

EDUCATIONAL TECHNOLOGY AND ICT

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Week-08

Lecture-36

Module-36: Educational Games and Simulations in Education

Hello dear learners, welcome to the SWAYAM-NPTEL course on Educational Technology and ICT. I am your course coordinator, Dr. Sarita Anand, from the Department of Education, Vinaya Bhavana, Visva-Bharati, Santiniketan, West Bengal, India. Today, we will talk about Module 36 on Educational Games and Simulations in Education. This is Lecture 36, and before going into the lecture, we will see the concepts covered.

Earlier, in the previous lecture, we covered emerging technologies in education, different realities like AR, VR, MR, and XR. We learned about Augmented Reality in education, tools and platforms for AR in education, Virtual Reality in education, different concepts of MR and XR, and also Augmented Reality in education. Now, we will talk about the concept of educational games. We all know that educational games are structured activities designed with the primary goal of imparting knowledge, skills, or competencies in an engaging and interactive manner.

These games integrate learning objectives with fun elements, making education more appealing to learners of all ages. The main idea behind educational games is to harness the power of play to enhance cognitive, social, and motor skills. According to Gee in 2003, educational games influence digital and non-digital formats to promote problem-solving, critical thinking, collaboration, and subject-specific knowledge acquisition. They create immersive learning experiences that develop deeper understanding and engagement through different types of games.

These types of games can be categorized in different format, format purpose and the mode of delivery like the on the basis of the format there are digital educational games, board games and card games, role playing games and simulation games. The digital games are the computer or the mobile or online games designed for the learning Any educational

video game which impart the knowledge to the students like Kahoot!, Minecraft-Education Edition etc. The board games, traditional games played on the board such as Scrabble or Chess, also the teachers can prepare age-appropriate board games for their learners.

Card games, games that involves the cards to reinforce the knowledge such as flash card quizzes and there are many card- game for the memory level of testing. So, the next one is role playing games, games where the players assume the character and act out scenarios like model of United Nations or any other kind of game where they play the role. And the next one is simulation game, these are the virtual or physical games that mimic real world scenario like flight simulators, business simulators etcetera.

So, on the basis of purpose there are different types of educational games like skill-based games, these games focus on the cognitive social and motor skill development. Subject specific games, subject specific games are designed to teach specific subjects like math for math, math blaster or the math learning and the learning games these language learning games are the games to help or improve the linguistic skills like Duolingo. This Duolingo is very famous in between the teachers and the learners. Next one is problem solving games.

These games challenge players to think critically and solve puzzles like mazes, riddles, and Sudoku and the next one is gamified assessment. Games that incorporate quizzes and tests for evaluation. Like quizzes and Kahoot! In B.Ed. classes, we also promote quizzes with fun elements.

The third type of educational game is based on the mode of delivery. Like the first one is single-player games designed for individual learning experiences, multiplayer games encourage collaborative or cooperative learning among students, creating a competitive learning environment. The third one is augmented and virtual reality games; these are non-immersive and immersive learning experiences using AR and VR technologies. Some simple examples we can take to understand the concept of different types of educational games. For example, I have mentioned here many pictures which I have taken from Pinterest, and the first one is a riddle.

A riddle is like a brain puzzle presented as a question, a statement, or in a poetic way to figure out the answer. Typically, riddles are phrases in a confusing or deceptive manner. They often contain hidden or double meanings, requiring imaginative and unconventional thinking. So, if a student is asked a riddle, they have to think critically and try to answer

the question. Since their answers are usually surprising, the solver must analyze them carefully to find the correct solution.

I have mentioned here this is the simplest riddle we can say that which alphabet is a question. So, Q which alphabet is an insect B which alphabet is a part of our body. So, student will think and they will answer like part of our body is I. So, the student will go on and they will not only learn, but also, they will enjoy the classes that riddle was for the kindergarten or play school level students. And next one is Mazes.

