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ABSTRACT

Educational games have received increasing attention as one teaching technique for individualizing instruction. The use of games for education was borrowed from the business community, which in turn had borrowed the idea from the military. Educational games include several distinct types--simulations, role playing, games and simulation games. Two general classes of classroom games have been developed. The first teaches specific skills and subject content; the second presents moral and social concepts. Games generate student enthusiasm and involvement. They encourage interaction among students. Disadvantages include their high cost and limited availability and their simplistic structuring of reality. The design of educational games involves several distinct steps. The first and most important is the specification of the game's objectives. The determination of a model appropriate to the objectives follows. Evaluation of games should test the game's validity and coverage and two aspects of comprehension--the students' understanding of both the game and the real world subject of the game. A 16 item reference bibliography is appended. (KB)

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EDUCATIONAL GAMES IN TODAY'S LEARNING

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Introduction

Education is currently in the midst of great change. In recent years topics such as student motivation, relevancy, and individualized instruction have been of interest to many educators. These concerns have led to curriculum changes, but more often to changes in teaching methodology. During the last decade instruction has been directed towards meeting the needs of individual students through child-centered teaching methods. Employed in these techniques are more extensive use of such educational materials as learning packages, performance contracts, films, television, and computers.

Because individuals learn or obtain meaning from their surroundings differently, one method of instruction does not bring equal degrees of success to all students. To optimize the learning process, instruction needs to be adapted to each individual's abilities and modes of learning. With the increased emphasis on personalized instruction it has been realized that education will not adopt one educational technique as the best method and disregard all others. On the contrary, more methods will be developed to complement those already in existence in an effort to meet the needs and styles of each individual.

One teaching technique which has recently received much attention is gaming. Educational games have been known by many names. They have been called models, simulations, games, simulated games, role-playing exercises, and many more. The lacking commonality of terminology is due to the diversification of the technique's origin and the uniqueness of each educational game produced.

Educational Games - Terminology And Types

Simulations

Simulations are models of physical or social situations. These have two basic characteristics; the first being that reality is represented, whether physical or social, on a reduced scale. The second characteristic is that reality is portrayed in a simplified form. In other words, only selected components of reality are included in the model. Physical models are constructed of many products and are often used to show their exterior appearance without simulating the intricate internal working parts. Like wise, social models are often developed as training aids to simulate a limited aspect of business or industry.

Role-Playing

Role-playing is often confused with social models or simulations. Most social models involve role-playing but not all role-playing can be classified as simulation. Role-playing can be defined as a portrayal of those activities and attitudes possessed by one in a specific position or role. Role-playing qualifies as a simulation when the roles portrayed accurately correspond to those actually in that role in the real process or system. On the other hand, one's interpretation of what a role is, such as a youngster playing "teacher", does not constitute a simulation because it does not accurately portray the real role.[1]

Games

Games are contests played under predetermined rules for the purpose of winning. This definition does not differentiate between casual games and educational games. There are many similarities between the two types except that educational games have explicit, preplanned, educational purposes and are not played just for entertainment. Student enjoyment and interest has been one of the strengths of educational games and this characteristic should not be destroyed but rather used to advantage. Dr. Clark Abt stated: "Games may be significant without being solemn, interesting without being

humorless, and difficult without being frustrating".[2]

Games may be simulations but they need not be. The primary distinguishing factor between games and nongames is their competition. Games stimulate competition between players and culminate in a definite winner and loser. Noncompetive simulations, such as production lines, chemical reactions, or traffic flow, are not considered games, where as business simulations in which the participants try to increase their profits have winners and losers and are therefore classified as games.

Even though the terminology used in connection with this subject and their definitions are not agreed upon by all, the factor which distinguishes games from other activities is its competition. Most subjects and activities in which there is competition among members with definite winners and losers can be called games.

Simulation Games

Simulation games are those activities which combine the characteristics of both simulations and games. They are models of physical or social situations in which there is competition, with definite winners and losers.

