

Design and Implementation of a Yogic Educational Game “Yogapatnam” as a Teaching Tool

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Abstract

The purpose of this paper is to develop and evaluate a mobile educational application that supports children's learning of the theoretical aspects of yoga. This paper describes an educational game application called “Yogapatnam”, which is an Android-based Snakes and Ladders game application that aims to be a learning tool with an attractive design that would help children learn basic yogic terms. The methodology of this research includes the study of literature (analysing similar applications for educational purposes), as well as the design, development, and implementation of the application. The application was implemented in 50 school students of 6th-8th grade for 1 month. Students were instructed to use the application on a daily basis as homework. The pre-and post-tests were conducted with the help of a multiple-choice questionnaire comprised of 50 questions related to Yoga education. The scores collected were considered as pre and post data to evaluate the yogic knowledge of the students. The paired t-value was found to be 24.25 at the $p>0.0001$ level. The results show that the educational game application “Yogapatnam” is an effective learning tool and can be used as a helping tool for learning basic yoga knowledge using an interesting and fun learning concept.

Keywords: School children, Educational game, Yoga education, Android, Yogapatnam

Introduction

The use of technology in the classroom has completely changed how we study and teach a variety of disciplines in recent years. Education technologies have developed steadily over time, from traditional classrooms to digital platforms. Their aim is to improve interaction, engagement, and memory retention. Extending this idea to yoga education, the incorporation of gamification concepts has the potential to completely transform how yoga is instructed and learned.

Traditional yoga teaching methods generally lack interactive and engaging components. This gap offers a fertile field for the development of innovative teaching methods that combine the ancient wisdom of yoga with modern educational technologies. This research paper aims to explore the design and implementation of a Yogic Educational Game (YEG) named “Yogapatnam” as a tool for teaching yoga. The YEG has developed a deep understanding of the fundamental principles of yoga and game design, ensuring an immersive and authentic experience for learners.

The YEG was created with a thorough understanding of and simplifying the core concepts of yoga, guaranteeing the learners a unique and genuine experience.

The objectives of this research paper are threefold. Firstly, to investigate the potential benefits of incorporating gamification in yoga education, such as increased motivation, active participation, and enhanced learning outcomes. This research study has three distinct goals. First, look into the possible advantages of gamification in yoga instruction, such as improved learning outcomes, increased motivation, and active involvement. Secondly, the principles of game design that can be effectively applied to the development of the YEG, fostering engagement, interactivity, and knowledge retention will be examined. At last, the effectiveness of YEG as a teaching tool was evaluated by comparing its impact on student learning outcomes. It seeks to empower yoga teachers with an innovative tool that can enhance their teaching methodologies by making yoga more accessible, enjoyable, and effective for students.

Review of related literature

Yau et al. (2022), conducted a systematic review to investigate the efficacy of mobile applications that encourage healthy dietary, physical activity, or sedentary behaviour modifications in children between the ages of 8 and 12 years in order to prevent childhood obesity. From January 2008 to July 2021, MEDLINE, Embase, PsycINFO, CINAHL, and ERIC were all thoroughly searched for peer-reviewed primary papers. The majority of the 13 studies that were found (n=8, 62 per cent), employed a quasi-experimental design. There were observed significant increases in BMI (2/6, 33 per cent studies), nutritional outcomes (5/6, 83 per cent studies),

physical activity (4/8, 50 per cent studies), and diet (Yau et. al., 2022).

Since kids are among the most susceptible to disaster damage, the educational game Ludo Disaster Alert was created to help kids become more prepared for disasters. It was put into practice at Setonorejo Kras Elementary School as a disaster alert education technique. Pre-experimental research was conducted utilising the one-group pre-test post-test design approach. The 20 students aged 8-9 years were included in this study. Before playing the instructional Ludo disaster alert game, 40 per cent of students fell into the category of almost prepared; however, after playing it, there was a rise in preparation, with 55 per cent of respondents falling into the category of really prepared. There was a significant difference between the pre and post-instructional game Ludo Disaster Alert, with a significance value of $p=0.05$ (Kurniawati & Astuti, 2023).