Mazes are the type of puzzles that are begin at a specific point and offer multiple routes leading to an exit. Like you can see here these are this is the number Maze where student can little kids learn how to make the picture with the help of numbers. So, these are having the objective to navigate through it without distracting or retracting their steps encountering dead ends. So, the like monkey wants to eat the banana or the girl want to meet with his friend you can use these majors for teaching the concept and student will take interest to complete it and definitely it increases the concentration level of the kids.

The third one is the word search. This is very enthusiastic educational game for the all kind of learning level especially in languages. whatever subject whatever paper you are teaching in the class you can make this kind of word search from your content so this is the example i have taken the healthy food word search and the social studies word search and the next one is Crossword puzzles, Crossword puzzles are also the word game in which they have to learn or have to complete a grid by filling in square which letter or the to create the words in interesting way horizontally or vertically.

So, clues are provided to guide you in the solving the puzzle, like this is the math crossword puzzle and kids can vertically or horizontally calculate it and get the right answer and the this one is the solar system crossword hints are written in downside and they can play very interestingly. So, the next one is Scramble word puzzle. This is also very famous word game that involves the rearranging jumbled letters and such like palm. So, palm is written as p m a l and they have to correct it.

So, these challenges are very interesting for the learners and they complete the task happily. So, this is the picture of anatomy word scramble when you teach in the class you can utilize it. And this is the countries of the world and they are their names are scrambled and they have to recognize it and correct it in a proper sequence. Then the comes the Sudoku. Sudoku is a very logic puzzle this involves the completing mainly 9 x 9 grid.

Sometimes you will get 3 x 3 or 6 x 6 puzzles also. and they have to complete each digit. I have shown here the Sudoku made by one of my B.Ed. students. He has made the puzzle called *Sudoku* and *Colorku*. You can see that we always play on the paper pencil.

but he has made color sudoku as well as the number sudoku and these are the board game you can arrange them in proper way and play with the sudoku.

So, some website of the educational games is there we can utilize it for the teaching learning process to teach our students like the first one is *Maths fun* this provides educational games like puzzles, numbers, strategy, logic and multiplayer game. So, these are the list. like the *LittleLadoo* is all about making learning a joyful ah joyful adventure and this these there are printable designs of play and you can take the print out and use for your students or the kids. So, the similarly there are many games one of very interesting game is like *akinator.com*

You can see this *akinator.com* is a fictional character and you imagine the guess the any famous personality you known to you and you will feed the answer and you will guess this app is able to tell you about the right answer. So, this is very interesting online game and we as a teacher should know especially the B.Ed. and M.Ed. students the school teachers should be aware about this kind of games. Like *prodigy kids* is also very standard aligned skills-based mathematics based or English game where students can play and the teacher will also utilize with their students and parents can also utilize this.

I have given the screenshot of different games which I had mentioned in the previous slide and these this you can go through the link and play with your students yourself and as well as your kids. The next one is Indian Educational Game. This is *ALPA Kids* and *ALPA Kids* is very interesting game for the students like 3 to 8 years old and they can play the game online this is free game and the educational video games are also available. This is the international level game like basic math and animal jam classic and I have given the link.

Definitely the learners of this course should go through the given link and they should try to see that what kind of games are going on and this one is the computer game actually the school system at present is having the scratch junior in their syllabus. Like this game this coding app is creative very creative for the learners of class 4 and 5 classes. this was taken from my daughter's class 4 computer curriculum and you can see that this Scratch Junior is available at Amazon or Android OS you can play kids can select the backdrops, the characters, the scene and the activities and they can create their own puzzle and the pieces they can create the animation, storytelling and through this they can learn many things

without any extra effort. So, this kind of computer games involved in the curriculum teacher should be trained and they should try to make available for the learners.

Now, the pedagogical principles of educational games. Every educational game is having its own pedagogical role and here I have tried to elaborate this pedagogical principle of educational games like active learning, progressive difficulty, constructive failure, collaboration and social learning, engagement and motivation. immediate feedback, personalization and contextual learning.

