BLENDED MODE AS AN ALTERNATIVE SOLUTION TOWARDS SUSTAINABLE GROWTH AND DEVELOPMENT: AN EXPLORATORY STUDY USING MULTILAYER PERCEPTRON MODEL

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ABSTRACT

Purpose - The idea of blended learning which originated in post-independence India to supplement traditional "gurukul system" used for face-to-face instruction experienced a challenge during Covid 19 since March 2020. Blended learning, though an old adage, has gained relevance in this fast-changing environment. This pedagogy has become a prominent alternative for all levels of higher education across the globe. As a result, it has become an obvious choice not only for the academicians, but all stakeholders involved in the teaching-learning process. The same concept has been promulgated in National Education Policy 2020 (NEP 2020) in India, as an alternative educational practice combining digital learning tools with traditional classroom teaching. The new NEP 2020 has stressed on student centric policy providing the students an opportunity to pursue their career in their area of interest. Blended learning programmes are meant for supporting social issue, economic viability and different formats of environmental dimension leading to a sustainable learning ecosystem, thus preserving environmental resources in the global arena. However, the efficacy of the blended mode and its effectiveness for Gen Z is yet to be ascertained and measured.

Design/methodology/ research - This study has attempted to explore the perceived changes in accepting opportunities and challenges encountered by student communities to adopt this blended learning approach using convenience sampling method of 102 respondents across India.

Findings- The observation in adapting to existing teaching practices and curriculum involvement in integrating two different structures into a seamless transformation has been explored. The other important issue that has created impediment – time, content, and pedagogy in this transformation process has also been explored. The researchers also tried to find out the relationship of blended learning in connection with sustainable developmental process using multilayer perceptron method.

Originality /value of research –The paper has tried to detect the characteristics of blended mode of learning among Gen Z students. It has also tried to explore the opportunities of blended mode of learning among its stakeholders, the acceptability rate and the extent of benefits to the future Gen Z students and stakeholders comprising educational institutes, society and government.

Limitations – The paper has tried to understand and predict the model which may be useful for future research. However, the data collected may not reflect the true picture if applied outside India since the respondents have been considered from India only.

Practical implications - The results are expected to explain the accessibility of the blended learning mode by Gen Z students' depending on the pedagogical acceptability and its benefits in

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different streams or courses. This study addresses the related findings of Gen Z students regarding blended learning mode.
Social implications –The blended learning mode has become imperative in the present pandemic situation. Almost all the governments are exploring opportunities to equilibrate a balance position while adapting to blended mode of teaching. However, the societal impact and its fallouts is still to be validated. This paper has attempted to reach a balance and explore prominent factors which may be considered for future sustainable research.

Keywords: Blended Learning, Higher Education Institutional Approach, Sustainable Growth and Development, Multilayer Perceptron.

INTRODUCTION

Evolution of the digital learning platforms has a huge impact in today's education. The world of education is changing constantly due to this change which has ultimately put the traditional, pedagogical approaches to the back seat. Nowadays, demand for both technologies based learning and traditional learning methods are evident, the way of merging digital learning technology with traditional offline physical learning method has become important in this transformed scenario leading to a disruptive innovation giving birth to the term "Blended Learning". The development of technologies and the emerging significance of adopting digital technology for teaching-learning pedagogy at different levels of education outline in NEP 2020 recommend using blended models of learning. The NEP-2020 has stated that while endorsing digital pedagogy of teaching-learning process, the importance of physical mode of learning cannot be completely eradicated (Saboowala et al., 2020); however, there should be an integration of both physical and virtual mode of teaching learning process ultimately, using different effective models of blended learning, identified for suitable replication. On May 20, 2021 the University Grants Commission has introduced the concept of blended mode of teaching and learning in various universities and colleges. According to this concept up to 60 per cent of any course can be taught in offline mode and 40 per cent online. It is a massive step which will be more effective in accumulating skills of students and providing them better access to quality education which is not accessible otherwise. Pankin et al. (2012) opined blended mode of learning "*as structured opportunities to learn, which use more than one learning or training method, inside or outside the classroom*". The definition has focused on the factors important for recognizing, distinguishing and extracting values out of this blended learning process which includes lecture session, tutorial, hands on practical training, case study discussion, and computer mediated techniques essential for supplementing the courses, in different synchronous or asynchronous module, guiding the learners through instruction based, individualistic assessment and mentoring and group learning activities and assignments. This has been corroborated by Huy and Vu (2020), where they have opined blended learning is mixing of online and traditional pedagogical methods in a well-planned appreciated style. Eze, et al. (2018) opined that before Covid-19 pandemic, face-to-face classroom i.e. traditional learning method was the normal and most recognized style of spreading knowledge, and the usage of technology in this learning was often restricted to using learning management systems (such as Moodle, Blackboard) for many higher education institutes. Mansour et al. (2007) has suggested the benefits of hybrid courses combining the traditional physical classroom teaching and sharing of instruction elements in line with online course format. According to Blier (2008), this may be referred to as a disruptive innovation where the mixed mode of learning has been promoted rigorously using web enhanced

