Technology Enhanced Learning driven music inspired LEARN with NOODLE model for inclusive education.

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Abstract— Prior to the pandemic, one in every six children in the world was not in a formal school environment, with girls and young people facing poverty, living in rural regions, conflict zones, or with impairments outnumbering boys. The pandemic has compounded existing imbalances, as two-thirds of the young learning population—1.3 billion people—do not have dependable access to the internet in their homes, limiting their involvement in distant learning. Faced with growing economic insecurity in their families, millions of young people are being forced into child labour rather than returning to school. In the present work, we tried to address this concern with own innovation NOODLE stands for New Normal Object-Oriented Dynamic Learning Environment (published patent reference no. 202331012519A) (Gupta et al, 2014, Gupta et al. 2023) in which effort has been made to address the very basic need of primary education to the under- privilege children with a motivation of inclusive education. Music has been effectively used to catch the attraction of children viz a viz. addressing their basic need of nutrition and mental health.

In the model formulation of the problem, the following facts are taken into consideration. During pandemic, virtual learning emerges with a crude fact that two third of the children don't have the basic ambience like accessibility to the internet. This campaign of digital divide is almost the same as that of World literacy campaign by UN. In terms of productivity, educational stepping stone of Outcome Based Education has been confined to one -third of the World children population. Most of the rest of the children are child labour at premature age. Especially in third-world and developing countries, however not confined to, parents are helpless due to poverty to engage their children and many of the children are identity less orphan. Rehabilitating this large child population is next to impossible, so the proposal is to "Heal the World! Make it better place" i.e. educate them in their present location through alternative available approaches linked to their job role.

In the solution process, a Technology Enhanced Educational Learning model LEARN with NOODLE is proposed in which LEARN is acronym for Learn Earn Academic Relaxed Network.

Keywords—Digital Divide, Inclusive Education, LEARN, NOODLE, OBE.

I. INTRODUCTION

As mentioned at the beginning that one -sixth of the children increased to almost two third during pandemic don't get the access to primary education, here are some more sensitive facts. Mostly under-privileged section across the Globe, mostly in third world developing countries, even in the first world. This is worsened post pandemic leading to almost one-third of the children population don't have the access to very basic life need called primary education. This is because of Digital divide (Mitra et al 2020, Mitra et al 2019), annexed by

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mal-nutrition, hunger and health concern. The target geographical region of this work is identified to be primarily, South-East Asia -Indian subcontinent, North-east Africa – Egypt, Sudan, Mid-West US among Mexican migrated population – YES! deprived of primary education (Illustrative, not exhaustive). Six different language variation is also taken into consideration viz. English, French, German, Spanish, Japanese, Chinese.

Learn with Noodle is a music driven intelligent educational model that is not only dedicated to outcome-based education but also addressing digital divide. The module NOODLE is intended towards digitally equipped affordable children population whereas LEARN is typically intended towards under privilege financially deprived children population. In this era of ubiquitous and pervasive computing, the cost of the digital devices is scaled down. various Government funding Agencies and NGEOs here in this regard can play their roles responsibility and accountability in order to extend the digital device support to the underprivileged children which is mandatory for virtual learning.

The proposed interactive virtual learning and communication process has been enhanced by advanced wireless virtual learning and mobile technologies. One of the most significant innovations that has transformed the educational process is virtual technology, which allows us to introduce our digital platform options and resources. The digital learning environment is completely novel. Students can access their content, such as audio, video, and text-based documents, using Internet-connected mobile devices. During the Covid situation, digital learning provided us with more information about appropriate activities for students or children, and parents. Carers, teachers, school leaders, and others are better prepared to assist their children with social, emotional, and academic needs. Parents, particularly in third-world and developing countries, are powerless to engage their children owing to poverty, and many of the youngsters are identity less orphans. This digital divide initiative is nearly identical to the United Nations' World Literacy initiative. (For more information, see https://doi.org/10.16920/jeet/2019/v32i4/145520). In terms of production, Outcome Based Education has been limited to one- sixth of the world's children (Reference: our paper https://doi.org/10.1007/s10639-019-10043-z). On the other hand, Cloud computing is a significant issue in our flexible dynamic environment, and it is an important research subject for a researcher.

