users have expressed feeling queasy, uneasy, bored, or distracted. (Rupp, et al., 2016; Smith, 2015). Besides also, the technical challenges that presented such as the resolution that needs high cost, as it depends on ultra-high resolution such as ((8K, 7680 × 4320 pixels). As, the users may face challenges with the interface that will disrupt them due to images splitting into half (one for each eye) (Glaser & Schmidt, 2018).

Previous literature concluded that, VR 360-degree educational videos have emerged as a captivating and immersive tool with the potential to revolutionize educational content delivery, among the technological innovations. In addition, the convergence of 360-degree video technology and online platforms like YouTube has paved the way for the creation of immersive educational experiences that transcend the boundaries of traditional classroom settings.

Moreover, integration of 360-degree videos into educational settings introduces a novel way to engage learners by providing them with immersive, real-world experiences that enhance comprehension, retention, and critical thinking.

But, till now there is lake of study conducted about the utilization of VR 360-Degree Videos on Immersive Educational YouTube Channels as a new way for adapting education on online platforms. So, the purpose of the study is to investigate potential implications of immersive educational content for various learning styles and preferences on Educational 360-degree channels on YouTube, Also the interaction of educators on 360-degree educational videos, through views, video duration, likes, and comments.

Research Statement

YouTube is growing in popularity as more than a million educational videos on the site receive more than one billion daily views. The incorporation of 360-degree videos on educational YouTube channels adds a layer of interactivity and immersion that traditional flat videos cannot match, as learners can explore environments from different angles, essentially being placed at the center of the learning experience. So, the analysis of a statistically significant sample of possibly subject-related 360-degree educational videos is necessary to have a deeper understanding of the quality of immersive 360-degree educational videos available on YouTube. It is impossible to expose numerous students to a large number of videos in order to evaluate the quality of these videos, through the feedback from the large community of students and learners who have viewed these videos.

So, the research problem is To monitor the uses of 360-degree YouTube Kids Videos by analyzing a sample of these videos and explore the interaction on these videos by users.

Significance of the study:

This research holds significance for educators, content creators, and educational technology developers alike:

1- Delving into the efficacy of 360-degree videos on immersive educational YouTube channels.

2- Inform pedagogical practices and content creation strategies that align with the preferences of modern learners.

3- Findings can contribute to the ongoing discourse on the role of technology in education and its potential to bridge the gap between conventional and contemporary learning environments.

Objectives

1- Examine the levels of user's engagement metrics, including view duration, likes, comments, number of views, and subscription, for educational 360-degree videos on YouTube.

2- To explore the relationship between user engagement, presence, and the content characteristics of 360-degree videos, such as content type, narrative structure, and interactivity.

3- Investigate the potential implications of immersive educational content for various learning styles and preferences.

Theoretical framework

Draws from one from the field of Mass communication. **"Media richness theory"** a framework, introduced in 1984 by Richard, et al., used to describe a communication medium's ability to reproduce the information sent over it without loss or distortion as an extension of information processing theory, also its used to rank and evaluate the richness of certain communication channels. As, it asserts that task performance will increase when task-information processing requirements are matched to a medium's capacity for delivering rich information. According to MRT, rich media allow people to understand and come to a consensus about unanalyzable, challenging, and complicated subjects. In other terms, the ability of a medium to promote comprehension and shared meaning is referred to as its richness (Daft & Lengel, 1984).

According to Daft, et al. (1987) there is **four factors determine the media's richness; - Capacity for immediate feedback:** The medium enables rapid convergence on a common interpretation.

- Capacity to transmit multiple cues: More than just information or facts, interpretation and meaning can be conveyed by a variety of cues, such as physical presence, vocal inflections, body language, words, numbers, and visual symbols.

- Capacity of the medium to have a personal focus: refer to the ability to express emotions and feelings or to the medium's capacity to be adapted to the requirements and viewpoints of the receiver.

- Language variety: when formulae and numbers offer more accuracy, using natural language that can communicate a wider range of notions and ideas.