Definitely this active learning is very important for the educational game whenever we are using to teach with the help of educational game our learners will learn active very actively their participation will be very active. Then the engagement and the motivation definitely enjoyable or a stimulus-based curiosity-based learning will increase the enthusiasm in between the students. The progressive difficulty as soon as they learn their difficulty level will increase complexity will be increase and then they learn more things. Immediate feedback this is also very important that instant response that they are going well they are going in the right direction is very important at the time of learning.

Constructive failure, definitely students should be, learner should be encouraged to do the mistakes and learn by their mistakes. So, these mistakes are called constructive failure which leads to the success in that game or in that content taught by the teacher. The next one is personalization, definitely game should be adapted to the individual learning styles and the pace. The student who are very much smart and they are getting the understanding the concept easily, they will learn faster and the learner who are having slow learning or any kind of difficulty, their pace will be slow. There should no problem regarding the pace of the learning.

So, next one is collaboration and social learning. Some games should promote teamwork and peer learning. every time the individual game should not be promoted but also the group performance group games should be encouraged in the classes contextual learning the context should be meaningful and applicable to real life situation now about the application of the educational game, where we can apply the educational games because these are widely used across the various domains including formal education, corporate training and personal skill development and maybe they are used as the classroom learning for the special education, for the stem education, online learning platforms they are being utilized in the language acquisition and also, the soft skill development.

So, the application of educational games is enormous and we should try to promote the educational games to make our teaching learning process interactive. The first one is classroom learning, the teachers use games to reinforce the concepts such as riddles, mazes, math puzzles, word and interactive digital tools. The online learning platforms also can be utilized for the gamified learning and the special education many sports activities and games are there for the person with disabilities helping them to improve their motor skills communication and cognitive development.

The language acquisition definitely the employees or the teachers or the students who are having the any kind of difficulty regarding their vocab and the grammar portion they can take the help of this kind of educational games. The stem education, educational games are very much utilized in the science, technology, engineering, mathematics subjects to by using the simulation and problem-solving games for practical learning. Soft skill development. Many type of training like leadership, team work, communication skills can be improved through role playing and interactive simulations.

So, these are the applications. Now, the challenges of educational games. Despite of the advantages definitely there are some challenges like the cost and accessibility. High quality digital games may require expensive resources. and this is not every time this is not true many websites are there which are free freely providing the educational games, but their number is very limited.

The screen time concern definitely this is the biggest concern regarding the online games, then excessive gaming may lead to the addiction or reduced physical activity. That is why we promote the educational game which are handmade and developed by the teachers or the trainers or the trainee teachers like B.Ed. or M.Ed. students. The teacher training educators need to skill to integrate the games effectively into the teaching. If the teacher is not trained teacher educator is not trained definitely, he or she will not be able to train their own students for further uses of educational games.

So, their training is very much important and most of the time these teachers are lacking this kind of training. Next one is content quality Some games lack pedagogical values and may focus too much on the entertainment and they will mislead or distract the course content and maybe not having any worth called as educational game or they are only for the entertainment purpose. the distraction this is also the big problem.

Sometimes classroom teaching distracts from the teaching objectives to and creates so much mismanagement in the class chaos in the class and classroom discipline is distracted

teacher is not focused students are not listening due to the educational games that is created promoting the entertainment and not on the focus on the concept clarification.

In today's lecture we have two concepts first one is educational game and this second one is simulation. What is this simulation we have to first understand then we will go for the simulated teaching or the teaching aids things. So, the simulation is the education, in the education where we make the interactive learning experiences that replicate the real- world process environment or situation to the enhance the learning of the students. So, they provide a safe controlled and immersive way for the students to practice a skill test hypothesis and develop decision making abilities.