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blended pedagogy. The increasing gamut of hybrid courses due to change in the demographic pattern of the student has been vividly observed in higher education leading to more acceptance. This has been due to travel time reduction of students residing in rural areas, and decrease in expenses and thereby increasing the convenience to the underprivileged economic class of the society (Yudko et al., 2008). The option enables the students to mitigate his household chores and manage the classroom sessions effectively and responsibly. The educational institutes has also welcome this change in their effort to reach more diverse students, thereby leveraging the additional expenses incurred by the students to obtain higher education (Woodworth et al., 2007). According to them, the effort to explore blended learning and its efficacy will challenge the existing academic practices used for years across the world. Rooney (2003) advocated that blended learning has been recognized as one of the top ten trends which have emerged in the existing academic scenario. According to Sharpe et al. (2006), the institutes are supporting the provisions of virtual learning through introduction of supplementary courses in line with the traditional ones as an additional resource. This practice is currently available across the globe, and every stakeholder has accepted the mode even if in disagreement.

Literature Survey

According to Allen and Seaman (2003), the classification of higher education courses are much dependent on the course content and subsequent delivery in online mode can be categorized to the following classes- a) offline traditional courses which are more reliant on oral and written delivery and less online learning options can be termed as zero online, b) Face-to-face on campus teaching of courses supplemented by requisite online web based technology having less than 30 per cent online content, c) Hybrid or blended courses having both online and offline teaching pedagogy containing more than 30 per cent but less than 80 per cent online, d) Online courses with very less or no classroom teaching containing more than 80 per cent online schedule. Jones (2006) has shown that online delivery of courses may extend from standard courses as well as application-oriented courses involving ICT through PowerPoint presentation, supplementary courses along with the traditional ones as a means of replacement of classroom teaching, accessible online resources, online discussion, assessment, and examination and resource materials. This according to him, will probably reduce the burden from the learners who are practically facing problems with the blended mode of teaching-learning process. This is in line with the developed theory of Caird and Roy (2019) when they suggested a different approach, though new, using detailed ICT indicators and multimedia, which can be synchronized with the physical mode; in an effort to create more robust, interactive and personalised provision of teaching, learning and assessing a learner. According to the authors, this will help in the affordability of both the instructors and the learners. Much before, Norberg et al. (2011) advocated about the growing interest of blended learning mode and predicted about the efficacy of that blended learning which has incidentally now been regarded as the "*new normal*". This approach is nowadays widely practiced across the globe in describing approaches of higher education in teaching and learning. A study by Reichlmayr (2005) identified that around 72 per cent of the students liked the blended mode of course though there was a disagreement of almost 30 percent of the respondents at that time. Further before, Ross and Gage (2006) stated the importance of blended learning of courses effectively and efficiently for a particular group of students on a trial mode. A study conducted by Graham et al., (2003) showed three categories of blended learning systems on the basis of primary blended objective – providing and enabling blends the same opportunity of learning experience, though through a different mode where the

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learners are provided with an option to choose the method which is cost effective for them within the stipulated time constraint, enhance the adopted blend through innovative learning management system to provide supplementary resources for the courses already delivered physically; and, transforming the blended approach using technology along with traditional learning. The challenges have been grouped into three major categories-a) the culture and blended learning environments, b) finding the right design and c) demand on time (Graham, et al. 2005). This has been corroborated in a report acknowledged by Becker et al. (2017), where they projected blended learning mode as one of the top trends of contemporary Higher Education. The same was opined by Garrison and Kanuka (2004) where they claimed that the blended mode of learning has the potential to transform the design of curriculum and the dynamics of teaching by the instructors, enabled through extensive use of ICT, virtual learning platform, remote access servers, network and online administrative control using cloud computing techniques (Caird et al., 2015).