Methodology

Research Questions

RQ1: What aspects of the interaction offered through 360-degree educational YouTube videos?

RQ2: What is the content of 360- degree educational channels that has the highest viewership on YouTube?

RQ3: What are the characteristics of 360-degree educational videos on YouTube?

Research Method

Qualitative data method will be collected through content analysis for several 360-degree YouTube channels to evaluate immersive interaction of 360- degree educational channels according to content of the channels& its characteristics through the engagement levels that will be measured within view duration, interaction rates, and user feedback through comments, also number of likes& dislikes.

Tools of the study

Qualitative content analysis tool for the 360-degree educational kids channels on YouTube.

As, the Sampling will be Non-probability purposive considers, Educational kids channels on YouTube that specified 360- degree videos for children, the sample will include seven 360-dergee educational kids channels with different content and patterns .

Table 1. 360-degree YouTube kids Channels Information

Channel Name	Content Type	Channel URL
Nat Geo Wild Kids (360 videos-Nat Geo Kids playlist)	Featuring animals& exploring world	https://www.youtube.com/@natgeokids
VR 360 Kids	2D Simple Animated colorful places	https://youtube.com/@vr360kids9?feature=shared
360 * Go Happy Kids	Entertaining interactive activities& songs	https://youtube.com/@360gohappykids6?feature=shared
Math& Learning videos 4 Kids	Learning letters and math through finding objects in 360-videos	https://www.youtube.com/@MageMath/featured
Om Nom 360	Long-running kid's comedy series that depend on the primary character of the game that called (Cut the Rope).	https://www.youtube.com/@OmNomStories
360° Pinkfong and Hogi HouseTour -playlist	Not official playlist provide 360 learning songs for nursery and KG.	https://youtube.com/playlist?list=PLfeE-jHY0wc5QZwbKZz9Q0hbVy27WInYSP&-si=_PGv9mOOeyCiF02O
Sesame Street 360	Early education, critical health lessons, and content targeting vulnerable and marginalized children.	https://www.youtube.com/@SesameEducation

NB: The researcher will use YouTube Video Analytics and Reports Web site (https://views4you.com), as additional tool for collecting views and likes ratio.

Results

The Researcher analyzes the immersive engagement& overview metrics for 360-Degree Educational kids Channels on YouTube according to the following results:

Table 2. General Metrics of channels

Channel Name	Total Sub-scribers	Total Views	Total Videos	Total 360° videos
Nat Geo Wild Kids (360 videos-Nat Geo Kids playlist)	944K	171,651,171	867	-
360 * Go Happy Kids	37K	19,281,127	87	27
Math& Learning videos 4 Kids	314K	116.24M	194	15
VR 360 Kids	1K	327,136K	5	5
Om Nom Stories 360	3.93M	3.35B	1.92k	6
360° Pinkfong and Hogi House Tour (playlist)	69.9M	Not provided	31	18
Sesame Street 360	344K	190,162,306	225	2

Table 3. Engagement Metrics for 360° videos for Nat Geo Wild Kids channel/360 videos-Nat Geo Kids playlist

