International Journal of Innovative Social & Science Education Research 11(4):154-158, Oct.-Dec., 2023

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Impact Of Chemical Simulation Laboratory On Students Academic Achievement

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ABSTRACT
The study looked at the impact of chemical simulation laboratory on students' academic achievement. The study adopted the descriptive survey research design. The population of the study consists of 120 chemical engineering students from various polytechnic in Rivers State. The entire population was used as sample for the study. The instrument for the study was titled "Impact of Chemical Simulation Laboratory on Students Academic Achievement" (ICSLSAA). The instrument is a four point rating scale consisting of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The items were weighed as 4, 3, 2 and 1 respectively. The instrument was validated by an expert in the department of chemical engineering in Rivers State University. The data obtained from the study was analyzed using simple charts and mean. Findings obtained from research question 1, table 1, revealed that items 1 to 7 all agreed to the various questions. Also, findings obtained from research question 2, table 2, revealed that items 8 to 13 all agreed to the various questions. It was finally recommended that chemical simulation laboratories needs to be established to enhance students knowledge on chemical analysis in Rivers State tertiary institutions.
Keywords: Chemical Simulation Laboratory, Academic Achievement

INTRODUCTION
Simulation systems are widely used in classroom for teaching and learning. It gas a high effect in capturing students' interest. We might divide applications of simulation broadly into two categories. The first includes so-called man-in-the-loop simulations used for training and/or entertainment. Many professionals hone their skills and learn emergency procedures in simulated environments which are safe from the consequences of inexperience and failure. Pilots train in flight simulators in order to experience the cockpit of a particular aircraft; nuclear power-plant operators routinely recertify in control-room simulators; physicians learn new procedures employing simulated patients (McGraw-Hill. Kelton, Sadowski, 2001).
In the realm of entertainment, we have all played computer games that simulate everything from driving a train to navigating the fanciful unrealities of virtual worlds. The emphasis here is experiential—learning (or just having fun) by doing. The second category includes the analysis and design of artifacts and processes. This is the technical domain which engineers and operations researchers most commonly associate with simulation. Consider for example the design of a new aircraft. The Wright brothers invented the wind tunnel in order to simulate aerodynamic phenomena using scale models. Wind tunnel tests are still used to calibrate highly-complex aerodynamic computer simulations. Simulation stands in contrast to analytical approaches to the solution of models. In an analytical approach, the model is expressed as a set of equations that describe how the system state changes over time. We solve these equations using standard mathematical methods—algebra and calculus—to determine the distribution of the state at any particular time (Ingalls and Eckersley. 1992). The result is a general, closed-form solution,

which gives the state at any time as a function of the initial state, the input, and the model parameters. When models can be solved analytically this is always the preferred approach.

Simulation is a particular approach to studying models, which is fundamentally experiential or experimental. In principle, simulation is much like running field tests, except that the system of interest is replaced by a physical or computational model. Simulation involves creating a model which imitates the behaviors of interest; experimenting with the model to generate observations of these behaviors; and attempting to understand, summarize, and/or generalize these behaviors. In many applications, simulation also involves testing and comparing alternative designs and validating, explaining, and supporting simulation outcomes and study recommendations (Ingalls, 1998).

In a discrete-event simulation, inputs are realized by the arrival of dynamic entities. These entities flow through the system and are the structural elements which effect the changes in the system state variables. Without entities, nothing would happen. Indeed, one stopping condition for a simulation run is when there are no active entities in the system. In our example, the entities are telephone calls—customers seeking information and perhaps wanting to place an order for a product. The state of the system at any point in time can be defined by three state variables—the number of calls in process on the IVR unit and the number of calls of each type waiting for service or in process. Obviously, the state changes every time a call of either type arrives or departs one of the processing units. While for convenience we will monitor a large number of variables during the simulation (the system image), in principle each of these variables can be derived if we know the inputs to the system and the system state at all points in time during the simulation run. Entities have attributes–characteristics of a given entity that are unique to that entity. Attributes are critical to understanding the performance and function of entities in the simulation.

Purpose of the study

The study looked at the impact of chemical simulation laboratory on students' academic achievement. Specifically, the study sought to:

1. To find out when chemical simulation is the appropriate tool on students' academic achievement.
2. To find out when chemical simulation is not appropriate tool on student's academic achievement.

Research Questions

The following research questions were developed and used as a guide for the study:

1. When is chemical simulation an appropriate tool used on students' academic achievement?
2. When is chemical simulation not used as an appropriate tool for student's academic achievement?

LITERATURE REVIEW

Simulation, according to Shannon (1975), is "the process of designing a model of a real system and conducting experiments with this model for the purpose either of understanding the behavior of the system or of evaluating various strategies (within the limits imposed by a criterion or set of criteria) for the operation of the system." According to this definition, a simulation can be a discrete-event simulation, as we will discuss in this paper. Many people who attend this conference will be familiar with the term "MRP simulation." This is a model (actually a copy) of the real system (the MRP system of record) on which experiments (or scenarios) can be run to evaluate various strategies (such as how to respond to a drastic change in the forecast). Although we do not teach courses in our curriculum on "MRP simulation," a MRP simulation is no less a simulation than the type of simulation we will discuss in this tutorial. The difference, and the power, of discrete-event simulation is the ability to mimic the dynamics of a real system. Many models, including high-powered optimization models, cannot take into account the dynamics of a real system. It is the ability to mimic the dynamics of the real system that gives discrete-event simulation its structure, its function, and its unique way to analyze results. So, to take liberties with one of my mentors in this field, we will say that simulation is the process of designing a dynamic model of an actual dynamic system for the purpose either of understanding the behavior of the system or of evaluating various strategies (within the limits imposed by a criterion or set of criteria) for the operation of the system. Throughout this paper, we will be referencing ideas and thoughts from Shannon (1975), Law and Kelton (2000), Banks, et. al. (2000), Kelton, Sadowski, and Sadowski (2001), Ingalls and Kasales (1999), Ingalls (1998), and Ingalls and Eckersley (1992).

