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Insights on Mathematical Modelling

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Description

The process of creating a mathematical representation of a real-world scenario in order to make a prediction or provide insight is referred to as mathematical modelling. There is a distinction between using a formula and creating a mathematical relationship. Real-world, messy problems can be approached mathematically, yielding a variety of potential solutions to help guide decision making. Because math modelling is so open-ended, both students and teachers are sometimes uncomfortable with it. So much unknown information appears to be a barrier. And what are the most important factors, however, it is the open-ended nature of real-world problems that encourages the development and application of problem-solving skills, creativity, innovation, and mathematics. Determine the Issue because modelling problems are inherently open-ended, the modeller must be specific in defining what they want to learn.

Make Hypotheses and Identify Variables because it is impossible to account for all of the relevant factors in a given situation, the modeller must make decisions about what to include in their representation of reality. Making assumptions reveals the variables that will be considered while also reducing the number of variables by deciding not to include everything. Relationships between variables will emerge as a result of this process, based on observations, physical laws, or simplifications.

Perform the Calculation a relationship between input and output will eventually allow a solution to be found. Analyze and evaluate the solution when considering the model's results and insights, one must ask if the answer makes sense. Iterate In most cases, the model can be refined and the process repeated to improve the model's performance. Apply the Model and Report the Results a clear report on the model and its implementation helps others understand the model.

A simulation is contrasted with a mathematical model. This is a reduction of the problem to a small set of equations that capture the essence of it and, more importantly, are simple enough to allow us to perform analytical calculations. Without having to run a large number of calculations, a formula derived from an analytical calculation can provide a clear picture of the role of the parameters in that system. Newton's law of gravitation applied to the solar system was possibly the earliest example of a mathematical model with enormous predictive power. Rather than modelling the entire system in its entirety, he treated the Sun and planets as single points.

Mathematical modelling is the process of describing a real-world problem in mathematical terms, usually in the form of equations, and then using these equations to help understand the original problem as well as discover new features about it. Modeling is at the heart of much of our understanding of the world, and it enables engineers to design future technology. We can use modelling to travel to the far reaches of the universe, peer into the heart of the atom, and predict the future of our climate.

One application of mathematical modelling that we are all very familiar with is weather forecasting. The following steps are used to create a modern weather forecast. Begin with the physical laws. These should be encoded as (differential) equations, particularly the Navier-Stokes equations. Take data from satellites and weather stations to accurately predict today's weather.

What we have described above is, strictly speaking, a simulation. The difference between a simulation and a model is that in a simulation, we are concerned with getting all of the details correct so that the conclusions are as accurate as possible. Using such simulations, we can, for example, predict whether a bridge will remain standing after it has been constructed. By varying the parameters in the computer simulation, we can also test the bridge to destruction without ever having to build it in the first place. Another important application of simulation is pilot training in aircraft simulators, which are designed to be as realistic as possible [1-5].

Conflict of Interest

None.

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