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Comments	Video Duration
360° Climbing Giants	Mar 4, 2017	297,153k	1.34%	1.8K	0.63%	94	3:26
360° Wingwalker - Part 2	Feb 18, 2017	82,519k	0.37%	514	0.62%	21	3:08
360° Wingwalker - Part 1	Feb 11, 2017	267.14k	1.21%	891	0.33%	67	4:06
3D Monarch Butterflies in 360	Jan 24, 2017	226K	1.03%	1.18K	0.52%	53	1:49
360° Underwater National Park (ocean wild life) (vo+music)	Jan 14, 2017	7,270,727M	32.90%	41.69k	0.57%	620	5:50
360° Bryce Canyon	Jan 3, 2017	305,925k	1.38%	1.7K	0.57%	52	2:02
360° Victoria Falls - The Canyons Below	Dec 27, 2016	165,808k	0.75%	1K	0.61%	35	1:42
360° Antarctica - Journey Through The Ice (NO VOICE OVER)	Dec 20, 2016	456.3k	2.06%	2.12k	0.46%	56	1:59
360° Victoria Falls – The Devil's Pool (VO+MUSIC+ Live sound+ text)	Nov 29, 2016	6.14M	27.77%	81K	1.33%	1.46k	1:48
Swimming With Bears in 360 (music +text)	Nov 29, 2016	236.61k	1.07%	1.01k	0.43%	54	1:5
360° Dive Through an Oil Rig Ecosystem (music+text)	2016, 24	338k	1.53%	2.2K	0.66%	102	3:12
360° Dangerous Honey Hunting (4K)	Nov 19, 2016	397.36k	1.80%	1.82k	0.46%	83	3:38
360° Orangutan School (vo+music)	Nov 16, 2016	832.5k	3.77%	3.52k	0.42%	131	8:59
360° Kamchatka Volcano Eruption (music+text)	Nov 13, 2016	2.2M	9.95%	19.9k	0.91%	465	2:16
360° Antarctica - Unexpected Snow(music+text)	Oct 20, 2016	2.93M	13.25%	27.21k	0.93%	327	1:55
360° Great Hammerhead Shark Encounter (music=text) under water	Oct 19, 2016	37.67M	170.43%	168.9k	0.45%	2.45k	2:14
Glow Worm Caves of New Zealand in 360° (text+music)	Oct 19, 2016	1.11M	5.02%	10.28k	0.93%	266	2:13

360 Nat Geo kids playlist is a common playlist for Nat Geo Wild kids and Nat Geo Educational YouTube channel, as they provide real& wild life animal and places by 360-degree camera or by drone for some places, like you are flying Over 15,500 feet tall, Klyuchevskoy is one of the tallest and most active volcanoes on the planet. Nat Geo 360-degree content takes two styles, videos with narrative voice over, nature live sound and music, while the other is only 360-degree text with music. The most effective one according to the views and engagement is through using narrative VO. Also, the highest engagements were for the ocean and underwater videos, also place people hard to go, so viewers felt so immersive with this type of content. 360° Great Hammerhead Shark Encounter under water video that released in 2016 has the highest viewership on the list with 37.67M views with 168.9k like and 2.45k.

Table 4. Engagement Metrics for 360° videos for -360 * Go Happy Kids YouTube Channel

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Com-ments	Video Duration
360 VR Twin girls playing in the play-ground 360 degree video	Jan 5, 2022	17,800k	48.11% (Good)	108	0.61%	-	10:2
Big bee chasing children 360 VR	Jan 4, 2022	14,957k	40.42% (Good)	84	0.56%	-	5:07
360 Video Kids are playing with off-road car 360 VR	Dec 20, 2021	8,279k	22.38%	50	0.60%	-	4:23
360 VR Kids on Playground 360 video	Dec 18, 2021	9,274k	25.06%	45	0.49%	-	4:10
Kids on Island by the sea in Cyprus | Playing with friends | 360 VR video for kids.	Dec 13, 2021	7,437	20.10%	36	0.48%	-	4:47
KIDS PLAYING AT THE BEACH | BEST 360 VIDEO FOR CHILDREN	Jul 23, 2021	639,849	1,729.32%	2.1K	0.34%	-	3:04
360 VR 1 2 3 Splashing in the sea song | EDU-CATIONAL VIDEO FOR KIDS (2D Animation)	Nov 16, 2019	2.31M	6,231.61%	8.6K	0.37%	-	2:43
Trampoline for kids in 360 degree | Kids entertainment 360 video	Aug 9, 2016	1.9M	5,121.86%	6.3K	0.33%	-	3:25
Panoramic video for kids in 360 degree video	Aug 3, 2016	1.37M	3,714.72%	4.3K	0.32%	-	2:17
Panoramic video for kids in360 degree video	Jul 26, 2016	1.06M	2,869.03%	3.3K	0.31%	-	3:26
HAPPY KIDS 3D	Jul 20, 2016	24.72k	66.80%	314	1.27%	-	2:46
VLOG Kids Playground Fun Play Place	Jul 15, 2016	2.31M	6,239.89%	7.1K	0.31%	-	3:12
360 VR Игра рыбалка | Дети на рыбалке Панорамное видео (Russian language) Fishing game | Children fishing Panoramic video	Jun 22, 2016	84,170	227.49%	338	0.40%	-	3:42
360 видео НА ЛОДКЕ | Дети развлекаются на воде. (Russian language) 360 video BY BOAT | Children have fun on the water.	Jun 20, 2016	680,459	1,839.08%	2.3K	0.34%	-	5:28
360 video Кролики пушистики | ВЕСЕЛАЯ ФЕРМА Дети играют сживотными (Russian language)	Jun 15, 2016	1.01M	2,720.35%	3.6K	0.36%	-	8:52