The analysed study contrasted the effects of using the MalMath application versus the conventional method of teaching mathematics on students' academic achievement. A quasi-experimental investigation was carried out using a sample population of 72 students. The students of the experimental MalMath group performed better academically (45.11) than the students in the control group (33.23), which was statistically significant (Shurygin et al., 2023).

The purpose of this study was to determine whether game-based learning and mobile learning may be used in teaching accounting. A total of 46 students took part in the training. Before the instructions began, a pre-test was given to the students. A post-test was given following the introduction of the game-based mobile learning approach. The findings demonstrated

that for every item, the post-test scores were significantly higher than the pre-test values. It suggests that mobile learning through games can enhance learning results (Kao et al., 2023).

The reviewed study aimed to determine whether adding ChordIQ, a digital program, to music teaching would enhance students' academic performance. A test of 25 theoretical questions and 25 practical exercises was created to evaluate academic performance. By computing the student's t-test using the "Test Score" and "Missed Classes" parameters, the groups were compared. According to the data gathered, the experimental group's mean score was 87.50 out of 100, but the control group's was significantly lower at 65.37. Compared to the control group, individuals in the experimental group were also proficient in the singing practice known as solfeggio (Ouyang, 2023).

The study evaluates the usability of a mobile game-based learning application called Rory's Math Adventure (ROMAAD) in improving the mathematical abilities of Year 4 primary students. It has 18 levels, which can be played without an internet connection. Evaluation of usability was carried out from the viewpoint of 37 school students. The evaluated 5 constructs were ease of use, ease of learning, consistency, information structure, design and satisfaction. The study concludes that ROMAAD is an effective educational mobile game for teaching Year 4 mathematics in game-based learning, with the potential to improve students' mathematical skills, computational thinking, motivation, active participation and interest (Annamalai et al., 2022).

This reviewed study by Kuznetcova et al., 2023, proposed a new direction of VS (visuo-spatial) training focusing on the development of visuo-spatial self-efficacy (VSSE), or one's confidence

that they could complete specific VS tasks. To implement and assess the effectiveness of a game-based VS intervention for middle school students, a quasi-experimental design with 169 students as samples by using purposive sampling. The 96 participants in the experimental group played the intervention game during 4 sessions over the course of 2 weeks, while the 73 participants in the control group engaged in typical class activities. The results revealed that the intervention significantly increased students' VS self-efficacy but not their VS performance or STEM performance (Kuznetcova et al., 2023).

The idea of this research paper is to design and develop a mobile game-based yoga learning tool. The reviewed literature indicates the use of various mobile-based games in teaching various subjects or topics, which proves the effectiveness of educational mobile games. However, we did not find any such game for the theoretical aspect of yoga. Like other subjects, there is a need to develop digital yoga teaching aids that may help introduce basic yoga terminologies to school children using a simple and play-based method.

Need of the study

There are many applications available for yoga, such as "Kids Yoga at Home - NH Fits", "Yoga for Kids and Family Fitness", "Yoga for Kids", and "Yoga for Kids Teenager Workout". However, all these apps focus only on the practical aspects of yoga, i.e., asanas, pranayama, and meditation. Though these are very important, another side of the coin, i.e., the theoretical aspect, is missing in these apps. After learning theory, practising yoga may make the children perfect. The benefits of yoga should not be limited to asanas alone; it is a part of life and approaches us in a holistic manner. According to NCERT

(2012), yoga could be introduced from the elementary (primary) level onwards, i.e., secondary and senior secondary, in informal ways (<https://ncert.nic.in/dess/pdf/yoga.pdf>). This kind of application can be used to convey the essence of our yogic scriptures in an interesting and interactive way so as to make children eager to learn about our traditional knowledge. Mobile applications based on yoga can help attain the goal of incorporating yoga, i.e., traditional knowledge systems, in school education, as directed by NEP (National Education Policy, India), 2020. Using mobile apps for yoga education may help students learn with ease and improve their ability to use technology. With the help of yogic mobile game applications, children will be able to learn and understand the basic concepts of yoga in an interesting way. It will also enhance value-based education among the new generation. These apps can become powerful teaching aids in yoga education for teachers.