By the name of the simulation, you should understand that these are not performed in the-real situation the these are the performed in the artificial situation. So, these simulations are widely used in the medical training, business education, engineering, military training and STEM disciplines to offer experimental learning beyond textbooks. They integrate Virtual Reality, Augmented Reality, AI and gamification creating realistic educational scenario. In our teacher training program in teacher education simulated teaching is also referred as teaching simulation. It involves the creating artificial teaching environment to help the future educators prepare for real classroom scenario.

These simulations take various forms such as role-playing activities, video-based scenarios and interactive online simulations. So, in practical in teacher training simulated teaching is allowing pre-service teachers be it interns to gain the experience in managing classroom situations including handling the student's behavior, delivering the lessons according to the accommodating all kind of teaching skills learned at the time of micro teaching and assessing the learning outcomes and remember this term micro teaching, micro-teaching is scaled down teaching where at the time of teacher training B.Ed. students are practicing themselves with the skill-based teaching training.

So, these all-whatever skills they have learned they accommodate in the simulated teaching. So, this method provides a safe and controlled setting where teachers can refine their skills before entering the actual classroom and here in teacher training departments in the at the time of internship the B.Ed. trainees real time situation where they perform their teaching in the real classroom with the real student and before that they practice in their own department in the artificial situation making their peers as a learner and this is called simulated teaching.

So, different approaches to simulated teaching include the online simulations, role playing exercises, video scenarios and the micro teaching. This online simulation is like managing virtual students and scenario through the computer program. Role playing is we can understand that the trainee enact or act or role play according the situation and the scenario like sometimes they are playing the role of teacher or the observer or sometimes they play the role of students.

Then comes the video scenario. whatever they are doing in the class teaching in the class observation and analyzing their recorded video. And they interact on behalf of that video and they came to know that they are performing well or not. And the fourth one is micro teaching. Micro teaching is the regular practice in the

Teacher training programs where brief skill-based lessons are delivered to small groups for feedback. And this small group is the peer group of that teacher trainee who is performing in the skill-based teaching classes. So, these are the different approaches of simulated teaching in the teacher education program. Now, we can say that these four activities are related to simulated teaching, where in teacher-training we are doing microteaching further for simulated teaching. There are types and applications of educational simulations, like I have mentioned here that the first one is physical simulations, like hands-on and laboratory-based in science, in the field of science we utilize it.

Like medical simulations, manikins used for CPR training, engineering simulations, wind tunnel experiments for aerodynamics. The science lab simulations, like chemical reaction simulation for safe experimentation. The second one is computer-based simulations, like software and virtual labs, where virtual labs like Labster and PhET interactive simulations allow students to conduct chemistry, physics, or biology experiments virtually and the next one is economic and business simulations.

These are like Econland Marketplace Simulation, where they simulate the financial market, business management, and corporate strategies and the coding simulation, which I have talked about earlier, that Scratch or Code.org or Code academy, these are the platforms which teach programming skills through an interactive environment. The third one is virtual reality or augmented reality simulations, like VR medical training where Touch Surgery, SimX allows students to practice surgery in a virtual operating room.

So, before going to real classes, they get training with the help of these VR medical training. AR science simulations, augmented reality science simulations, are like PM e-Vidya AR. Its name has been changed now, becoming ePartial AR and Google Expedition

AR Merge Cube, it enhances hands-on learning in physics, biology, and chemistry. Also, historical or cultural virtual reality simulations are there, like virtual tours of ancient civilizations and historical landmarks, which are now possible with the help of these simulations, where without going to the farthest place, we can visit that place.

The fourth one is role playing and scenario-based simulations like the teacher training I have already mentioned that the teaching skills together in an artificial situation and the peer group play the role of the learner and one of their peers is the playing the role of teacher. So, the next one is Business Negotiation Simulation helps the MBA student's business management students practice corporate negotiations. Then comes the Crisis Management Simulation. It teaches the emergency response and disaster management strategies to the learners. Now, the limitations of the simulations in education.