Objective of Study

The literature review has shown that blended learning mode can be considered as an alternative choice for higher education. The researchers have tried to explore the mindset and the perception of the common people including students, teachers and parents about the opportunities underlying the blended education mode; at the same time the difficulties faced by the above-mentioned categories adopting the blended mode of learning.

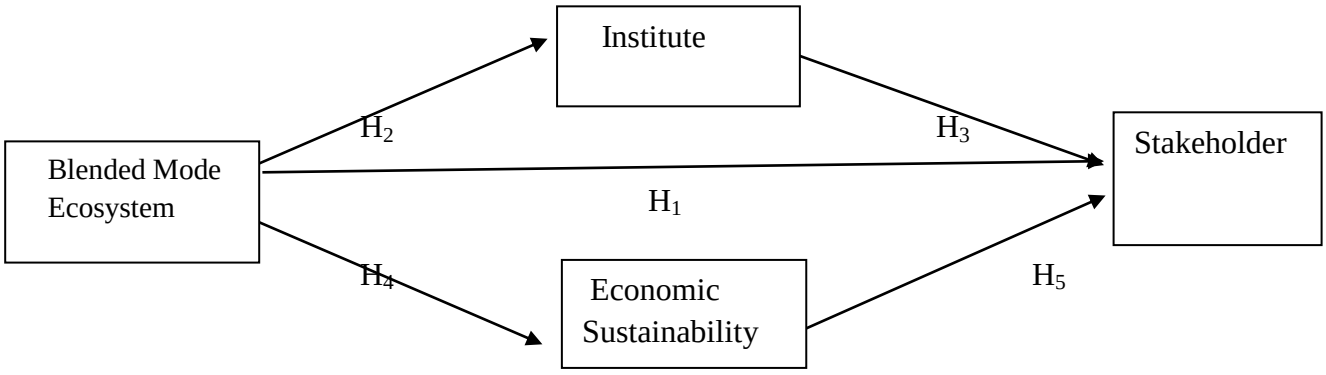

FIGURE 1
HYPOTHETICAL MODEL OF BLENDED MODE AND ITS IMPACT

On the basis of literature review, figure1 illustrate the model of our current study. Stakeholder includes students, parents and the government which are the three main components. Blended mode of learning includes both physical and online classes in a hybrid mode. These components directly affect stakeholders which comprise of parents, students and society, whereas, institute and economic sustainability act as the mediator linkage between blended learning and stakeholders. The current study aims at investigating these hypothesized among the mentioned variables.

H_1: *Blended mode has no positive impact on stakeholders*

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H_2: *Blended mode has no positive impact on the institute which is governed by teachers, academic rules and regulations, again the role of the controlling authorities like UGC, AICTE, NCERT etc. cannot be ignored.*

H_3: *Institute has no positive impact on the stakeholder*

Blended mode ecosystem has been impacted by the intangible resources which influences the economic sustainability of educational institutes. The educational institutes comprise of intellectual capital which ultimately benefits the stakeholder. However, it has a significant impact across all elements of administration, thus enhancing the overall effectiveness of intellectual capital which is critical for effective administration process (Cabrilo, 2018).

H_4: *Blended mode has no positive influence on economic stability of organization.*

H_5: *The human organizational and institutional aspects are neither encouraged nor discouraged by stakeholder's decision to accept or reject a particular mode of learning.*

METHODOLOGY

The data has been collected from respondents through structured questionnaires from 102 respondents. The constructs have been developed based on the 14 items using Kashdan and Steger (2006) scale to identify and analyze the greater dispositional social anxiety which tend to suppress emotions. Crowne & Marlowe (1960), in short referred to as MCSDS, was used to assess the degree of responses an individual normally presents in a favourable situation, further modified by Robinson, et al. (1991) The respondents were requested to complete the questionnaire within a fixed time frame. The acceptable reliability of the questionnaire was found to be within the limit as defined in the scale.

RESULTS

H_1: *Blended mode has no positive impact on stakeholders*

To analyse whether there exists any positive impact of blended mode of learning among stakeholders, Chi square test was performed. The result obtained shows χ^2 (tab) at df 1=24.548 at $\alpha = .05 > \chi^2$ (cal) at df 1=3.841. Hence H_0 rejected. Though it has been found that blended mode has some positive impact on stakeholders, however the strength of association as per Cramer's V value=0.491, indicated though blended mode has some positive impact on stakeholders but it has not been accepted across by the sample respondents.