Application development and design

Steps followed by the developer for Application development:

Step 1: Create a new Unity project and name it "SnakesAndLadders".

Step 2: Create a new scene in the project and name it "GameScene".

Step 3: Create a 3D plane object in the scene and scale it to 10x10x1. This will serve as the game board.

Step 4: Create a 3D cube object and scale it to 1x1x1. This will serve as the player's token.

Step 5: Create a script named "PlayerController" and attach it to the player's token. This script will handle the movement of the player.

Step 6: In the PlayerController script, create a variable to store the current player position on the game board.

Step 7: Create a method in the PlayerController script to move the player based on the result of a dice roll. The method should update the player's position and move the token to the new position on the game board.

Step 8: Create a script named "GameController" and attach it to an empty game object in the scene. This script will handle the game logic.

Step 9: In the GameController script, create a list of all the snakes and ladders on the game board. Each item in the list should contain the start and end positions of the snake or ladder.

Step 10: Create a method in the GameController script to check if the player has landed on a snake or ladder. If they have, the method should move the player to the end position of the snake or ladder.

Step 11: Create a UI canvas in the scene and add a button to roll the dice.

Step 12: Create a script named "DiceRoller" and attach it to the roll dice button. This script will handle the dice roll.

Step 13: In the DiceRoller script, generate a random number between 1 and 6 to simulate a dice roll.

Step 14: In the DiceRoller script, call the move player method in the PlayerController script with the result of the dice roll.

Step 15: In the GameController script, create a method to check if the player has won the game by landing on the last square of the game board.

Step 16: Add a win condition to the game by displaying a message on the screen when the player wins.

Step 17: Test the game and make any necessary adjustments to the code or game mechanics.

These steps provide a basic outline for

creating a Snakes and Ladders game in Unity.

Game design:

After following these steps, this is the design of the game:

1. The designed and developed game is a special kind of game application similar to the traditional S&L game. It can be called a Yogic Snakes and Ladders game. It is an Android-based application, and it is a serious game. Serious games are those that serve purposes other than entertainment, such as educational, political, advertising,

exercise etc. The average size of the app is about 18 megabytes and it is an offline game. The player does not require internet access after downloading it once. So, it is very easy to use and access. This is a two-player game, and one piece is green, and the other one is blue. The players get a hint above the board about whose turn it is.

2. While playing any level, the player may have the option to pause, replay the level, or go to the home page. There is also pleasant background music that is optional to play or not (fig. 1).

Figure-1: Options in between the game

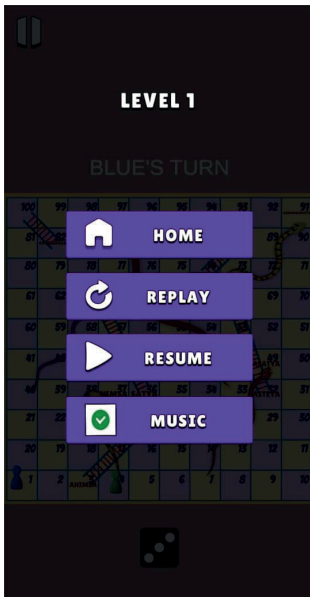


Figure-2: Home page



3. The Snakes and Ladders game is divided into 7 levels (fig. 2) and only after passing the previous level players are allowed to promote to the next level. The number of yogic terms increases as per the level. The squares with ladders represented the yogic practices / moral values helpful in the yogic path, while the squares with snakes represented evils or things that act as obstacles in the yogic

path as well as in normal human life.