A. Literature Review

One-sixth of the overall population of children is deprived of primary education (Source: GARTNER). Mostly underprivileged people all over the world, mostly in third-world developing countries, but also in the first world. This became worse since the pandemic, with about one-third of the youngsters affected. This is due to the Digital Divide, which is exacerbated by malnutrition, poverty, and health concerns (Mitra et al 2020, Mitra et al 2019). To create a more cost-effective framework for elementary education for this age group of children, it has to be observed that this population of children has the fewest amenities and surroundings. Poverty-stricken parents are obliged to employ them as child labourers. Music is the only alternative they have in their line of work. Music is the universal language that affects human behaviors by eliciting emotional responses (Das et al 2020).

It is possible to transfer knowledge through music in a hard form (Illustrations: In India -Anganwadi, Bratachari). This, too, addresses the therapeutic cause (Das et al. 2020). Health and nutrition are two issues that must be addressed concurrently. Solution is in two stages: LEARN is a manual framework in the sense of Outcome based education (OBE) in (Gupta and Datta 2020) for the digitally disadvantaged that uses rhymes, musical folktales, and Fables in local language and practice capturing regional semantics (Arts ed. Part. 2011). NOODLE is a virtual framework for children to help them overcome the digital divide.

Music teaching develops the region of the brain that controls sensory and motor activity, and it has been proven that musically trained students have stronger motor action (Das et al 2020,Arts education 2011). Music practice strengthens the region of the brain involved in the processing of complicated mathematical processing (Forgeard 2008). Long-term music training improves a musician's ability to maintain mental control during memory and recall tests (Hyde 2009, Helmrich 2010). When music students were evaluated for verbal memory, they performed better than non-music students (Berti 2006). Students who study music outperform their non-music peers on arithmetic assessments, and this advantage grows with time (Forgeard 2008). Early childhood instrumental music training enhances attention qualities such as visual focus, active listening, and remaining on task, while ongoing music education throughout adolescence reinforces and strengthens these (Pallesen 2010). Students who take music lessons outperform their peers on assessments that assess perseverance (Ho, 2003).

B. State of Art of Music Education globally

Taking into consideration one continent e.g. Africa, Meki Nzewi's (2001) philosophy regarding African music education in modern music education discourse is that the formal system of music education should be based on indigenous African model and resources in generating the content and the pedagogy. In support of Meki's view, Ongati (2010) describes two pedagogical methods that have been used for learning African music in formal institutions. Leonhard and House (1959) outboxes advance basic patterns for teaching procedures in music education in teaching performance skills, appreciation, knowledge and understanding and attitudes. Elliot (1995) proposes six strategies that are especially important to the musical practicum: modeling, coaching, scaffolding, articulating, comparative reflecting and exploring. McNergney & Herbert (2001) concur that there is no single best way to teach all people for all purposes because learners vary in needs and abilities. At the same time when goals and objectives change, instructional models must change. They propose four instructional models by Joyce and Weil, 2003. Like-wise many countries have strong, well-funded music initiatives that are backed up by a widespread belief in the importance of music (and arts) education. Music education, for example, flourishes in nations such as Sweden, Finland, Norway, and Denmark, where it frequently extends outside the classroom to include publicly financed extra-curricular musical instruction.

C. Augmented issues

There are two unique issues to consider when providing primary education to underprivileged children. This is regardless of the technique for information transfer through musical education. The most important is dietary need. Specifically, the basic need for sustenance. The second is mental health, which includes a psychological component.

In this new normal, virtual learning has emerged as a critical form of education. Several new components and tools have been added to deal with this circumstance and provide suitable education. Health-related difficulties constitute the greatest threat in this post-pandemic condition, which has an impact on cognitive development. Inadequate nutrition and early growth, according to DiGirolamo et al., 2020, are connected with poor performance on cognitive functioning assessments and motor development, as well as deficits in academic successes, learning, and social skills. To tackle education with new technology in this new normal period, mental wellbeing and educational sustainability are critical.