Historical Development of Games

Games have their origin steeped in history but were not used in education for learning purposes much before the early 1960's. Games in education originated from simulation games in the business community. The business community, in turn, borrowed the technique from military training.

Military Games

Military games or war games as many are commonly called date back many centuries. One of the oldest war games is a form of chess which was used as a stylized or symbolic representation of war. Other early games similar to chess have been found originating in many parts of the world and are thought to have the same purpose.

As war became more complicated and abstraction was more developed, other military games were developed. Some of these were played for pleasure and others were used for instructional purposes. One of these games was "Kriegspiel", first played in 1798, which used a map and outline of rules which the soldiers followed.[3]

During the 1800's military games began to align themselves into distinct groups. These were the "rigid" and "tactical" war games. Rigid games were more of an academic training in overall war strategy. The games covered realistic situations which required much preparation, the use of charts, maps, and tables. The unpredictable

changing patterns of the war were introduced through the use of dice. The second type of war game was used for tactical training. These games employed great realism and were played by large numbers of soldiers.

These early games developed by the Prussians have now spread through the world and are part of the training for every military force in existence. Since the days of the nineteenth century, war games have become highly sophisticated and their operation has lent itself to computer processing.

Business Games

Over the years of military game development, the business community saw applications for techniques similar to those used by the military. With the expanding need for qualified management personel, those in business began analyzing training methods. The methods used in formal education, such as lectures and seminares, did not actively engage the student in the real world of business. Much of the information in this type of presentation was factual and poorly remembered or did not have immediate application and therefore was forgotten. The second common type of training was on-the-job learning. This method was highly desirable, however, it was relatively slow and learning was limited to the job encountered. Also, mistakes made while learning were costly to the industry. Beacuse of this a new training technique had to be developed which would incorporate the desirable aspects of both types of training.

In 1956 the American Management Association developed what was probably the first game for business management. It was called the "Top Management Decision Simulation". This game and others were used to allow the participants interaction with real life situations. Participants were confronted with problems and they had to make decisions based on their knowledge and gained experience.[4]

Educational Games

The first use of educational simulation and gaming as reported by Tansey and Univin[5], and Boocock and Schild[6] was in 1962 in a project known as "Jefferson Township School District". This early use of simulation games was developed to train educational administrators, similar to that used in business. The administrators were presented various situations and were asked to react to them.

The use of games in the classroom fell into two general classes. The first use was to aid students in developing skills and learn course content. This technique was developed by Layman E. Allen, a professor at Yale, and notably was in the area of mathematics and logic. Many of the early games were played using dice and tended to be highly competitive.

The second type of classroom game attempted to teach social or moral concepts. Guetzkow, Alger and others at Northwestern University and Coleman and Boocock at Johns Hopkins University were the leaders and pioneers in this field. These games tended to employ real situations and nations put under ficticious names. Games of this nature were more highly simulated with less competition than those of the first type. Games of the second type have developed more strongly than those of the first, especially in the area of the social sciences. One of the major producers of this type of game has been Abt Associates, Cambridge, Massachusetss.

Values Of Games

Since its early development, the technique of gaming has grown and many educators and researchers have indicated that the technique offers advantages to the educational process.

The most predominant characteristic of gaming is the enthusiasm generated within students. Games are highly motivational because students enjoy them. They look at games as a form of play. Research has shown that those who have played simulation games have expanded their interest in the subject of the game and have gained intellectual confidence. The degree of complexity and structure of games has had a direct relationship with the degree of concentration, understanding, confidence, and satisfaction experienced through the game.

In addition to motivational effects, games tend to lead to a high level of involvement by those who participate. Games provide direct experience with the topics dealt with in the game. Students learn through the actual manipulation of game components. They analyze individual components in the game model and learn how these should be combined to obtain desired interaction to win or succeed. This allows an opportunity to sense the structure of the game variables.