Despite of the different benefits or the advantages simulations are also having certain limitation or challenges like the high development cost these kinds of all technological things are having cost issues. The technical requirement all the administrators or the teachers are not having the high-end training regarding the technical use of these simulations or the software. The Steep learning curve for the educator's faculty members may require training to integrate simulation effectively. We as a teacher educator we are very much able to simulate the teaching in the artificial situation at the time of micro teaching and simulated teaching, but beyond that using any software is hard for us also and without training. So, the next one is limited Real-World Unpredictability.

So, definitely simulation may not fully replicate the complexity of the real-life situation and maybe the imagined or hypothesized artificial situation practice is different and the real-life situation may be different for the learners. So, what are the difference between the educational games and the simulations in education? More or less these educational games are looking similar, but they are not identical. Simulations primarily aim to realistically replicate the real-world scenario often without a specific win condition, because there is no matter of win or lose, but in contrast to that educational games incorporate more playful element and structured objectives guiding learners towards a defined goal even when they mimic real life situation.

So, both educational games and simulations are valuable learning tools, but serve different purposes. Games emphasize engagement and motivation through structured goals and interactive elements, while simulations focus on realistic practice and skills development in real-world scenarios. Their effectiveness depends on the subject matter, learning

objectives, and the target audience for whom they are prepared. So, now we will visit some simulation demos.

I thought I would show you different games, especially *Akinator*, because I personally like *Akinator*, it imagines your thought process. But I want to show you this simulation demo from funbrain.com. So, I will try to connect it; I hope it will open. So, it will show how the simulation demo works. Now, I want to show you the simulation demo on the website funbrain.com, and I

After that, I will show you small clips of the educational games made by our B.Ed. students for your learning purposes. By watching those small videos, you will learn how to make educational games by hand through creativity or activity-based teaching-learning processes. So, I will show you the *Funbrain* game, which is a simulation game and will be very interactive for learners. Here, you can see the picture of a tiger. So, the voice is not coming.

So, I will check the audio maybe systems audio is closed yes, yes now tiger is roaring you can see and if we are going to see that the power of his body the muscular part body parts muscular system will be showing here if you will click on the heart now how it eats The digestive system, you give him the meal, he is eating. Now, the frog, he eating. Now, digestive system is working by its own.

Now, we will give him the leaf. He is throwing, he will not eat it. Now, the carrot, he will not eat. But again, if I we will give the fish he is eating. So, this kind of demonstration will be helping for the learners the they can understand the body part the digestive system it is having the sound system also.

Now, the brain. Now, the bones. you can do this this this kind of activities how it will look now the tiger is gone. So, this kind of simulation is there and we can utilize the things for the training of the students, our learners and this is the Bengal tiger. So, I hope you will enjoy this kind of simulated learning in the class show utilize the facilities available online for your learners and for yourself also and now we will conclude our lecture that educational games are definitely powerful or useful tools in the modern time in modern education blending the learning with the play to create engaging and effective learning experiences.

By adhering to the key principles, educators can use these games to enhance the students motivation, their cognitive skills, their collaboration, problem solving abilities. critical

thinking and different types of positive approaches are involved in the educational games. As the technology continues to evolve the role of educational games in formal and informal education system is expected to grow.

Making learning more interactive, personalized and impactful learning these technology-based games can be utilized. Therefore, parents and the educators should encourage learning through play as much as possible either its ground game or the online game. So, that should be educational definitely. In the other hand simulations in education transform the learning by making it interactive, immersive and experiential and we have seen the that how the Bengal tiger is functioning.

So, this kind of simulation is whether it is in a stem, medicine, business, humanities or language learning simulations It bridges the gap between the theoretical knowledge and the real world. This is the educational game made by one of my B.Ed. students, Shruti Das, and she will present how to play. This is the educational game for mathematics.