By Roberts et al., 2022, all essential nutrients are required in conjunction with water to sustain the anatomical integrity of the brain. Numerous previous research have found a strong link between cognitive development and nutrition. Several micronutrients, including iodine, zinc, omega-3 fatty acids, iron, choline, and others, have been demonstrated in Nyaradi et al., 2013 to have an impact on neurocognitive development. According to the findings of Ogunlade et al. 2011, undernourished children provided a fortified diet displayed improved brain processing and problem-solving abilities.

Understanding human psychology, on the other hand, is constantly prioritized by academics from all fields. Many additional frontiers have grown in awareness of intellect within humans to produce an improved civilization after comprehensive research and handsome trial and error processes. The learn with noodle concept is a type of model based on collaborating human psychological as well as behavioral essence to artificial intelligence, where the child population of below poverty level will get their education through an exclusive device-based app rather than relying on so-called traditional classroom bound teaching.

The pandemic outbreak has taught us to live new normal lives with new normal components. To avoid a halt in education, it has become vital for people of all socioeconomic backgrounds to become tech-savvy and acquire a variety of emerging technologies. At this point, psychological adaptations to embrace certain new knowledge-based obstacles have impacted every part of society as well as every scale of vocation; educating pupils is no exception. Numerous evidences support the notion that complicated human-computer interactions have been examined multiple times to provide minimum to maximum comfort in terms of psychological stress reduction (Alkatheiri 2022). Several other studies have demonstrated that even complex mathematical solutions became more easier in this modern form of teaching, whereas traditional approaches were proven to be psychologically distressing for the students (Richard et al 2022). In contrast to the preceding viewpoints, another study found that the rapid growth of artificial intelligence in higher education fails to meet the critical thinking aspects, but it may be said that it can serve the purpose for primary education, whereas comprehensive research is required for accurate resolution.

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responsibility and accountability in order to extend the digital device support to the underprivileged children which is mandatory for virtual learning.

II. METHODOLOGICAL ASPECTS

The objective of the proposed work is to create an alternative affordable framework to facilitate primary education to this children population. The entire research work has been frame- worked with key following points:

- This children population have least amenities and ambience. Poverty ridden parent are forced to push them as child labor
- In their livelihood only alternative thing they are exposed to is music
- Music is the universal language that controls the human behavior making emotional adjustments [5]
- Free accessibility to the World of music is available (http://radio.garden/)
- The bottle-neck is language and semantic
- Accessibility to above is available (Language: https://www.worldlingo.com/, https://www.duolingo.com/ Semantic: https://www.expert.ai/blog/introduction-to-semantics/
- Transferring knowledge through music in hard form is available (Illustrations: In India - Anganwadi, Bratachari). Even this address therapeutic cause (Gupta, S., 2014)
- Health and Nutrition are parallel issues to be taken care of.
- Two stage solution:

LEARN is a manual framework in the above line through rhymes, musical folktales and Fables using local language and practice capturing regional semantic for the digitally deprived (Mitra, 2020). NOODLE is a virtual framework to the children population to make them get rid of digital divide.

A. Model formulation

The model formulation of the problem is characterized by the fact that during Pre-pandemic, every one out of six children don't have access to education and post pandemic the situation only worsened. During pandemic, virtual learning emerges with a crude fact that one third of the children don't have the basic ambience like accessibility to the internet. This campaign of digital divide is almost the same as that of World literacy campaign by UN. (Reference: our work https://doi.org/10.16920/jeet/2019/v32i4/145520). In

terms of productivity, educational stepping stone of Outcome Based Education has been confined to one -sixth of the World children population (Reference: our work https://doi.org/10.1007/s10639-019-10043-z). Most of the rest of the children are child labour at premature age. Especially in third-world and developing countries, however not confined to, parents are helpless due to poverty to engage their children and many of the children are identity less orphan. Rehabilitating this large child population is next to impossible, so the proposal is to "Heal the World! Make it better place" i.e. educate them in their present location through alternative available approaches linked to their job role. Pre-pandemic, every one out of six children don't have access to education and post pandemic the situation only worsened. During pandemic, virtual learning emerges with a crude fact that one third of the children don't have the basic ambience like accessibility to the internet. This campaign of digital divide is almost the same as that of World literacy campaign by UN. (Reference: our workhttps://doi.org/10.16920/jeet/2019/v32i4/145520). In terms of productivity, educational stepping stone of Outcome Based Education has been confined to one -sixth of the World children population (Reference: our work https://doi.org/10.1007/s10639-019-10043-z). Most of the rest of the children are child labour at premature age. Especially in third-world and developing countries, however not confined to, parents are helpless due to poverty to engage their children and many of the children are identity less orphan. Rehabilitating this large child population is next to impossible, so the proposal is to "Heal the World! Make it better place" i.e. educate them in their present location through alternative available approaches linked to their job role