360 video Гигантские мыльные пузыри | Большие пузыри для детей (Russian language) 360 video Fluffy rabbits | FARM FUN Children play with animals.	Jun 13, 2016	4,143k	11.20% (Bad)	28	0.68%	-	3:10
360 Challenge for kids	Jun 11, 2016	4,135k	11.18% (Bad)	27	0.65%	-	6:07
360VR | Челлендж что внутри. Игры для детей. 360 градусов видео для детей (Russian language) 360VR | Challenge what's inside. Games for children. 360 degree video for children	Jun 10, 2016	1.11M	3,008.63%	3.8K	0.35%	-	4:44
360VR for KIDS | Дети запускают летающего змея. Развлечения для детей в 360 градусов (Russian language) 360VR for KIDS | Children launch a flying kite. Entertainment for children in 360 degrees	Jun 6, 2016	4,114k	11.12% (Bad)	29	0.70%	-	6:09
360 VR Для детей | Панорамное видео развлечения для детей. (Russian language) 360 VR For children | Panoramic video entertainment for children	May 18, 2016	770,789k	2,083.21%	3.02k	0.39%	-	5:02
Games for kids 360 degree	May 16, 2016	1.89M	5,119.62%	6.6K	0.35%	-	6:23
Challenge in 360 for kids	May 14, 2016	1.29M	3,475.22%	4.92k	0.38%	-	9:35
360 video Панорамное | Развлечения для детей | Пасхальная прогулка (Russian language) 360 video Panoramic | Entertainment for children | Easter walk	May 8, 2016	2.95k	7.98% (Bad)	17	0.58%	-	4:34
360 video Дети кормят голубей | Детские панорамные видео (Развлечения для детей) (Russian language) 360 video Children feeding pigeons | Children's panoramic videos (Entertainment for children	May 6, 2016	3.75k	10.14% (Bad)	41	1.09%	-	4:24
Happy Kids Яночка и Вовчик 360VIDEO FOR KIDS (Russian language) Happy Kids Yanochka and Vovchyk 360VIDEO FOR KIDS	May 3, 2016	635.23k	1,716.84%	2.02k	0.32%	-	2:11
Дети делают кексы на природе 360 градусов. 360 video for kids. (Russian language) Children make cupcakes in nature 360 degrees. 360 video for kids.	Apr 30, 2016	779.21k	2,105.98%	2.98k	0.38%	-	18:47

Although the 360 * Go Happy Kids YouTube Channel created in 2016, and specified for 360-degree videos, as contains 87 videos, only 27 of them are VR 360 videos, the last uploaded videos was in 2022. The channels depend on VR environment for children, most of the videos include kids playing or doing an activity to learn something with Background music. The highest engagement two videos according to number of views and likes ratio, are (VLOG Kids Playground Fun Play Place), and (360 VR 1 2 3 Splashing in the sea song | EDUCATIONAL VIDEO FOR KIDS), as this video is 2:46 minute considered the only 2D animated 360-Degree video in 360- playlist, has the highest viewership that represents 2.31 million views. Also, 8.6K likes. The channel turned off the comments because of the policy of YouTube kids.