4. Whenever the player reaches either snake or ladder, there opens a dialogue box with a yogic term. The player gets enough time to read the term. After that, the player is shifted to the other end of the snake or ladder and another dialogue box opens with the meaning of that yogic term (figs. 3 &4).

Figure-3: Dialogue box with yogic term

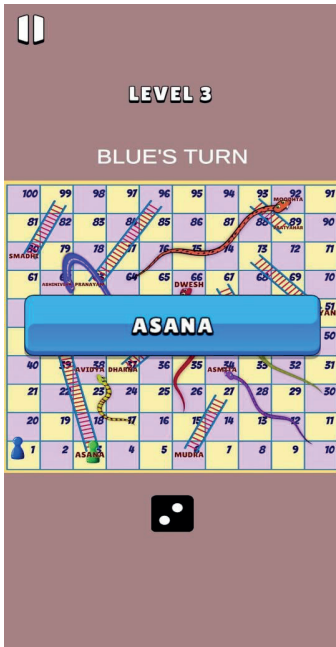
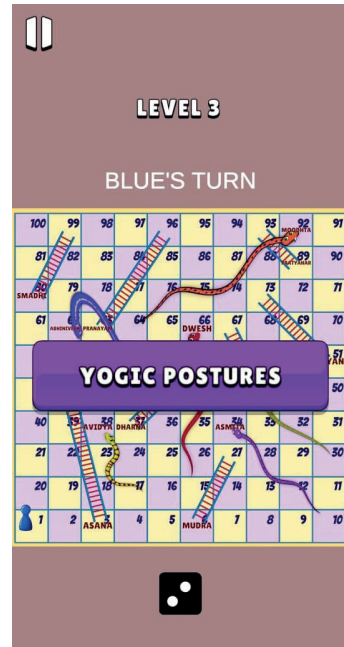


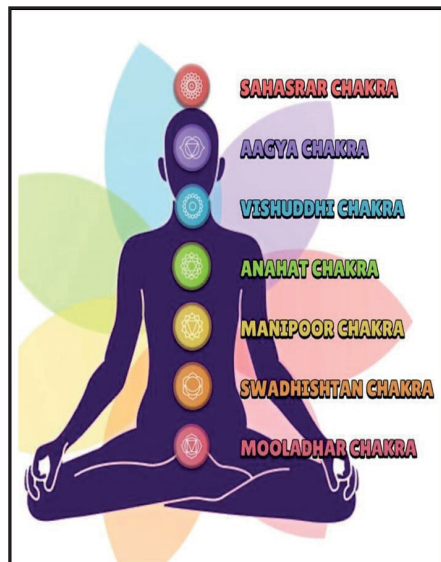
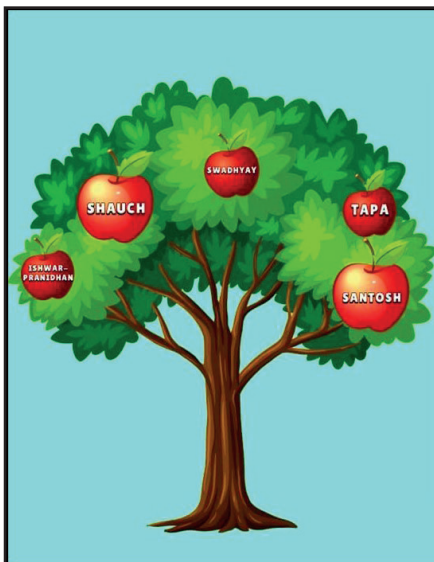
Figure-4: Dialogue box with the meaning of the yogic term



At the end of each level, there is a screen with a tree having some fruits. The fruits are named after the positive yogic activities that the players learned


at the level. This will help the players to remember the yogic terms collectively (figs. 5&6).