B. Solution Process

In proposed LEARN with NOODLE model, LEARN is for victims of digital divide whereas NOODLE is for rest. Learn - Earn Academic Relaxed Network (LEARN) with New-normal Object Oriented Dynamic Learning Environment (NOODLE) The only relaxation to a larger group of this children labour is music. Audio has higher capabilities of knowledge transfer comparable to text (Reference: Radio Garden http://radio.garden/). Music is a universal language and also available offline. It brings relaxation, recreation even at the time of work and productivity enhancement with it is a proven fact (Reference: our work https://doi.org/10.1016/j.procs.2020.05.151).

Coincident to their work place, the knowledge transfer learning resources are to be build in catchy and attractive way fit to their working condition with topic objective and outcome (Reference: our work \https://doi.org/10.1016/j.procs.2020.05.053).

The NOODLE sub-model is to get rid of digital divide in virtual learning. In this proposed work, the objective is to provide this LEARN with NOODLE hybrid model with catchy learning resources employable to both physical and virtual environment. Dependencies will be the support of the Govt. and Laws of the land and implementable through UN bodies like UNICEF, UNCPD etc.. Proposed Circuit diagram of NOODLE: It will be same to the other general mobile device, but our proposing research work is expected to do education more effective for the students conducting private network settings also helpful and it will be low cost. That device will be facilitating with automatically recording facility of online teaching and learning session and student cannot stop their audio and camera throughout the session. This automatically recording, audio and camera activation will be supervisory password protected. Also social applications and network activities if we can restrict for this teaching learning device, then data usage will be low, it can control the network cost. This resolution may be adjuvant for worldwide students along impoverished and unconsidered will be helpful to get rid of e-learning.

III. PROPOSED MODEL

A. Model of Mobile Device NOODLE
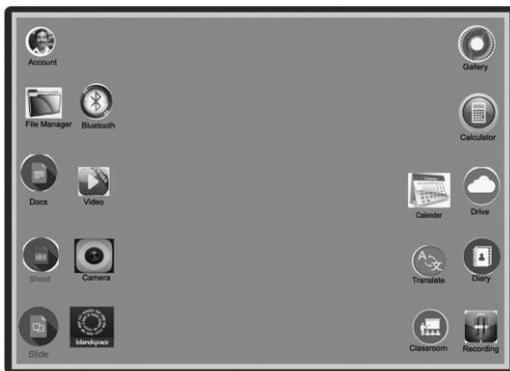
Fig. 1. The device NOODLE interface.

The interface of the model NOODLE is presented above in which the software components are described below:

1) File Manager
This application, help us to maintain the file systems. Download files, copy files for backup, move files from one area to another,change the name of a file and delete unnecessary files. Also, ithelps us to store download files, documents files, images,videos, etc. for future use.

2) Docs
It is a word processing application. Users can write text, letters, tables, find and replace text, use mail merge, bulleted text, number text, design text, colour text, etc. All kinds of documentation are possible.

3) Sheet
It is an electronic spreadsheet group of applications. Using this application users can create a calculative worksheet, graph, auto analysis features, and different category functions.

4) Slide
It is a presentation kind of application. Users can apply animation and various styles and colours of the text in their presentation documents.

5) Bluetooth
It helps us to connect and transfer our important files from one device to another device. Student can share their educational file, notes, etc.

6) Video
It helps us to see the video files like mp3, mp4, etc. Students can see the class recording, educational speech, etc.

7) Camera
Users can take pictures and students also can use this to take snape their notes so that they can share these notes with others.