H_2: *Blended mode has no positive impact on the institute which is governed by teachers, academic rules and regulations, again the role of the controlling authorities like UGC, AICTE, and NCERT etc. cannot be ignored.*

To analyse whether blended mode of learning has any positive impact on institutes governed by teachers, academic rules and regulations and the controlling authorities, the Chi-Square test performed showed that χ^2 (tab) at df 1=23.752at α=0.05 $>\chi^2$ (cal) at df 1=3.841. Hence H_0 rejected. However, it has been found that blended mode has some positive impact on institutes, however the strength of association as per Cramer's V value = 0.483, indicated though blended mode has some positive impact on institutes, still it has not been accepted across by the sample respondents.

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H_3: *Institute has no positive impact on the stakeholder*

To analyse the positive impact of institute on the stakeholders, Chi-square performed showed that χ^2 (tab) at df 7=4.392 at α=0.05 >χ^2 (cal) at df 7=14.157. Hence H_0 accepted which confirms that there is no positive impact of an institute on the stakeholders.

H_4: *Blended mode has no positive influence on economic stability of organization*

To analyse whether blended mode has any positive influence on the economic stability of an organisation, a Chi – Square test was performed. The result obtained, χ^2(tab) at df 8 = 8.331 $^{at}\alpha$ =0.05 >χ^2 (cal) at df 8 = 15.507 showed that there is no positive influence of blended learning on the economic stability of an organization.

H_5: *The human organizational and institutional aspects do not encourage stakeholder's decision to adopt a blended mode of learning.*

To analyse whether institutional aspects encourage stakeholder's decision in adopting blended mode of learning, it has been found that χ^2 (tab) at df 1 = 82.25 at α = .05 >χ^2 (cal) at df 1 = 3.841. This clearly shows that there is a strong support and influence of institutions on stakeholders' decision in adopting blended mode of learning. Moreover, Cramer's V (0.898) result shows that there is a strong association between the institution and the stakeholders.
In order to understand the efficacy of the reasons on different age groups and the impact of the blended mode of learning on a particular age group, multilayer perceptron method was used. The model was designed on the following logic of multilayer perceptron network where the general architecture is:

Input layer: J_0=*P* units, *a*0:1,...,*a*0:*J*0; with *a0*:*j*=*xj*.

Ith hidden layer: J_i units, *ai*:1,...,*ai*:*Ji*;
with *ai*:*k*=*γi*(*ci*:*k*) and *ci*:*k*=*Ji*−1Σ*j*=0*wi*:*j*,*kai*−1:*j* where *ai*−1:0=1.

Output layer: J_I=*R* units, *aI*:1,...,*aI*:*JI*;

with *aI*:*k*=*γI*(*cI*:*k*) and *cI*:*k*=*J*1Σ*j*=0*wI*:*j*,*kai*−1:*j* where *ai*−1:0=1.

It may be noted that the pattern index and the bias term of each layer are not counted in the total number of units for that layer. The multilayer perceptron model has been used to predict the model where the dependent variable, Blended Mode as Career Improvement has been divided into 3 sub-variables, wide variety of domain knowledge, better job prospect and further scope of research Table 1. This when logically tested through neural network has given the following result. The network information table Table 2 is displaying information about the neural network model and has ensured that the specifications mentioned is correct. Here, the number of units in the input layer is the number of covariates, that is, 1 and the number of factor levels which is 4. Thus, a separate unit has been created where the total number of units excluding the bias unit has been found to be 16. The result has also shown that there is 1 unit of hidden layer and the number of units in hidden layer excluding the bias unit is 3.

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Table 1 CASE PROCESSING SUMMARY			
		N	**Percent**
Sample	Training	76	74.5%
	Testing	26	25.5%
Valid		102	100.0%
Excluded		0	
Total		102	

Table 2 NETWORK INFORMATION			
Input Layer	Factors	1	Education
		2	Gender
		3	Age
		4	Annual Income
	Covariates	1	If_Effective_Reason_1
	Number of Units[a]		16
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		3
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	If_Yes_How_Improve_Career
	Number of Units		3
	Activation Function		Softmax
	Error Function		Cross-entropy

a. Excluding the bias unit

The neural network Figure 2 has been used to predict the complex understanding about the prediction in understanding how the blended learning mode can help in improving the career of the stakeholders, that is, students in particular. The model has shown that Neural networks used in predictive applications, such as the multilayer perceptron (MLP) and radial basis function (RBF) networks, are supervised in the sense that the model-predicted results can be compared against known values of the target variables (Davoudi et al., 2019). According to Gross (2019), The neural networks option allows you to fit MLP and RBF networks and save the resulting models for scoring. From the diagram, it is understood that the career development of students in terms of wide variety of knowledge, job prospect and further scope of research are related to 3 number of hidden layers which are subsequently connected to education classified under the category, upto Class XII, Graduate and Post Graduate.