Table 5. Engagement Metrics for 360° videos for - Math& Learning videos 4 Kids (360 VR Kids Videos playlist) YouTube Channel:

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Com-ments	Video Duration
Letter B - 360° 3D Animated VR Kids Video	Jul 11, 2018	4.39M	1,396.68%	11.49k	0.26%	-	1:37
Learn C - 360° 3D Animated VR Kids Video	Jul 17, 2018	2.73M	870.45%	6.15k	0.22%	-	1:29
Learn Letter D - 360° 3D Animated VR Kids Video	Aug 6, 2018	3.73M	1,187.42%	10.62k	0.28%	-	1:36
Learn the Letter E - 360° 3D VR Animated Kids Video	Aug 24, 2018	5.16M	1,641.97%	16.45k	0.32%	-	3:40
Learn the Letter F - 360° 3D VR Animated Kids Video	May 23, 2019	919.82k	292.94%	1.54k	0.17%	-	2:07
Learn the Letter G - 360° 3D VR Animated Kids Video	Jul 14, 2019	683.51k	217.68%	1.24k	0.18%	-	2:10
VR Space Pod Math Escape Room - Mage Math 10 Minute Video	Aug 26, 2020	111.23k	35.42%	390	0.35%	-	12:04
VR Space Pod Escape - Math Escape Room - Mage Math 5 Minute Video	Aug 26, 2020	119.56k	38.08%	158	0.13%	-	7:04
Learn the Letter H - 360° 3D VR Animated Kids Video	Mar 10, 2021	293.88k	93.59%	412	0.14%	-	2:21
Learn the Letter I - 360° 3D VR Animated Kids Video	Jun 8, 2021	409.98k	130.57%	989	0.24%	-	3:21
Learn the Letter J - 360° 3D VR Animated Kids Video	Jun 21, 2021	613.64k	195.43%	1.84k	0.30%	-	5:01
Learn the Letter K - 360° 3D VR Animated Kids Video	Jul 28, 2021	2.12M	673.64%	5.14k	0.24%	-	5:09
Learn the Letter L - 360° 3D VR Animated Kids Video	Aug 17, 2021	2.37M	756.25%	6.07k	0.26%	-	7:13
Learn the Letter M - 360° 3D VR Animated Kids Video	Jan 7, 2022	121.04k	38.55%	130	0.11%	-	6:03
Learn the Letter N - 360° 3D VR Animated Kids Video	Jan 25, 2022	100.45k	31.99%	108	0.11%	-	4:27

All 360 VR Kids Videos playlist includes 360- degree educational videos for learning letters and finding objects starts with specific letter, the videos depend on child interactivity, instead of watching just a 360-video using a Voice over and music to be more energetic and more fun. Although Most of the videos have the same format, but view ratio varies.

Table 6. Engagement Metrics for 360° videos for -VR 360 Kids YouTube Channel

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Comments	Video Duration
Simple 360 anima-tion for kids! FARM GARDEN	Jul 19, 2023	views 53	5.30% (Bad)	1	1.89%	-	1:22
VR360 Happy World!	Mar 2, 2023	193	19.30% (Av-erage)	3	1.55%	-	1:16
SPACE ADVENTURE animation in VR 360!	Mar 21, 2017	27.4K	2,740.60% (Good)	52	0.19%	-	2:36
FUN-TASTICAL UN-!!!!DERWATER VR360	Sep 11, 2016	270.9K	27,091.70% (Good)	653	0.24%	-	1:58
Simple 360 VIDEO ANIMATION for young KIDS	Aug 30, 2016	28.6K	2,856.80% (Good)	-	0.00%	-	0:35

VR 360 Kids channel depends only on 2D simple 360-degree videos that includes colorful 2D illustrations with music background, as it contains only five videos from 2016 till 2023, there is no immersive engagement or any comment for videos, even most of the videos have good views ratio.