8) Blend space
It's a very good free web application for creating digital lessons like interactive lessons, projects, presentations, and more. Users need to sign up through the blend space website. Users can create a lesson to combine digital contents and their files like Tes resources, YouTube, PDF, images, PowerPoint, Dropbox, links, word doc, google drive, etc.

9) Accounts
All setup is present in this application and it is protected by a supervisory password. Using this application users can set their information about the device. Password levels will be different for different applications. Users can set text, fingerprint and face detected passwords.

10) Gallery
Users can see all images, videos, and documents through this application. Edit images, delete images, move, and arrange images in created folders.

11) Calculator
It helps the user to calculate the mathematical calculation and students also use scientifical calculations.

12) Calendar
Users can see the current and previous calendars and set events on a specific date.

13) Drive / Cloud
Using this application users can store their valuable all kinds of files in the cloud area.

14) Translator
It helps to translate different languages. Like English to Bengali, Bengali to English, and other different languages.

15) Diary
It is used to store notes for a different purpose. Like events, memories, quotations, etc.

16) Recording

Use to create audio files. Students can record their own speech. Audio recording of virtual classes for future use.

17) Classroom

It is a virtual learning application or platform for learners. It helps to convey every educational and other information to learners easily without being physically present. It helps to record classes for future use. Everyone can present their presentation and the entire screen for others who are active classroom.

IV. PROTOTYPE DESIGN

The design of the prototype of the proposed device NOODLE has been presented in the following sections. It has been presented through Circuit diagram with Circuit component details.

Circuit diagram

The proposed circuit has been presented in the following diagram:
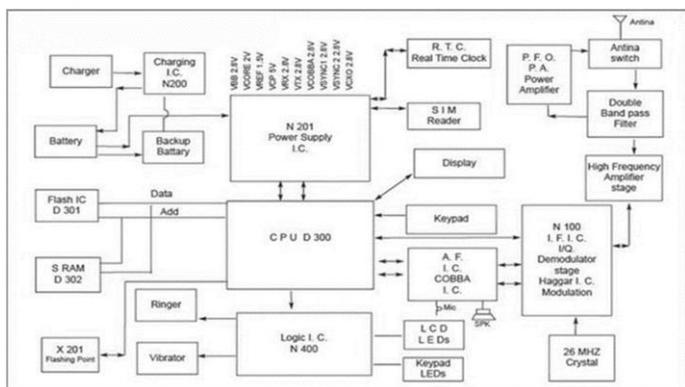
Fig. 2. NOODLE circuit diagram

B. Circuit component description

1) Charging IC
The battery of the proposed device is charged when the charging IC gains current from the charger. It is located near the power section. The device will be dead or not get charged due to a short or defective Charging IC.

2) Power Supply IC
This component circulates power to all the parts of the proposeddevice after gain power from the battery.

3) Real Time Clock
It helps us to count the pathway of time of an electronic device.RTC has a supercapacitor which is rechargeable and soldered for an alternate source of power to keep time when the main power supply is cut off. It also supplies power for the backup ofRAM.

4) PFO Power Amplifier
The PFO Power Amplifier amplifies the power magnitude of a signal. It is located near the Antenna

Switch. The network will be unavailable when PFO is not working properly.

5) Double Band Pass Filter
A dual bandpass filter is a kind of filter that provides two different filters in the size of one filter. It allows visible light and only a special part of the visible and near-infrared spectrums for the use of the colour camera which using in sunlight and night.

6) Antenna Switch
In this proposed device another component is Antenna Switch Modules or ASM, which is used to maintain telecommunication-related matter of smartphones and other multi-band network-connected wireless devices. It is available in metal and non-metal. It finds out the network and after tuning transmits forward.

7) High-Frequency Amplifier Stage
In the communication process, the Amplifiers are the main working block. The low incoming signal into a receiver needs to amplify to a higher value so that signal can identify or digitized. On the other hand, the signal requires too large for a long transmission range using free space and cables.

8) N 100 IFIC I/Q Demodulator stage Haggar IC
Modulation As per the instruction of the CPU this device acts like a transmitter or receiver of audio or radio signals. This is also known as an RF signal processor.

9) MHZ Crystal
This is a metal component and also known as Network Crystal. It processes frequency at the time of outgoing calls.

