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An Academic Value-Added Mathematical Model in Education Sciences

Pramod N Belkhode[1], Pratibha S Agrawal [2]
[1] Associate Professor, Department of General Engineering, Laxminarayan Institute of Technology, Nagpur.
[2] Professor, Department of Chemistry, Laxminarayan Institute of Technology, Nagpur.

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*Corresponding author
Email: pnbelkhode@gmail.com
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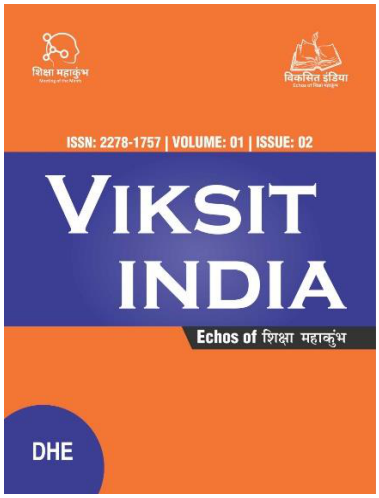

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Abstract
Mathematical Modelling approach which involves realistic equation or the relationship between the one output and number of inputs which indicate the most influencing input to be controlled to achieve the desirable output at lower efforts, cost and time. Equation help to the enhancement of mathematical thinking among the young learners by concentrating on the most important independent terms related to education among the several which influence the output such as evaluation of use of Innovative ICT methods and Modern educational system. Formulated mathematical modelling is useful to predict exact independent term on which more focus is to be given so that the cost of investigation and time to search the cause is reducing which result into the enhancement in the educational output to be achieved. The present work deals with the mathematical computing approaches of each stakeholder's views involved and then relating with the plausible weight age factor determination. NEP is basically construction of education in a structured manner with strong pillars of holistic development, ICT based education, student centric methods and building up a bright future of young learners.

Keywords: Education, Mathematical Modelling, Education System, Enhancement, Innovative.

Introduction
The main propose to identify the most influencing independent term which is going the affect more modern education system compare to other terms such as evaluation of technical education of middle income or low-income students, assessment expanded, Policy Improved Implementation, Use of regional language, student's understanding and many more so that necessary steps can be taken to achieve the desirable output using the mathematical modelling. The concept mathematical modelling approach is applied in the educational study related to implementation of NEP in which different output such as Use of Innovative ICT methods and Modern educational system is correlated to the numbers of inputs terms which is independent such as {(Assessment Expanded) (Policy Improved Implementation) / (Use of regional language)}; {(student's understanding) (participate in Tech education) / (spend sufficient time together)}; {(NEP to leave the course midway.) (UHV vision of NEP) / (NEP job opportunities)} ; {(Technical skills) (Digital skills) (Master basic skills) / (Cognitive skills) (Socio-emotional)] } ; {(Technology collaboration) (ICT tools learning challenges) /(Technology career goals) } ; {(cognitive development) (Pedagogical practices and technology-) / (Students' socio-economic)} and {(quality of teaching) (Remote Learning system) / (gender gap widening)} affecting the performance. This concept of mathematical modelling predicts the performance of implementation of National Education Policies. So apart from direct teaching and research activities such innovative approach of implementing mathematical modelling will surely help the teacher in devising effecting teaching plan. It is a structured approach which involves realistic, which can lead to the enhancement of mathematical thinking among the young learners by concentrating on the most important independent terms among the several which influence the output such as Use of Innovative ICT methods and Modern educational system. Formulated mathematical modelling is useful to predict exact independent term on which more focus is to be given so that the cost of investigation and time to search the cause is reducing which result into the enhancement in the educational output to be achieved.

Design/methodology
The methodology proposed in this work involves mathematical modelling approach as world-renowned field of research in digitalizing the education. Different modelling cycles were developed and discussed in order to describe modelling processes and goals as well as arguments for using in teaching applications. Mathematical modelling approach is the world-renowned field of research in digitalizing the education. Different modelling cycles were developed and discussed in order to describe modelling processes and goals as well as arguments for using in

teaching applications. Many recent qualitative and quantitative research studies show that mathematical modelling was used as teachers' tool. However, students also play an important role in implementing mathematical modelling successfully into education system.

Research limitations/implications

The proposed methodology does not address accurate calculated output using the mathematical modelling approach. To achieve the accurate output to be calculated using mathematical model which is to be compared with the field data-based output to estimate the percentage error is possible by changing the grouping of the individual independent variables. The proposed methodology does not address computer program to ensure the accuracy however the analysis on the excel sheet give the final outcome with percentage error.