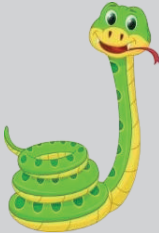
Figure- 5&6: Summary of levels




Yogic terms and their meanings in the levels of game:

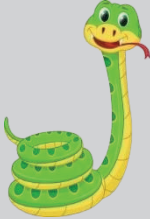
Level 1

Ladders		Meaning
Ahimsa		Not to harm anyone by body, mind and speech
Satya		Truthfulness
Asteya		Non-stealing
Brahmcharya		Celibacy/Move into Brahman consciousness
Aparigraha		Not to possess unnecessary things


Snakes		Meaning
Himsa		To harm anyone by body, mind and speech
Asatya		Non-truthfulness
Steya		Stealing
Abrahmcharya		Not to move into Brahman consciousness
Parigraha		To possess unnecessary things


Level 2

Ladders		Meaning
Shauch		Hygienic mind, body and speech
Santosh		Satisfaction
Tapa		Willingness to go through adverse situations
Swadhyay		Listening, understanding and implementation of knowledge
Ishwar-Pranidhan		Faith in God


Ladders		Meaning
Ashauch		Unhygienic mind, body and speech
Asantosh		Non-satisfaction
Atapa		Being into comfort zone
Aswadhyay		Not to take knowledge from anywhere
Nastikta		No faith in God

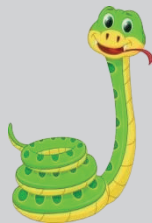
Level 3

Ladders		Meaning
Asana		Yogic postures
Mudr		Symbolic gestures, posture to channelize the pranic energy
Bandh		Postures in which we lock the flow of energy
Pranayam		Controlled breathing
Pratyahar		Inward senses/ full control on senses
Dharna		Concentrating on a particular object
Dhyan		Meditation/ unbroken flow of concentration
Smadhi		Meditator and the object of meditation integrate into the one single identity


Snakes		Meaning
Avidya		Lack of knowledge
Asmita		Feeling of me and mine
Raag		Deep attachment towards the things which give happiness
Dwesh		Strong dislikes or hatred towards the things which give sorrow or pain
Abhinivesh		Fear of death
Moodhta		Foolishness

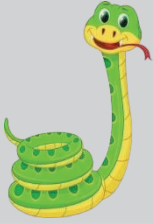
Level 4

Ladders		Meaning
Utsah		A strong feeling of excitement
Sahas		Ability to face difficulties
Dhairy		Ability to remain calm in adverse situations
Tatva gyan		Knowledge of the reality
Nishchaya		Firm determination
Jansang ka tyag		To avoid spending too much time with other people


Snakes		Meaning
Ati-ahar		To eat more than necessary
Prayas		Excessive working
Prajalp		Excessive speaking
Niyamagraha		Bound in restrictions
Chanchal mana		Unstable/ scattered mind
Jansang		To live around many people

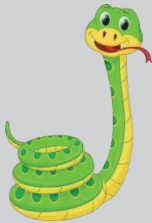
Level 5

Ladders		Meaning
Balanced mooladhar chakra		Energetic, physically fit and strong
Balanced swadhishtan chakra		Creativity, enthusiasm, joy, bliss, passion
Balanced manipoor chakra		Strong self-esteem, Sense of self and life's purpose Healthy metabolism
Balanced anahat chakra		Love, compassion
Balanced vishuddhi chakra		Clear speech, singing ability, balanced & calm thoughts
Balanced aagya chakra		High concentration, wisdom, ability to discriminate between real and non-real
Balanced sahasrar chakra		Strong nervous system, spiritually blessed, open minded, feel connected to universe