10) SIM Reader
It is required to establish a wireless network connection for the identification of this proposed device. It can store all personal details and configurations of this device.

11) AF IC COBBA IC
It is used to maintain the Speaker and Microphone of this device. It is known as a Melody IC. In general, it presents in the power section.

12) CPU D300
It is the brain of the proposed device, which maintains all portions of the device. It is called Central Processing Unit and is also known as RAP IC, MAD IC, and UPP.

13) Logic IC N400
It will be used to maintain the Light Emitting Diode, Vibrator, and Ringer parts of the proposed device. If any problem in this Logic IC, then Vibrator, Ringer, and Light Emitting Diode are not working. Also, we can call it an Interface IC.

14) Backup Battery
The primary power source, if unavailable, then backup battery provides power.

15) Vibrator

It helps to vibrate the device. It is a very tiny motor which is a peculiar soaring weight on the axle.

16) Charger

A charger reserves power in a battery by flowing an electric current through it.

17) Battery

Major electronic mobiles/tabs are using Lithium-ion batteries. It supplies power to all sections of the device.

18) Flash IC D301

Flash IC is used to store the IMEI number and Software of this device. It is also known as RAM IC, ROM IC, EEPROM IC, and Memory IC.

19) ROM

It will help to install all present operating applications on a mobile device. If any error in ROM, then a software problem will be arising.

20) RAM

All operating commands are sent and received by the RAM of a Mobile device. If any error in RAM, then the mobile device repeatedly gets hanged.

C. Data Minig Framework

This framework is a data warehouse from which the association rule can be extracted easily. It is also necessary to mention the personal background details to judge the effect of a particular music sample before derivation of the association rule. However, it suggested to test all the samples to entire population to make the rule more robust amidst cost complexity.

Fields → Music_ID	Type	Classification	Tone	Pitch	Principal Nodes	.....
Record 1	.....	....	.....	.....	....	
Record 2	.....	....	.....	.....	....	
......						
Record N.............	....	....	....	....	....	

Table 1: Music Sample Database

later on, an interesting pattern is established in association of persons along with music samples. The knowledge adequacy received from the Data Warehouse will be improved by the image obtained from brain analysis accompanied by physical input from the individual. The Master Database has information on everyone, the effect being evaluated by pattern recognition, picture analysis of the human brain, and collective physical feedback from people. It also contains samples of many types of music. Population size is considered to be N and musical variation to be M.

Table 2: Effect measurement and manual feedback

In the rubric, e_{ij} s and f_{ij} s represent, respectively, the

#Trial No	Music Sample	Person ID	Measured Effect through brain image analysis	Physical feedback
1	M1	P1	e11**	f11**
2	M1	P2	e12	f12
N+1	M2	P1	e21	f21
N+2	M2	P2	e22	f22

resultant effect of brain imagery and physical input in relation to the music sample I while taking the person j into consideration. Additionally, because different environmental factors can have a different impact on an individual's response to a certain musical sample, e_{ijk} evaluates the influence of the musical sample I on person j for the t k'th trial.

In this area, two different databases containing person details and music sample details can be merged to get a final database to confirming direct link between measurement of effect out of imaging and physical feedback. As a result, the large Data Warehouse presents the following sets of fields.

Field	Measured Effect	Physical Feedback	Music Sample	Person	Other field of Relevance
Sub Fields	Attributes such as Abstract Lyrics,Aggressive Drumming Etc.	Attitude	Music Id	Personal ID	Enviornmental Inputs
		Behaviour	Type	Age group	
		concentration	Classification	Regional	
		fittness	tone	Educational	
		----------	pitch	Financial	
		-----------	Principel Nodes	Professional	

Table 3: Parameters and Performance indication for feature extraction

V. EXPECTED OUTCOME

In this new millennium, there are numerous options for teaching and learning. Activity-based learning is gradually replacing traditional chalk-and-talk learning. The pattern of interactive teaching from monologue to dialogue is not simply contained. Hands-on learning has a significant impact on the next generation of learners. The new generation of trainees is self-sufficient in terms of the curriculum offered by the teacher. Learners rely on Web contents (such as Wikipedia, You Tube, and Google, among others)