Originality/value

The proposed work is highly original in its approach to addressing the challenges of any types of independent terms as in this case related to the education questionnaires' which would help to resolve the inference between the numbers of various independent pie terms to achieved the desirable output at low cost and minimum time. Paper details the collection of different views from different stakeholder by collecting feedback in the form questionnaires' and further correlating the input and output collected data by formulating the mathematical model particularly exponential form. The indices of each grouped pie term indicate the effect on the output variables such as individual independent variable is directly proportional or indirectly proportional to the dependent variables. This interpretation helps to predict the important independent terms on which more concentration or importance is to be considering results into saving in cost analysis and reduces time required for analysis. Paper describe the approach to evaluate of Technical Education of Middle Income, Gender bias restrictions, Use of Innovative ICT methods, Modern educational system and Smart educational system for the in NEP using the field data-based modelling approach.

Analysis of Data (Establishment of Dimensionless π terms)

These independent variables have been reduced into group of π terms.

List of the Independent & Dependent π terms of the Use of Innovative ICT methods, Modern educational system and Smart educational system are:

Table 1: Independent dimensionless π terms

Sr. No.	Independent Dimensionless ratios	Nature of basic Physical Quantities
01	π1= Pi terms related to the Assessment Expanded, Policy Improved Implementation and Mother Language	π_1 = **[(**Use of learning assessments should be Expanded**) (**The capacity of ministries of education should be improved to design appropriate policies and implement them successfully**) / (**Introducing mother languages for each subject in academic institutes is a problem**)]**
02	π2 = Pi terms related to the student's understanding, participate in Tech education, spend sufficient time together	π_2 = **[(**Less than 1 in 10 teachers exhibit good teaching practices, such as regularly checking for student's understanding and providing feedback**) (**Do society participate in Tech education and training?**) / (**Do teachers and students spend sufficient time teaching and working together?**)]**
03	π3 = Pi terms related to the NEP to leave the course midway, UHV vision of NEP and NEP job opportunities	π_3 = **[(**NEP might encourage the pupil to leave the course midway.**) (**"Universal Human Values for Holistic Value-based Education", will go a long way in realizing the vision of NEP 2020.**)/ (**NEP will open more job opportunities.**)]**
04	π4 = Pi terms related to the Technical skills, Digital skills, master basic skills, Cognitive skills and Socio-emotional	π_4 = **[(**Technical skills should be upgraded.**) (**Digital skills should be essential**) (**A significant number of students do not master basic skills**) / (**Cognitive skills should be improved**) (**Socio-emotional skill are most essential**)]**
05	π5 = Pi terms related to the Technology collaboration, ICT tools learning challenges and Technology career goals	π_5 = **[(**Technology in the classroom encourages collaboration with inter universities**) (**ICT tools help students facing physical, emotional and learning challenges**) / (**Technology helps students in exploring and realizing more career goals**)]**
06	π6 = Pi terms related to the cognitive development, Pedagogical practices and technology and Students' socio-economic	π_6 = **[(**Early childhood education (ECE) is needed for cognitive development**) (**Pedagogical practices and technology-assisted learning is lacking for inclusive learning**) /(**Students' socio-economic background has a strong impact on performance**)]**

Table 2: Dependent dimensionless ratios

Sr. No.	Dependent Dimensionless ratios or π terms	Nature of basic Physical Quantities
01	πD1	Use of Innovative ICT methods

DOI:

02	πD2	Modern educational system

Six independents π terms $(\pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6)$ and three dependents π terms (π_{D1}, π_{D2}) have been identified for field study model formulation.

Each dependent π term is a function of the available independent π terms,

Use of Innovative ICT methods = $f(\pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6)$

Modern educational system = $f(\pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6)$

Where,

Use of Innovative ICT methods = π_{D1}, First dependent π term

Modern educational system = π_{D2}, Second dependent π term f stands for "function of". The probable exact mathematical form for the dimensional equations of the phenomenon could be relationships assumed to be of exponential form.