These have a strong affinity with male gender in particular and are influenced by the parents in particular who have attained the age of 40 years and above.

Moreover, the data obtained has a strong correlation with the annual income of the respondents where the annual income is greater than 8 lacs and above.

Thus, it can be predicted that the parents who are in the age group of 40 years and above, with an annual income of more than 8 lacs, can think of accepting the blended mode of learning where they consider wide variety of domain knowledge as the most important factor. The training and testing results in Table 3 strongly corroborate the fact.

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The results show that 48.7% results are incorrect in the training phase while 53.8% is incorrect in the testing phase.

This means, that the cross-entropy error has been reduced by almost 6 % while executing the testing phase.

This has been finally shown in Table 4, where the result shows that during training the overall percentage which is 59.2% will be reduced to 50% in case of wide variety of domain knowledge, but when it leads to further scope of research, the result has been markedly improved from 27.6% to 42.3%.

This shows that if the stakeholders are interested about taking up new courses in the blended mode, the results may show an improvement in their knowledge and aptitude. The neural network Figure 2 has been used to predict the complex understanding about the prediction in understanding how the blended learning mode can help in improving the career of the stakeholders, that is, students in particular. The model has shown that Neural networks used in predictive applications, such as the multilayer perceptron (MLP) and radial basis function (RBF) networks, are supervised in the sense that the model-predicted results can be compared against known values of the target variables (Davoudi, et al., 2019). According to Gross (2019), the neural networks option allows you to fit MLP and RBF networks and save the resulting models for scoring. From the diagram, it is understood that the career development of students in terms of wide variety of knowledge, job prospect and further scope of research are related to 3 number of hidden layers which are subsequently connected to education classified under the category, upto Class XII, Graduate and Post Graduate.These has a strong affinity with male gender in particular and are influenced by the parents in particular who have attained the age of 40 years and above. Moreover, the data obtained has a strong correlation with the annual income of the respondents where the annual income is greater than 8 lacs and above. Thus, it can be predicted that the parents who are in the age group of 40 years and above, with an annual income of more than 8 lacs, can think of accepting the blended mode of learning where they consider wide variety of domain knowledge as the most important factor. The training and testing results in Table 3 strongly corroborate the fact. The results show that 48.7% results are incorrect in the training phase while 53.8% is incorrect in the testing phase.