Snakes		Meaning
Imbalanced Mooladhar chakra		Anxiety, depression, insomnia, digestive issues
Imbalanced Swadhishtan chakra		Urinary disease, infertility, allergy, negativity, addiction
Imbalanced Manipoor chakra		Diabetes, obesity, lack of confidence and motivation
Imbalanced Anahat chakra		Heart disease, asthma mistrust, anger, revenge
Imbalanced Vishuddhi chakra		Anxiety, lack of freedom, restriction, thyroid and throat problems, speech disorders
Imbalanced Aagya chakra		Lack of decision making power, intuition and attention, get stuck in negative thought pattern, confusion
Imbalanced Sahasrar chakra		Poor coordination, difficulty in meditation and spiritual practices, unable to feel peaceful

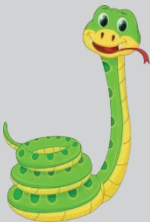
Level 6

Ladders		Meaning
Vairagya		State of being free of attachment to materialistic life
Abhayas		Practice repeatedly to get perfection in a skill
Maitri		Loving-kindness, towards oneself as well as others
Karuna		One identifies the suffering of others as one's own.
Mudita		Empathetic joy as a result of knowing that others are happy.
Upeksha		A sense of even-mindedness.
Yukta ahara		Balanced diet
Satsang		Being in company with good people
Vivek		Ability to differentiate between real and unreal
Mauna		Practicing silence
Anushasan		Discipline

Snakes		Meaning
Moha		Attachment
Mada		Ego
Irshya		Intense dislike
Dormanasya		Frustration caused due to non-fulfillment of wishes
Ang-mejayatva		Shivering of body
Dukh		Misery
Vyadhi		Physical disease/ ailment
Styan		Lack of interest or motivation
Sanshya		Lack of faith
Pramad		Carelessness
Alasya		Love of comfort and mental ease/ laziness
Avirti		Stuck into desires

Level 7

Ladders		Meaning
Shukla-karma		Good deeds
Kshama		Forgiveness
Dhriti		Steadiness and strength in the mind
Daya		Compassion
Arjavam		Sincerity and harmony in one's thought
Mitahar		Moderate eating
Daan		Giving away as charity
Yajna		Sacrifice
Shravan		Careful listening
Vyavhar-kushalta		Good behavior
Kaivalya		Merge yourself with supreme consciousness

Snakes		Meaning
Krishna-karma		Bad deeds
Cruelty		State of being cruel
Adhi		Mental disorders
Tamas		Quality of dullness or inactivity, apathy, inertia or lethargy
Kama		Lust
Krodha		Anger
Lobh		Greed
Matsarya		Jealous

In the designed game “Yogapatnam”, both types of yogic terms produce either positive or negative effects and their operational definitions have been given according to the yogic texts Patanjali’s Yoga Sutras, Hathpradeepika, Shri Mad Bhagwad Geeta and Yog Vashishth.

Implementation

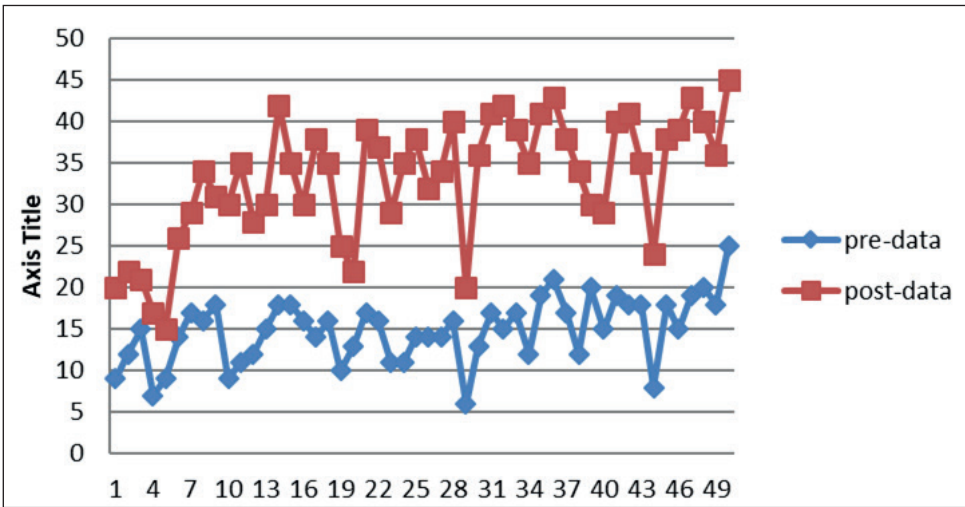
A specially designed questionnaire (MCQ) related to yoga was asked of 6th- 8th-grade students of Navjyot Public School, Rohtak, Haryana, India, in which their knowledge about yoga was assessed. The questionnaire consists of 50 questions related to the basic terminology and meanings related to Yoga. Then, students were allowed to play ‘Yogapatnam’ for one month. As the purpose of our study was to include