In the conventional classroom the teacher must play a role as guide and evaluator. He must lead pupils through learning and at the same time criticize and judge them. Games and simulations tend to break down the direct one-to-one lines of interaction between the teacher and the individual student and open up interaction between the students. The teacher now acts only as a guide because the game itself acts as the judge by "rewarding" or "punishing" certain behavior or actions. The winner is determined within the framework of the rules of the game and not by an evaluation from the teacher.[7]

Games provide a means for students to learn peer interaction. In all games the participants experience competition and tension to overcome the obstacles in the game

and achieve the stated objectives to win. In some games this competition takes the form of one player individually competing against another. In other games cooperation among players is needed to successfully compete against other players. In still other games one competes against himself or a standard.

Games aid in developing efficacy. Students learn through games that they can have an effect on their surroundings. Most games depend on the action and ability of the student to apply what he knows for success. From this the student sees that his behavior has a direct relation on the outcome of events.

While students learn that they can effect their own environment, they must also learn that in life, as in most games, there is an element of chance or fate. Through games players learn that information is not always accurate, machines break down, and nature can cause disasters to occur. The elements of chance adds realism to the game and teaches that bad luck can not be avoided but its effects can be reduced with good planning.

Games as well as simulations can be used to acquaint students with situations which could be found in real life and yet do it quicker and without the long lasting consequences which would be found in life if failure is encountered. This value adds a feeling of realism and relevance to the classroom. The fear of reproof and failure often deters students from entering into traditional instructional methods whereas with gaming the student is not held to the effects of this mistakes, and is only beaten by the system rather than being criticized by the teacher.

The values of using academic games in the classroom are many and varied. Like any other teaching methodology, gaming has its disadvantages as well as its advantages. Some have felt that games are a gross distortion of reality and tend to introduce naive misconceptions of the game topics. Others have felt that games introduce a given set of values and students are not given the opportunity to establish their own values. Games offer the disadvantage of being limited in the types of physical, psychological, and social contexts in which they may be placed. Cost associated with some types of games, particularly computer games, has been extreemly high and therefore one limiting factor. Another disadvantage to gaming is that not all fields of education have commercially produced games and those who produce their own games are limited by the time it takes to develop a game and their own creativity.

Game Construction

Game construction is difficult and those in the field concede that game design is still in its early development. There are no concrete steps to follow to achieve success. The success of the game design thus far has been erratic in nature and relies primarily on imagination rather than established techniques.

The first and most important step in designing a game, as with any other instructional method, is to identify the objectives of the game. One must know what is to be learned or taught through the game. Games can generally perform three functions or fit into three general categories. These include first, the learning of facts. Fact type games can reinforce already known material or teach new material. A common example of this type game would be one designed using arithmetic flash cards. The second general classification of games are those which teach "about" something or teach a process. An example of this type of game is "Legislature". In this game students play the roles of representatives trying to get bills passed by the legislature. Players learn about the process of government through the game. The third type of game is one during which the students extrapolate concepts on their own using what they learned through the game.

The second step in the construction of a game is to determine the mode or model which can best teach the stated objectives. Various modes can be used such as cards, dice, boards, role-playing, computers, writing, and construction. Models, either physical or social, can also serve as the major agent in achieving objectives through games. If a model is selected it must be defined at this stage in the design process. A model must be developed which is simple, manipulable, and significant.

The third step in constructing a game is to identify the players. The players must be identified as to their nature and number. Some games require many different types of players to work as a team. Other games require only one person to take each position. The size of the team and number of each type of player is determined by the number which can demonstrate the model effectively. The classroom needs and limitations should be considered when making these decisions.

The players must have resources to manipulate or exchange in competition with other players. These are decided upon and must take a form consistent with the game mode or model. Resources may be such things as troops, money, votes, products, and the like. The resources should have precise value so that players can assess their position and progress during the game and facilitate determining a winner at the termination of the game.