Simulation application's areas are only limited by the imagination of the user." (Farrington, Nembhard, Sturrock, and Evans, 2001). In fact, simulation is used in many different contexts. It practically does not have limits and can be applied to any system that fits the concepts of simulation modeling. Manufacturing systems (ex. optimization of production lines and logistics), public systems (ex. emergency vehicle dispatch and weather forecast), military systems (ex. warfare scenarios and training), transportations systems (ex. railroad and air transportation), constructing systems (ex. test buildings), computer systems (ex. computer networks and computer games), are some examples of applications. In the following sections it will be introduced several important concepts of simulation, and discussed aspects like why and when use simulation for problem solving.

There is not one universal definition for simulation. Nevertheless, all definitions follow the same general concept: simulation is an imitation of a system. System imitation involves the construction of an artificial history, with the real system features. This allows a better understanding of the system including how it works, behaves and evolves over time.

METHODS

The study adopted the descriptive survey research design. The population of the study consists of 120 chemical engineering students from various polytechnic in Rivers State. The entire population was used as sample for the study. The instrument for the study was titled "Impact of Chemical Simulation Laboratory on Students Academic Achievement" (ICSLSAA). The instrument is a four point rating scale consisting of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The items were weighed as 4, 3, 2 and 1 respectively. The instrument was validated by an expert in the department of chemical engineering in Rivers State University. The data obtained from the study was analyzed using simple mean.

DATA ANALYSIS

Research Question One: *When is chemical simulation an appropriate tool used on students' academic achievement?*

Table 1: chemical simulation an appropriate tool used on students' academic achievement

S/N	Items	Mean	Decision
1	Simulation enable the study of internal interaction of a chemical subsystem with complex system	3.43	Agree
2	Informational, organizational and environmental changes can be simulated and find their effects on chemical analysis	3.24	Agree
3	A chemical simulation model help us to gain knowledge about improvement of system	3.33	Agree
4	Finding important chemical input parameters with changing simulation inputs	3.54	Agree
5	Chemical Simulation can be used with new design and policies before implementation	3.23	Agree
6	Simulating different capabilities for a machine can help determine the requirement	3.65	Agree
7	Simulation models designed for training make learning possible without the cost disruption „	3.23	Agree

Findings obtained from research question 1, table 1, revealed that items 1 to 7 all agreed to the fact that simulation enables the study of internal interaction of a chemical subsystem with complex system, informational, organizational and environmental changes can be simulated and find their effects on chemical analysis, a chemical simulation model help us to gain knowledge about improvement of system, finding important chemical input parameters with changing simulation inputs, chemical Simulation can be used with new design and policies before implementation, simulating different capabilities for a machine can help determine the requirement and simulation models designed for training make learning possible without the cost disruption.

Research Question Two: *When is chemical simulation not used as an appropriate tool for student's academic achievement?*

Table: chemical simulation not used as an appropriate tool for student's academic achievement

S/N	Items	Mean	Decision
8	When the problem can be solved by common sense	3.15	Agree
9	When the problem can be solved analytically	3.55	Agree
10	If it is easier to perform direct experiments	3.65	Agree
11	If cost exceed savings	3.33	Agree
12	If resource or time are not available	3.54	Agree
13	If system behavior is too complex	3.57	Agree

Findings obtained from research question 2, table 2, revealed that items 8 to 13 all agreed to the fact that chemical simulation not used as an appropriate tool for student's academic achievement when the problem can be solved by common sense, when the problem can be solved analytically, if it is easier to perform direct experiments, if cost exceed savings, if resource or time are not available and if system behavior is too complex.

Summary of Findings

The following are the summaries of the findings:

1. Findings obtained from research question 1, table 1, revealed that items 1 to 7 all agreed to the fact that simulation enables the study of internal interaction of a chemical subsystem with complex system, informational, organizational and environmental changes can be simulated and find their effects on chemical analysis, a chemical simulation model help us to gain knowledge about improvement of system, finding important chemical input parameters with changing simulation inputs, chemical Simulation can be used with new design and policies before implementation, simulating different capabilities for a machine can help determine the requirement and simulation models designed for training make learning possible without the cost disruption.
2. Findings obtained from research question 2, table 2, revealed that items 8 to 13 all agreed to the fact that chemical simulation not used as an appropriate tool for student's academic achievement when the problem can be solved by common sense, when the problem can be solved analytically, if it is easier to perform direct experiments, if cost exceed savings, if resource or time are not available and if system behavior is too complex.

CONCLUSION

The study showed that simulation enables the study of internal interaction of a chemical subsystem with complex system, informational, organizational and environmental changes can be simulated and find their effects on chemical analysis, a chemical simulation model help us to gain knowledge about improvement of system, finding important chemical input parameters with changing simulation inputs, chemical Simulation can be used with new design and policies before implementation, simulating different capabilities for a machine can help determine the requirement and simulation models designed for training make learning possible without the cost disruption.

In addition, chemical simulation cannot be used as an appropriate tool for student's academic achievement when the problem can be solved by common sense, when the problem can be solved analytically, if it is easier to perform direct experiments, if cost exceeds savings, if resource or time is not available and if system behavior is too complex.

RECOMMENDATION

It was finally recommended that chemical simulation laboratories needs to be established to enhance students knowledge on chemical analysis in Rivers State tertiary institutions.

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