


IMPACT OF LOCK-DOWN ON VIRTUAL LEARNING AND LEARNING ANALYTICS
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Abstract:

Acquiring Knowledge is one of the vital continuous processes for every being across the globe. Adaptive Techniques, Logical approach towards facing any kind of situations in day today life, implementing the acquired knowledge in the respective situation to manage the environmental issues are great challenges for every living being in the earth. COVID-19 pandemic situation is the most foreseeable problem for the Educators and Learners in Learning-Educating-Learning progression. Educators, Learners and Researchers wouldn't be able to solve or manage the situation or get rid of the present issues immediately. Moreover, the problem solving for the current state of affairs should be considered as a continuous course for the Education Society which are accommodated in every country. Especially, this process should be handled, directed and implemented (solutions) gently and at the same time firmly for the betterment of the developing countries. In this paper we will see, what are the problems faced by the Learners, how the problems' solution can be derived through Machine Learning Model through Exploratory Data Analysis. Discernments of the data have been derived and the knowledge which are acquired through the Data mining process are the important key factors for finding and implementing solutions for the future aspects.

Keywords— *Google Forms, Data pre-processing, Virtual Learning Environment (VLE), Multi-linear Regression, Exploratory Data Analysis (EDA), Data-mining Techniques.*

I. Introduction and Literature Review

In the Artificial Intelligence world, the members of work place should be trained to manage, to cope-up and to implement or to apply Twenty first Century skills in the actual working environment. Especially, in the developing countries consisting of huge population, where more competition exists in-service for the existing employees as well as for those are ready to enter the work place training must be imparted with the updated skills (Bektas Ozaskin, O., and January 2010). Data mining Techniques were very much useful for the understanding purpose of Learners' performance and Learners' behaviors towards learning. The acquired patterns and models which are derived from the Data mining algorithms were useful for the creation of instructional design for the learners based on their capacity of learning (Goyal, M., Vohra, R., March 2012). Education Data Mining and Learning analytics are interrelated terms, the raw data will be collected massively from the Educational environment (MOOCs' environment) and then the collected data will be pre-processed which will be transformed into a data of the form through which the patterns and Models can be derived (Sin, K., Muthu, L., July 2015). The derived patterns and the Models will be indicating about the Learners' understand ability about the concepts, Learners' behaviors towards learning, Learners' performance in



that specific course and the Learners' dropout from the course means about the Learners' Learning Analytics will be clearly studied and new strategic plans can be done for getting the knowledge from the patterns and Machine Learning models for the future generation Learners (Calvet Liñán, L., & Juan Pérez, Á. A. (2015)). With help of small data sets the classification models can be created and estimated. The small size data sets have been taken for the research purpose and the accuracy of models for the prediction of student's performance through MLP-ANN, LDA NB (kernel) SVM KNN(K=9) have been compared based on graphical representations (Abu Zohair, L.M, 2019). With help of Predictive Linear regression models, we can take advance measures for the future problems especially in the Virtual Learning Environment for the assessment purpose (Bhuma Devi, S., Jain, P., 2020). Development towards any kind of betterment, the ideas measures could be derived from the patterns of the previous data. The role of Predictive Models of the Learners' Performance are the special indicators of quality maintained by any educational institution, which could be possible only with proper data analysis and data-mining techniques (Alyahyan, E., Dustegor, D., 2020).

II. Research Questions

COVID-19 pandemic situation led to virtual learning for every hook and corner of the world. Learners have been subjected to arduous challenges, like medium of learning (Smart phones, Laptops) and for the acquiring of knowledge through the Online live lectures and Pre-recorded videos which have been recorded by the Educators for the respective concepts of distinct subjects, Online mode of assessments, Online mode of submissions and gathering study materials. Some of the problems will be discussed in this paper with the help of collected data:

1. How the gender proportions are affecting the purchasing ability of the population with respect to gadgets?
2. In which way the learners' preference (way of learning) is affecting the collection of study material in the virtual Learning Environment?
3. Can we create a multi-dimensional linear Regression Machine Learning Model for the time spent Onscreen?
4. What sorts of eye related issues are the Learners having?

With the help of Exploratory Data analysis, we can find the relation between the features which will lead to create and validate the distinct classification models like Decision Tree classifier, Random forest classifier.