Fifth, the players must engage in some activity or exchange of resources. This activity must be clearly defined and specific objectives or goals for the players must be stated. These may be to collect points, make money, advance one's position on a board, capture so many of the enemy, collect so many votes, and the like. These goals will in most cases be far different from the overall educational objective for the game itself.

For most games a set of limitations or rules must be established to state what is acceptable activity and what is not. Also time or point limitations may be necessary to determine certain stages of the game such as the end of a battle or termination of a

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hand of cards. Criteria also need to be stated to determine the end of the game. In some games the limitations or rules imposed are very elaborate and strict while others are relatively simple. Some games encourage the breaking of the rules if players feel they can get away with it but they must also be willing to pay the penalty if they get caught.

Finally, some games require a certain amount of background information to set the stage before play may begin. For example, a discussion of a historical situation describing the various players, their motives, backgrounds, and objectives may be necessary to function in a particular model. This information may take its form in written commentary, audio or video recordings, pictures, slides, or any other means of presentation.

After a game has been written it must be tested by actually playing it. This is the only way to see if all players are equally involved, to determine the time needed to play the game, and test the rules of play. After testing, most games need revisions to improve their playability.

One of the most important considerations in game planning is the after game discussion. Games provide a point of departure to bring out the educational objectives for the game. The teacher should try to get the students to verbalize about their feelings and actions during the game. Students should state the real world applications or implications brought out because of the game. Also, many students have questions regarding certain aspects of the game and the real world counterpart. These aspects of gaming must be considered and used to their fullest to achieve the maximum value of the gaming experience.[8]

Evaluation

Less material has been written on the subject of game evaluation than any other aspect of gaming. The success of individual games to date has been of an erratic nature. This is partly due to the lack of concrete evaluation criteria. However, due to the varying nature of each individual game it is difficult to establish criteria which would apply to all games.

There are several questions which should be asked about a game which might provide some measure of its success. First, how valid is the game? To be valid it must accomplish the educational objectives which were predetermined at the beginning of the design stage.

A second factor to consider in evaluation of a game is its coverage. Does the game really represent the subject portrayed? Coverage would seek to determine the degree to which a game represents its real world subject. This question is particularly applicable to

those games built on physical or social models.

Comprehensibility should be considered. There are two areas of comprehension to be evaluated; the first being the comprehension of the game itself by the players. Are the students able to understand the game operation? Care must be taken to explain the game and make it as understandable as possible. Understanding must not be confused with simplicity. Games should not be unnecessarily complicated or confusing, however, they may be structurally complex to make them more exciting and challenging. The second area of comprehension is that of the real world subject of the game. It is important to determine the degree to which the game portrays the desired concept.

Closely alligned to the last consideration is the degree to which a game is structured. Is the game playable? The rules must be evaluated to determine whether they needlessly restrict players or the action of the game, or whether there are enough rules to cover all situations.

A fifth factor to consider in game evaluation is the degree of competition and participation of the players. These two factors are very important to make the game interesting and exciting for the students. Without these two factors many of the values of games, such as motivation and interaction, are not present.

The ultimate area of evaluation is that of educational value. Answering questions regarding the degree of learning which takes place during gaming must be evaluated in light of the game's educational objectives.

Gaming Research

The results of research studies in the area of gaming have been as diverse as their purposes. Smith[9] found that students could learn factual material using computer simulation games. Studies by Harvey[10] and Confe[11] found similar results. A study by Lunetta[12] found that cognitive information could be learned more effectively using gaming and loop films than conventional classroom approaches. In studies by Anderson[13], Curry and Brooks[14], Stadsklev[15], and Cherryholmes[16] the conclusion was that students could not learn significantly more using games than traditional methods.

Conclusion

Educators need to be aware of differences within individuals and the affect that differences have on ways in which students seek meaning from their surroundings. Individual

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differences must be realized and various educational methodologies be available to students to meet instructional objectives. Students should be allowed to select alternative instructional techniques enabling them to capitalize on their unique skills and abilities. One technique which offers excitment and involvement is educational gaming.

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