Model formulation by identifying the curve fitting constant & various indices of π terms

The multiple regression analysis helps to identify the indices of the different π terms in the model aimed at, by considering six independent π terms and one dependent π term. Let model aimed at be of the form,

The exact forms of models obtained are as under

Use of Innovative ICT methods = $K1\{[(P1)]^{a1},[P2]^{b1},[P3]^{c1}[P4]^{d1},[P5]^{e1}[P6]^{f1}\}$

Modern educational system = $K2\{[(P1)]^{a2},[P2]^{b2},[P3]^{c21}[P4]^{d2},[P5]^{e2}[P6]^{f2}\}$

To determine the a_1, b_1, c_1, d_1, $e_1$and f_1 in equation, so that:

Use of Innovative ICT methods $(T) = K_1*[(\pi_1)^{a1}*(\pi_2)^{b1}*(\pi_3)^{c1}*(\pi_4)^{d1}*(\pi_5)^{e1}*(\pi_6)^{f1}]$ (1)

Modern educational system $(Me) = K_2*[(\pi_1)^{a2}*(\pi_2)^{b2}*(\pi_3)^{c2}*(\pi_4)^{d2}*(\pi_5)^{e2}*(\pi_6)^{f2}]$ (2)

To determination of K_1, a_1, b_1, c_1, d_1, $e_1$and f_1 in the above equations, so that:

$$\Sigma T = nK_1 + a_1*\Sigma A + b_1*\Sigma B + c_1*\Sigma C + d_1*\Sigma D + e_1*\Sigma E + f_1*\Sigma F$$
$$\Sigma T*A = K_1*\Sigma A + a_1*\Sigma A*A + b_1*\Sigma B*A + c_1*\Sigma C*A + d1*\Sigma D*A + e_1*\Sigma E*A + f_1*\Sigma F*A$$
$$\Sigma T*B = K_1*\Sigma B + a_1*\Sigma A*B + b_1*\Sigma B*B + c_1*\Sigma C*B + d1*\Sigma D*B + e_1*\Sigma E*B + f_1*\Sigma F*B$$
$$\Sigma T*C = K_1*\Sigma C + a_1*\Sigma A*C + b1*\Sigma B*C + c_1*\Sigma C*C + d1*\Sigma D*C + e_1*\Sigma E*C + f_1*\Sigma F*C$$
$$\Sigma T*D = K_1*\Sigma D + a_1*\Sigma A*D + b_1*\Sigma B*D + c_1*\Sigma C*D + d_1*\Sigma D*D + e_1*\Sigma E*D + f_1*\Sigma F*D$$
$$\Sigma T*E = K_1*\Sigma E + a_1*\Sigma A*E + b_1*\Sigma B*E + c_1*\Sigma C*E + d1*\Sigma D*E + e1*\Sigma E*E + f_1*\Sigma F*E$$
$$\Sigma T*F = K_1*\Sigma F + a_1*\Sigma A*F + b_1*\Sigma B*F + c_1*\Sigma C*F + d1*\Sigma D*F + e1*\Sigma E*F + f1*\Sigma F*F$$

In the above set of equations, the values of the multipliers K_1, a_1, b_1, c_1, d_1, $e_1$and f_1 are substituted to compute the values of the unknowns (viz. K_1, a_1, b_1, c_1, d_1, e_1 and f_1). The values of the terms on L.H.S and the multipliers of K_1, a_1, b_1, c_1, d_1, e_1 and f_1 in the set of equations are calculated and tabulated. After substituting these values in the equations, one will get a set of 5 equations, which are to be solved simultaneously to get the values of K_1, a_1, b_1, c_1, d_1, $e_1$and f_1.The above equations can be verified in the matrix form and further values of K_1, a_1, b_1, c_1, d_1, $e_1$and f_1 can be obtained by using matrix analysis.

$$X_1 = inv\,(W) \times P_1$$

The matrix method of solving these equations using 'MATLAB' is given below.

W = 7 x 7 matrix of the multipliers of K_1, a_1, b_1, c_1, d_1, e_1 and f1

P_1 = 7x 1 matrix of the terms on L H S and

X_1 = 7 x 1 matrix of solutions of values of K_1, a_1, b_1, c_1, d_1, e_1 and f1

Then, the matrix obtained is given by,

X1 matrix with K1 and indices a1, b1, c1, d1, e1 and f1 are evaluated:

K1=10.157, a = 0.10, b = 0.01, c = 0.12, d = 0.03, e = 0.1, f = 0.04

X_1 matrix with K_1 and indices a_1, b_1, c_1, d_1, e_1 and f_1 are evaluated and substituted in the given equation:

$$T = 10.157*(\pi_1)^{0.10}*(\pi_2)^{-0.01}*(\pi_3)^{0.12}*(\pi_4)^{0.03}*(\pi_5)^{0.1}*(\pi_6)^{0.04}$$

Where T= Use of Innovative ICT methods has a strong impact on improving students' performance

Similarly, based on the same approach the unknown for Modern educational system (Me) is calculated and equation is presented in the given form

$$Me = 9.5085*(\pi1)^{0.01}*(\pi2)^{-0.07}*(\pi3)^{-0.19}*(\pi4)^{0.10}*(\pi5)^{0.16}*(\pi6)^{0.23}$$

Where, Me = Modern educational system helps to prepare students for their future world.