III. Methodology

In order to get insights from the data, first step is data collection, second step is data pre-processing, third step is Exploratory Data Analysis, fourth step is observing the patterns in the analysis and finally deriving Machine Learning Models and the deployment of those models for use into the market or in the (Industrial point view) production environment. For the collection of data, the researcher used snow-ball sampling. A questionnaire has been developed using Google form and was circulated among the students' groups. The questionnaire contains demographical questions and the kind of data which are required for the research purpose. Some of the questions have been listed below:

1. Amongst the multiple modes of virtual learning, which one is the learners' preference?
2. When did they buy the physical instruments (Medium), during the pandemic or owned it prior to this time?
3. How do they manage the study Materials for learning purpose?
4. How much time do they allot for studying (Both Lectures and self-learning)?
5. What kind of health issues do they have due to this change in mode of learning?

The collected data has been processed through Excel Tool so that the collected data can be fended for the Python



environment. In the Python environment, the data has been processed according to the convenience of the analysis purpose which means that all the attributes have been converted to numeric form. The transformed data has been reconfirmed whether all the categorical and numeric attributes are in place of the respective positions in the data-frame. Exploratory Data Analysis (EDA) has been undertaken to understand the relation between the attributes. The Data-mining Tools and Libraries of Pandas have been urged on the collected data for the derivation of many patterns. The derived patterns have been learnt, the insights and results have been analyzed towards research questions.

IV. Research findings and Discussion

DISCUSSION FOR THE FIRST QUESTION.

The gender proportion plays significant role for any kind of research. According to the proportions we can take measures for that specific issues. The collected data consists of 51% female and 59% male Learners. The following bar-graph will show us how the gender proportion is contributing in availing the instrument (Physical) facility during the Lock down period.

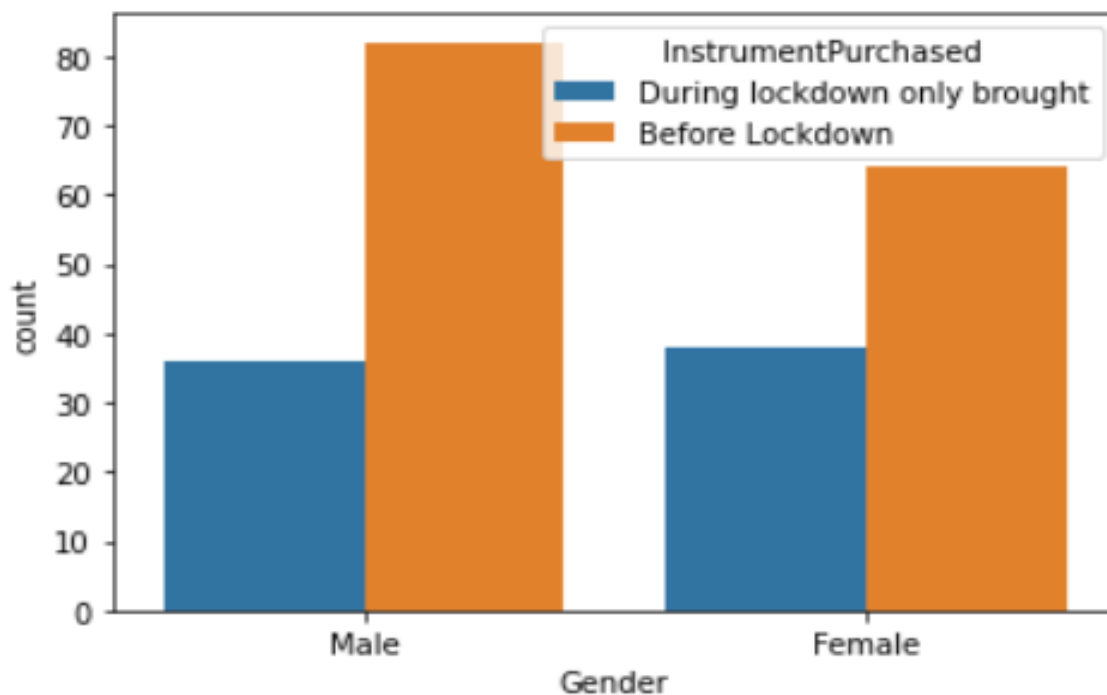


Fig.1

The following table will be indicating us the relation, how the purchasing capacity is varying with respect to the gender proportion. During the Lock down period the purchasing rate was increased approximately 6.7% among Female Learners compared to Male Learners. Overall, 33.64% purchasing rate has increased. During the lock down period the rates of Physical facilities have been increased significantly. This situation really it was challenging to the Learners especially for the economically backward Learners but at the same time purchasing instruments were unavoidable for the Learners. Actual cost of instruments (which are used for Learning Purpose) have also been increased 30 to 35 percent.