Table 7. Engagement Metrics for 360° videos for – Om Nom Stories YouTube Channel

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Comments	Video Duration
Find The Hidden Objects in 360 - Om Nom Stories: Mysterious House	Oct 6, 2017	8.52M	216.90%	17.45k	0.20%	-	2:00
Om Nom 360°: Unexpected Guest - Teaser	Mar 10, 2017	1.57M	40.03%	2.98k	0.19%	-	0:18
Om Nom 360°: Unexpected Guest	Mar 24, 2017	12.99M	330.54%	38.65k	0.30%	-	2:02
Om Nom 360°: OSPITI INASPETTATI	Animati Cartoni per bambini	Feb 22, 2019	6.23M	941.82%	11.01k	0.18%	-	2:21
٢٦٠° فيديو - حلقة خاصة اوم نوم في	Om Nom in 360° - Special Episode	Nov 11, 2019	1.59M	4,151.52%	zero	0.00%	-	2:20
Om Nom Stories: हिंदी	Om Nom 360	Unexpected Guest ꓶ हिंदी कार्टून ꓶ Funny Cartoons For Kids	Apr 30, 2022	29.21k	10.32% (Bad)	91	0.31%		2:20

Om Nom Stories that released in 2012 considers a long-running kid's comedy series, that depend on the primary character of the game that called (Cut the Rope), for the UK well-known for its mobile game franchise, ZeptoLab. Currently has more than 36 BLN views worldwide, 220x3.5 episodes, and is currently producing new content.

Its intended audience is preschoolers aged 0 to 6 years old. However, Om Nom Stories YouTube Channel include 1.92k video that released in different languages, with the viewership exceeded 3.35B, there are only 6 six VR 360- Degree videos on the channel from 2017 till 2022, as the video same video released in four languages. Comparing to number of subscriptions and views 360 videos for Nom Character didn`t take a huge interaction as the content of the video doesn't include any speech or any directions for children, just only music.

Table 8. Engagement Metrics for 360° videos for- 360° Pinkfong and Hogi House Tour | YouTube playlist

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Comments	Video Duration
360° Pinkfong and Hogi House Tour | VR 360 | @ PinkfongPlayground	May 7, 2021	3.02M	4.33% (Bad)	9.05k	0.30%	-	4:22
360 VR video Hello song and dance together | Nursery Rhymes | Kids Songs | Baby Doli	Jan 7, 2020	4.34M	16.02% (Average)	17.44k	0.40%	-	3:10
ABC song | 360 video best Nursery Rhymes for Kids	Nov 18, 2019	6.12M	16,955.53% (Good)	17.73k	0.29%	-	1:49
Train ride 360 video for kids | LooLoo Kids	Sep 26, 2016	5.82M	10.62% (Bad)	13.36k	0.23%	-	20:58
Change the World Song (360 Animation Video)	Oct 10, 2017	114.82M	33,378.57% (Good)	263.4k	0.23%	-	1:37
House tour with Hogi and Pinkfong | VR 360 | Learn Colors for Kids | Hogi & Pinkfong Colors	May 7, 2021	614.19k	736.44% (Good)	1.98k	0.32%	-	4:22
Sing Along to Nursery Rhymes in VR!! | Humpty Dumpty / The Bath Song / Rain, Rain, Go Away |	Jun 11, 2020	8.96k	23.33% (Good)	27	0.30%	1	2:27
Five Little Monkeys 360 | Nursery Rhymes & Kids Songs | 360° VR Glasses	,Jul 11 2020	2.47M	580.20%	8.96k	0.36%	-	2:15
Old Macdonald had a farm | 360 video best Nursery Rhymes for Kids	Jul 20, 2020	6.34M	17,575.84%	16.14k	0.25%	-	1:41