In the above equations (T) is relating to response variable for Use of Innovative ICT methods and (Me) is relating to response variable for Modern educational system

7. Result and Discussion

7.1 Interpretation of Use of Innovative ICT methods (T)

$$T = 10.157*(\pi_1)^{0.10}*(\pi_2)^{-0.01}*(\pi_3)^{0.12}*(\pi_4)^{0.03}*(\pi_5)^{0.1}*(\pi_6)^{0.04}$$

The absolute index of π_1 is highest Viz. 0.10 is the term related to the Assessment Expanded, Policy Improved Implementation and Mother Language. The value of the index is positive indicating that Use of Innovative ICT methods has a strong impact on improving students' performance is directly proportional to terms related to the Assessment Expanded, Policy Improved Implementation and Mother Language involved. As the improvement in the up gradation of Assessment Expanded, Policy Improved Implementation and

Mother Language is done or achieved then it will be easy to improve the Use of Innovative ICT methods has a strong impact on improving students' performance.

The absolute index of π_2 is the lowest Viz. 0.01 the term related to the student's understanding, participate in Tech education, and spend sufficient time together. As the student's understanding, participate in Tech education, spend sufficient time together would help to improve the Use of Innovative ICT methods has a strong impact on improving students' performance increase. This improvement of the Use of Innovative ICT methods has a strong impact on improving students' performance is significant.

Further π_5 , π_6 terms having the index 0.1 and 0.04 which Technology collaboration and ICT tools learning challenges related to π_5, Pedagogical practices and technology related to π_6,. The indices of these pie terms is directly proportional to the output term of Use of Innovative ICT methods has a strong impact on improving students' performance. As these terms increases which indicates the improve the Use of Innovative ICT methods has a strong impact on improving students' performance is significant. The tem π_2 is student's understanding and participation in Tech education is having negative index -0.01 which is inversely proportional term related to Use of Innovative ICT methods has a strong impact on improving students' performance. Curve fitting constant K is 10.157 indicate the influence of other pie terms.

7.2 Interpretation of Modern educational system (Me)

$$Me = 9.5085*(\pi_1)^{0.01}*(\pi_2)^{-0.07}*(\pi_3)^{-0.19}*(\pi_4)^{0.10}*(\pi_5)^{0.16}*(\pi_6)^{0.23}*(\pi_7)^{0.02}$$

The absolute index of π_4 is highest Viz. 0.10 is the term related to the up gradation of technical skills, necessity of digital skills, lack of master basic skills, improvement in cognitive skills and necessity of socio-emotional. The value of the index is positive indicating that Modern educational system helps to prepare students for their future world is directly proportional to terms related to the up gradation of technical skills, necessity of digital skills, lack of master basic skills, improvement in cognitive skills and necessity of socio-emotional involved. As the improvement in the up gradation of technical skills, necessity of digital skills, lack of master basic skills, improvement in cognitive skills and necessity of socio-emotional is done or achieved then it will be easy to improve Modern educational system helps to prepare students for their future world.

The absolute index of π_1 is the lowest Viz. 0.01 the term related to the Assessment Expanded, Policy Improved Implementation and Mother Language. As the Assessment Expanded, Policy Improved Implementation and Mother Language increase then the Modern educational system helps to prepare students for their future world increase. This improvement of the Modern educational system helps to prepare students for their future world is significant.

Further π_5 and π_6 terms having the index 0.16 and 0.23 which Technology collaboration and ICT tools learning challenges related to π_5, Pedagogical practices and technology related to π_6. The indices of these pie terms are directly proportional to the Modern educational system helps to prepare students for their future world. As these terms increases which indicates the performance of the Modern educational system helps to prepare students for their future world is significant. The tem π_2 is student's understanding and participation in Tech education is having negative index -0.07 which is inversely proportional term related to Modern educational system helps to prepare students for their future world. Curve fitting constant K is 9.18 indicate the influence of other pie terms.

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