Table 1

	Before Lockdown	During lockdown
Female	0.627451	0.372549
Male	0.694915	0.305085
All	0.663636	0.336364

The insight of the above pattern from Fig.1 and Table 1 clearly shows, the revenue of the institutions those are in the market for the sales of physical facilities to the Learners has been increased by one third of the population for the small dataset which is involved in this research. Because of, increase in sales there is significant rate of cash flow increment may be happened in the firms. The reflection of net profit due to the unanticipated lock down expenditure was high-ticket of that situation among the learners (Ali AL HAYEK, M., (2018)).

DISCUSSION FOR THE SECOND QUESTION.

Primarily, in the Virtual Learning environment (VLE), Pre-recorded videos and the Online Live Lectures are playing significant roles for cognitive concept building for all the logical modules of any subject. Mainly, for the firm and clear conceptual knowledge acquisition the study material gathering is also unique challenge for the Learners in the VLE. The above-mentioned attributes' relation has been extracted through EDA for the analysis purpose among the Learners.

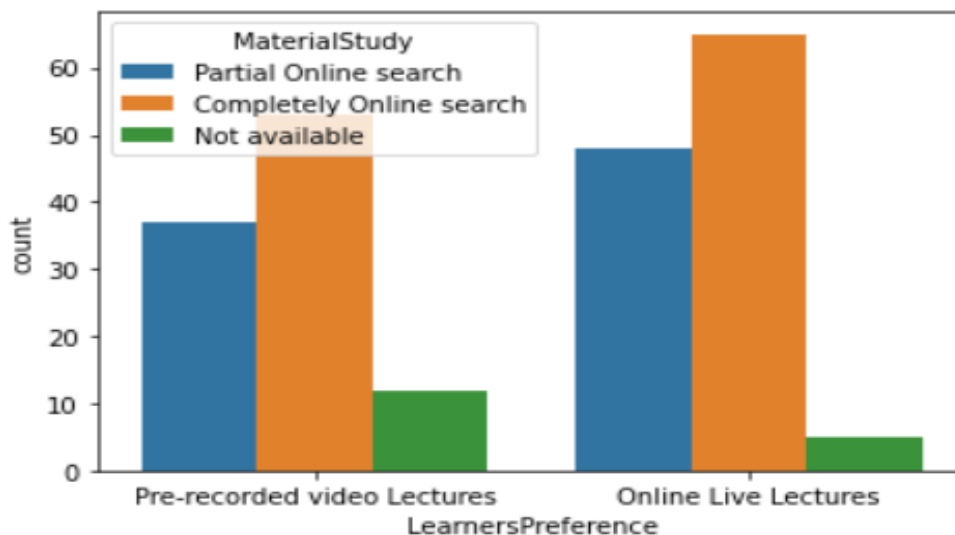


Fig.2

The following table values are conveying us the relation, how the Material collection varies with respect to the method of learning. There is 3% difference among the method of learning, in the material collection which is “Completely Online Search”. There is 4% difference among the method of learning, in the material collection which is “Partial Online search”. In the above two cases, those who all are giving preference to Online Live Lectures could search material comfortably. There is 8% difference among the method of learning, in the material collection which is “Not



available”. In the third case, those who all are giving preference to Pre-recorded video Lectures could not search material for the study purpose.

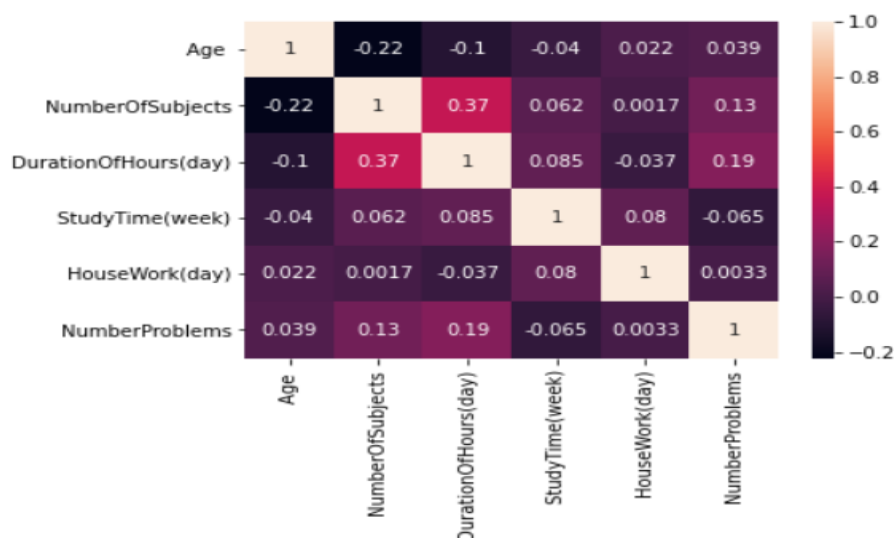
Table 2

	Completely Online search	Partial Online search	Not available
Live Lectures	0.550847	0.406780	0.042373
video Lectures	0.519608	0.362745	0.117647
All	0.536364	0.386364	0.077273

The insight of the above pattern from Fig.2 and Table 2 clearly shows, the Learners who all are able to concentrate in Online Live Lectures are able to collect the Materials for study purpose. Of course, the Learners those who fall in this category will be getting concepts clear through self-study also. Personalised learning through “Pre-recorded video Lectures” is also good for the deep concept acquisition, but again time the learners have to dedicate more time for learning. By making “Online Live Lectures’ more interactive Educators can give the deep knowledge about the subjects to the learners in the Virtual Learning Environment.