Lola the cow - 360° - Kids Songs & Nursery Rhymes	Nov 7, 2015	54.42M	954.79%	157.56k	0.29%	-	2:10
360 vr degree video for Kids - Nursery rhyme - Whoopies Wonder world – Bird	May 24, 2016	2.65M	19,354.90%	10.8k	0.41%	-	2:25
360° Video - Baby Shark VR Dancing	Apr 17, 2020	2.24M	588.19%	8.82k	0.39%	-	3:38
360 Virtual Reality Winter Wonderland - Gummibär The Gummy Bear	Dec 21, 2017	11.58M	137.38%	31.34k	0.27%	-	2:43
Virtual Reality 360 Nursery Rhymes - Twinkle Little Star	Mar 12, 2017	34.68k	253.17%	84	0.24%	-	1:50
VR Kindergarten | Kids 360 Song | Nursery Rhymes	Oct 15, 2018	5.18k	2,056.35%	11	0.21%	-	11:22
Time to Clean Up (360° Video) | Kid's Cleanup Song	Jan 27, 2018	74.78M	8,031.88%	242.91k	0.32%	-	3:06
Super Seek and Find – Presentation Video 360 VR Cardboard	Aug 30, 2017	4.81k	674.33%	43	0.89%	-	4:05
Row Row Row your boat | 360 video | 360 video best Nursery Rhymes for Kids	Jul 3, 2020	316.57k	876.93%	759	0.24%	-	1:33

360° Pinkfong and Hogi House Tour Playlist include 360-degree learning nursery &KG songs from different official kids' YouTube channels. All the videos were 2D Animated for famous character for kid's cartoon, so they have great engagement and interaction. The three top videos of the playlist are, Change the World Song (360 Animation Video) that released in 2017, for Sesame Street official channel, as the total views are 114.78M, while 263.37k like. The second, Time to Clean Up (360° Video) | Kid's Cleanup Song, that released in 2018 with 74.78M viewership and 242.91k like. While the third one is Lola the cow - 360° - Kids Songs & Nursery Rhymes, with 54.42M view and 157.56k like. The duration of the videos range from 1:37 to 3:06 minutes.

On the other hand, the well-known kids series Sesame street official YouTube channel with 344K subscription, contain only two 360-videos out of 225 videos, as Change the World Song (360 Animation Video) released in different language from 2017 till 2023, Although the video have good engagement and reach compared to other 360 videos on other YouTube channels.

Table9. Engagement Metrics for 360° videos for- Sesame street official YouTube channel

Video Title	Upload Date	Total Views	Views Ratio	Likes	Likes ratio	Comments	Video Duration
Change the World Song (360 Animation (Video	Oct 10, 2017	114.78M	33,367.50%	263.37k	0.23%	-	1:37
Sesame Street: Grover Shows Near and Far in !VR 180 Video	Apr 21, 2018	12.53M	53.55%	28.68k	0.23%	-	4:24

General Results

The study depends on content analysis tool for seven 360- degree educational kids You Tube Channels, that differ in their content and characteristics, but the spoken language is English. According to RQ1. The results found that the VR 360-degree educational real wildlife and places, has the most realistic immersive experience for YouTube users, as one of the users comment on a video, said: "what a fantastic video! thank you for this <3 my husband loves marine life, but his health prevents him from ever scuba diving, but this video offers us the next best thing. It would be wonderful to have an even longer 360 dive videos in the future!". Another user comment:" Being an underwater explorer, exploring oceans with underwater cameras...great feeling and perfect choice of lifestyle and job, miraculous, incredible universe!".

Also, the majority of the videos that were filmed under water or bird angle view had the most immersive integration. Also, the duration of the videos consider one of the factors that affect viewer engagement, as the short as the video, the more the engagements are. Answering RQ2 and RQ3. the 360-degree videos that include songs with 2D animated video content has the highest engagement and more effective with children especially for nursery and KG(e.g., Change the World Song) that Sesame Street YouTube channel released in different languages for girls. Although, all the channels use music as a background in their videos, the educational channels that include music and 360-degree text only videos have the less viewership and Engagement.

Conclusion and Discussion

After Analysing seven VR 360-degree educational YouTube Channels for kids, it was found that Virtual Reality 360-degree videos are started to be used mostly in 2016, although it`s starts to spread within the last three years as one of media innovation technique to cope with technological transformation worldwide. Even most of 360-degree YouTube channels released in 2016, by the times the average of uploaded videos decrees. The reason for this may be the reason for this spreading specific VR educational Websites, also more advance technological devices instead of YouTube cardboard such as oculus VR glasses, and in 2023 Meta company introduced the new Ray-Ban, Meta Smart Glasses, as a partnership with Essilor Luxottica company.

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