She is unboxing, and these are the parts of the game: the player's part, the cards, and she has given the name of this game, MATH-A-THON. This is a board game, and it has two players. One is the Rabbit, and one is the Tortoise. And both are made by you? Yes, it is made of molded clay. Okay. First, we have to throw the dice. Let the Rabbit take the first turn. So, the face of the dice shows 1 and the Rabbit proceeds one step ahead. Now the space is the color pink. So, we have to pick the pink card from these cards. He or she can choose any of the cards. Here the question came: What is the formula of the discriminant of the quadratic equation $ax^2 + bx^2 + c = 0$? Okay! and the answer is $b^2 - 4ac$. If he or she gives the correct answer, then he will advance to this place. Okay. But if not, then he will go back to it. The previous place. Okay. Then the next turn will be the tortoises. Okay. Then, using a similar method, we can proceed.

Okay! The dice will be rolled by the tortoise, and whatever number comes up, he may play. The student will play. The student will play. Okay, and what about these four colors? If one player rolls the dice and it lands on six. Okay. Then We will go to the sixth place.

One, two, three, four, five, six. Okay. Then there are four colors. Okay, So, he or she can choose any of the four colors. Okay. Now he or she has the option of choosing the question. Option of choosing the four colors. Okay. From the four colors and the four colours define the four parts of mathematics. Pink is for arithmetic. Okay, you have written here, right? Yes. Okay, that is dark, but we can read it. Okay.

Sky blue is for geometry, yellow is for trigonometry, and orange is for statistics. Okay. So, if the student is good at statistics, then he or she will choose the orange card. Okay. So, he chooses the orange card.

Then the question comes. What is the mean of 5, 10, and 15? Okay. These questions are already prepared. Yes.

Okay. So, he can give the correct answer. So, he will place this, acquire this place, or if not, he will go back to his previous place. Okay. And the game will end.

When the first player, who will finish the game, wins. Okay. Thank you. Thank you. So, dear learners, this kind of educational game can be prepared for each and every level of the learners according to their needs, the subject, and the difficulty level.

So, thank you, Shruti, you have made a very interactive educational game. And I will be using this in my course content. Thanks. This is another educational game made by Nibedita of B.Ed. Semester 1.

She has made the educational game on the different paper of the education and there are question bank of this course. topic like educational technology and the educational communication and the student will play how they will play Sutapa you please play with the dice there they are the three colors, color will come red color is came it means the question bank will be taken from the bank of learning theories And the question will be asked by the student and they will give the right answer and accordingly they will get the score. Then again if the wrong answer, then another dice she will play and the game will be going on there.

This is another educational game prepared by one of our B.Ed. student Deep Ghosh and it is about the reaction mechanism. Now, Deep will demonstrate how it will be played by the students. Yes, Deep, you can continue. Hello, I am Deep Ghosh, a student of B.Ed.

First semester. Now, I am going to show how our game, our educational game about Reaction Mechanism works. So, let us learn. This is a carbon atom. And if you put two oxygen atoms, it makes carbon dioxide.

Okay. And then if you add more oxygen, it will make a carbon atom. If you remove two then it is a carbon monoxide, ok good, so you can make much more combinations through it so here is much more atoms like, Ba^{2+} , Zn^{2+} so here can be made various type of possibilities or various type of combinations there are four types of reactions mainly

addition reaction decomposition reaction displacement and double displacement so you can use to make ah four types of reactions so a student who can make much more reactions or make more reactions compared to the others he will win, he or she will win so let's make two reactions Ba^{2+} & 2Cl^- then if we put sodium and OH then it will form BaOH whole two and two table salt or NaCl So, it is a nucleation reaction and you made a new reaction.

Then, 2NOH and 2HCl . It will form 2 water and 2 table salt. It is a nucleation reaction. Very good. So, you can make various type of combination and make chemistry easier through this game.

Okay. Then, the student who will make more combination, he will win the game. Okay. Thank you. Thank you.

He has shown his creativity by the cubes. He has made the cubes with the help of thermocol and the paper. There are two types of game can be played with the numbers and the color cubes and we can play like this. Putting the numbers or the colors here in this board. So, this is very interactive educational game made by our student and I hope you will utilize these contents. Thank you. Keep learning.