both practical and theoretical aspects of Yoga, we selected a school where Yoga has already been a part of the school curriculum. Hence, students were learning both practical and theoretical aspects of yoga. After the intervention, a post-test was conducted using the same questionnaire to assess the effect of mobile game applications on yoga education among students.

Data analysis

By using the paired ‘t’ test, the data obtained in pre & post-tests was analysed with the help of SPSS version 26. The data collected from the sample is shown in the chart below. The blue line and brown line data indicate pre and post data, respectively.

Figure-7: Pre (Blue) and Post (Brown) Data



Results

Table-1: Descriptive Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Pre Data	50	14.88	3.89	0.55
Post Data	50	33.16	7.45	1.05

Table-2: Paired sample correlation

	N	Correlation	Sig.
Pre data & Post data	50	.729	.000

Table-3: Paired sample t- test

Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig.(two tailed)
-18.28	5.33	0.75	-19.79	-16.76	-24.25	49	<0.0001

Tables 1, 2 and 3 depict descriptive statistics, paired sample correlation and paired t-test values. The intervention drawn from the Yogapatnam mobile game is found to be significant at $p < 0.0001$ for a sample size of 50 students. The calculated absolute value of the paired 't' statistic was found to be 24.25, which is compared with the table value, i.e. 3.496 at 49 degrees of freedom, which was significant at $p < 0.0005$ level of significance. As the calculated value of 't' was much greater than the table value, it can be argued that the t in the present study is very significant and can be used as an effective medium and as a teaching aid for children. The correlation between pre and post-data is 0.729, which indicates a significant positive relation.

Discussion

This study aims to prove the efficacy of the 'Yogapatnam' game application by introducing it to 50 school children and evaluating their level of yoga education before and after. There was a significant improvement in the yoga education ($p=0.000$) of the experimental group following 1 month of "Yogapatnam" game practice, as shown in Table 3. The mean of marks obtained at 0 days is 14.88, and after 30 days, it was 33.16, which shows the significant positive effect of the games on the level of yoga education. The intention behind E-Learning is not to replace conventional methods of

teaching and learning in the classroom. It is aimed at creating an augmented learning environment where technology is used to deliver a combined range of teaching and learning techniques aimed at maximising individual participation (Anwar et al., 2020). Understand Yoga education takes one's lifetime, while in this application, we attempted to use a fraction of the Yogic knowledge to introduce children to some basic concepts of Yoga. As Yoga is a vast subject, many other valuable concepts may be included in further research.

Conclusion

Results indicate that the "Yogapatnam" game may be helpful in transmitting the yogic knowledge hidden in yogic scriptures given by ancient sages. It has simplified the basic concepts of yoga, so; the teachers may also use it as a yoga teaching tool. It is concluded that the 'Yogapatnam' game learning medium is acceptable, feasible and effective.

Declaration of interest: None

Declaration of generative AI in scientific writing: During the preparation of this work the authors used "Unity Engine" in order to develop the mobile game application. After using this tool/service, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

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