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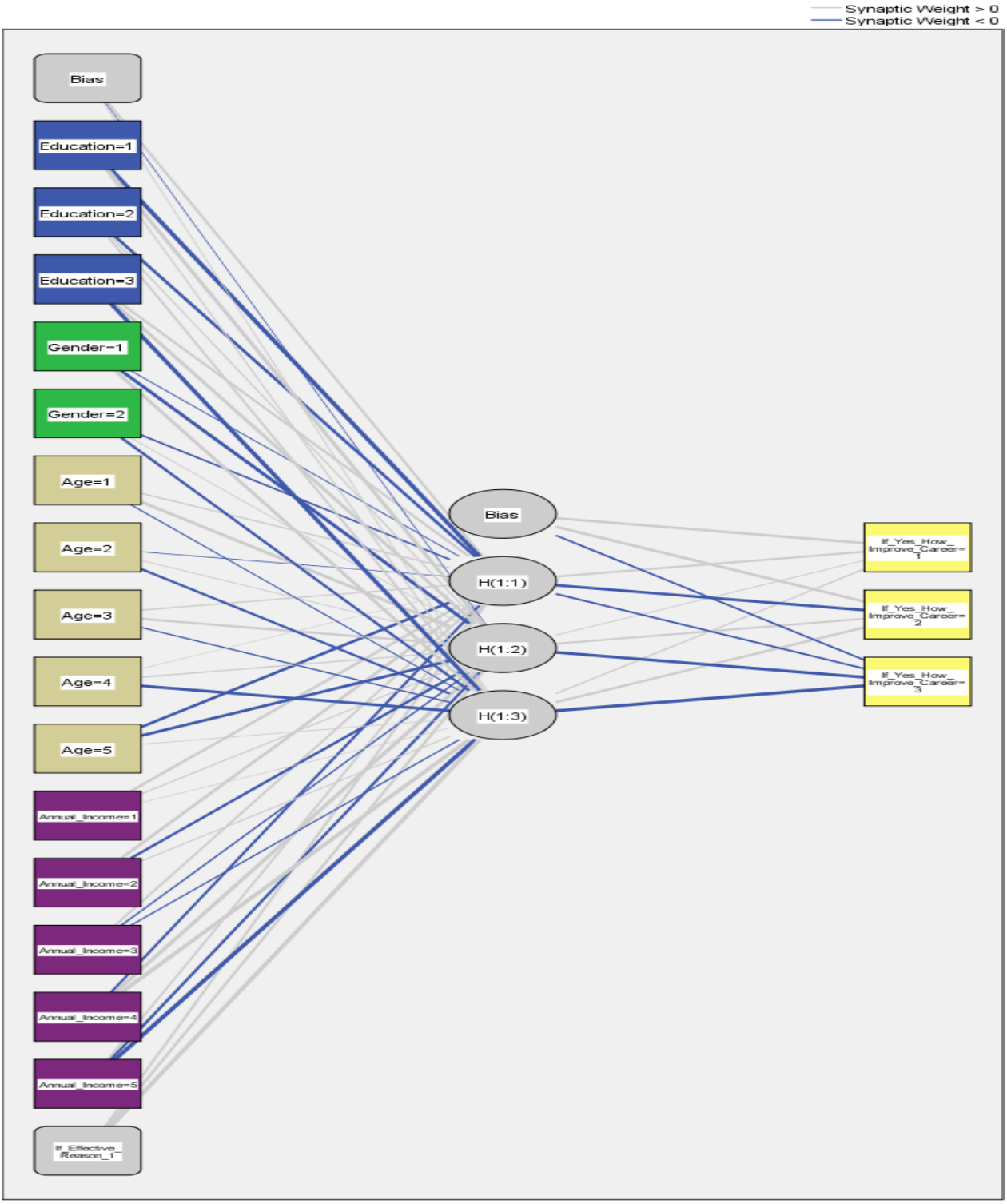

FIGURE 2
MULTILAYER PERCEPTRON MODEL

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Table 3
MODEL SUMMARY

Sample	Observed	Predicted			
		Wide Variety of Domain Knowledge	Better Job Prospect	Further Scope of Research	Percent Correct
Training	Wide Variety of Domain Knowledge	23	1	7	74.2%
	Better Job Prospect	13	7	5	28.0%
	Further Scope of Research	9	2	9	45.0%
	Overall Percent	59.2%	13.2%	27.6%	51.3%
Testing	Wide Variety of Domain Knowledge	7	1	4	58.3%
	Better Job Prospect	2	0	2	0.0%
	Further Scope of Research	4	1	5	50.0%
	Overall Percent	50.0%	7.7%	42.3%	46.2%

Table 4
CLASSIFICATION

Training	Cross Entropy Error	75.508
	Percent Incorrect Predictions	48.7%
	Stopping Rule Used	1 consecutive step(s) with no decrease in error[a]
	Training Time	0:00:00.02
Testing	Cross Entropy Error	27.619
	Percent Incorrect Predictions	53.8%

Dependent Variable: If_Yes_How_Improve_Career

a. Error computations are based on the testing sample.

Conclusion

The present pandemic has metamorphosed the teaching pedagogy considerably. What was proposed before the pandemic has turned into reality since last year for disseminating knowledge and continuous learning process maintaining physical distance. In the light of this, the researchers tried to delve into understanding whether the blended learning mode will be an acceptable and feasible solution for the present generation. The research has opened up new vistas of understanding which has been protagonised by the academicians worldwide. However, there remains few questions. The researchers found that blended learning mode is possible for a specific class considering the income pattern and the opportunities available in terms of internet facility, pedagogical skills and training facilities, and updated gadgets. The factors which may be important are the flexibility in learning, classroom interaction, technology orientation and overall readiness of the instructors in shaping the young minds into tomorrow's responsible citizen. This has been found from our results which clearly show that further scope of research is possible if the blended learning mode is widely accepted.

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