DISCUSSION FOR THE THIRD QUESTION.

The subset of the collected data has been taken for the creation of ML Model for analyzing the hours of screen-time of the learners. The correlation heat-map has been taken for the finding the relation between numeric values of the collected dataset. The relation between “Number of subjects” and “Online lecture Time” are nearly 37% positive relation can be observed from the Fig.3 and the results are indicating there is increased screen-time of the learners in

**Fig.3**

Multi-dimensional regression model $Z = AX + BY + C$ has been derived. The derived model has been tested with 20% of the data points. The root mean square error of the model has been observed as 2.6%. This model will be helpful to the instructors in preparing the instructional design for the respective subjects with respect to minimize the screen-time of the learners. The Learners could be exposed to experiential learning through “learning by doing” with



multidisciplinary internships, the solutions of the respective fields using their Domain Knowledge can be extracted and executed for the man-kind.

DISCUSSION FOR THE FOURTH QUESTION.

The Screen-Time, in VLE has increased exponentially in all the level of Education. Many eyes' vision , concentration and sleeping related health issues have been encountered due to increased Screen-Time by the Learners. The following pattern of the data threatens the entire Education Society with its results. COVID-19 Pandemic situation has created new challenges to all the people not only we have protect ourself from the virus but also we have to minimise our Health issues.

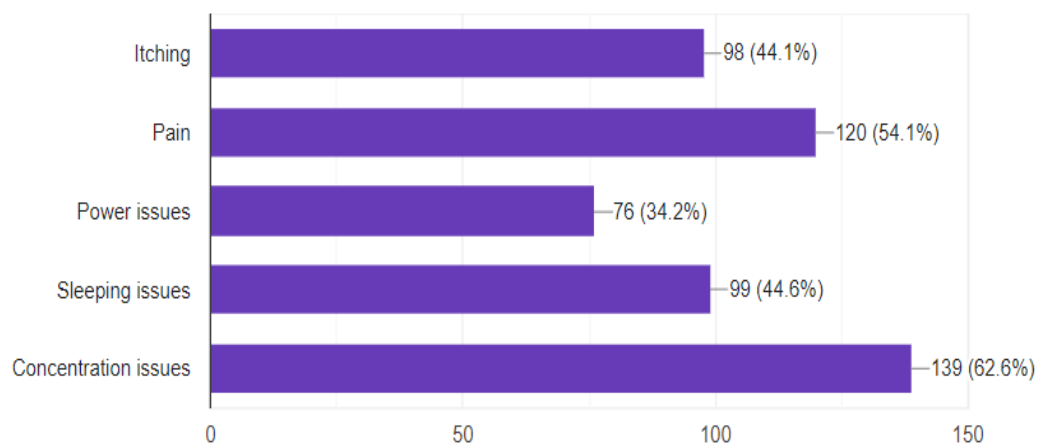


Fig.4

Especially for the current and future generation Learners and Educators Eye-protection measures should be taken on the urgent basis. Regarding the exercises or yoga sessions should be conducted for the Educators as in the form of special training. Self-regulated monitoring system should be created in the relation with self-improvement about their own health issues to minimize the above listed problems. As the part of the duty the educators should do mentoring to the Learners to overcome the same issues with self-regulation activities. District, State, Country level result-oriented research should be carried out with the experts in the respective field. The derived results should be reflected in National level health policies to bring control in these issues (Ramke, J., et al. (October 2018)).

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V. Conclusion

Insights of the Explortary Data Analysis are the main part in any kind of studies through which many patterns can be extracted, results can be observed, research-based solutions can be derived and the proper measures can be taken for



the future especially in the Education field. Learning is the great concept whether its for the Living Being or to make the Machines learn. With help of ML Models any kind of problems can be solved in the real world. The good algorithms like Decision Tree classifier, Random forest classifier are very much helpful to solve, predict and suggest the solution in any field. In the future study the above mentioned Models will be created and validated the solutions from the models will be considered for the problems of virtual learning of our learners.

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