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because they are more comprehensive than individual content. Blend Space, Screen Casting, My Simple Show, and other large corporate-driven portals provide customized learning aid for students. Furthermore, learners' or students' participation in and contribution to social networking sites increases their social awareness and understanding. Because not all web content is real, pupils still need the guidance of a teacher. Teachers are rapidly becoming a student's Guide. The facts presented above are based on the Outcome Based Education (OBE) framework. Outcome is expected to be optimistic in equity action for child education; it may change the perception of education among underprivileged children; it may bridge the GAP between underprivileged and affordable children; and it may reduce the digital divide; all of this is likely the first integrated attempt to use music as a tool on a large scale.

VI. CONCLUSION

This work depicts an effort to provide primary education to underprivileged youngsters. Three diverse socioeconomic-demographic regions from different subcontinents were studied experimentally. A device design prototype is offered for broad virtual instruction. Annexed problems such as nutritional needs and mental health are also taken into account. Music instruction benefits pupils by preparing them to learn [3], improving fine motor abilities, preparing the brain for achievement, fostering superior working memory, and cultivating improved thinking skills. South-East Asia – Indian subcontinent, North-east Africa– Egypt, Sudan, Mid-West US among Mexican migrant population – YES! deprived of primary education (Illustrative, not exhaustive). Six languages (English, French, German, Spanish, Japanese, and Chinese) are used to explore the work's enormous global perspective span. If this initial endeavour evolves to the appropriate degree of compliance, there is tremendous possibility for subsequent research in other industries. There is ample scope of improvement. LEARN is a conceptual model whereas NOODLE is a prototype. As such LEARN is a process NOODLE is a product. As such, there is a lots of scope of further expansion both conceptually and practically.

REFERENCES

Alam, A., & Mohanty, A. (2023, January). Foundation for the Future of Higher Education or 'Misplaced Optimism'? Being Human in the Age of Artificial Intelligence. In Innovations in Intelligent Computing and Communication: First International Conference, ICIICC 2022, Bhubaneswar, Odisha, India, December 16-17, 2022, Proceedings (pp. 17-29). Cham: Springer International Publishing.

Alkatheiri, M. S. (2022). Artificial intelligence assisted improved human-computer interactions for computer systems. Computers and Electrical Engineering, 101, 107950.

Arts Education Partnership (2011). Music matters: How music education helps students learn, achieve and succeed. Washington DC.

Berti, S., et al. (2006). Different Interference Effects in Musicians and a Control Group. Experimental Psychology, 53(2), 111-116.

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two decades of artificial intelligence in education. Educational Technology & Society, 25(1), 28-47.

Das, P., S. Gupta, and B. Neogi, "Measurement of effect of music on human brain and consequent impact on attentiveness and concentration during reading", Procedia Computer Science, Elsevier Science, ISSN:1877-0509, Vol. 172, pp. 1033-1038, 2020. https://doi.org/10.1016/j.procs.2020.05.151

DiGirolamo, A. M., Ochaeta, L., & Flores, R. M. M. (2020). Early childhood nutrition and cognitive functioning in childhood and adolescence. Food and Nutrition Bulletin, 41(1_suppl), S31-S40.

Elliot, D.J. (1995). Music Matters: A New Philosophy of Music Education. New York: Oxford University Press.

Forgeard, M., et al. (2008). Practicing a Musical Instrument in Childhood is Associated with Enhanced Verbal Ability and Nonverbal Reasoning. PLoS ONE 3(10): e3566.

Gupta, S. et al. (2014) Published patent as inventor (Applicant: Then Institution) entitled: "System for medical treatment following music therapy and the method thereof" (Patent Appl. No. 20 / KOL / 2014) in the Journal 6 / 2014. Publication date: 7th February 2014 (Joint)

Gupta, S. et al. (2023) published patent entitled "Interactive Technology driven Low-cost Virtual learning Devices NOODLE for equity to address digital divide", (Appl. No. 202331012519A) published on 10th March 2023.(Joint)

Gupta, S., P.K. Datta,(2020), "Topic objective and outcome: Performance indicators in Knowledge

Transfer through in-depth Curriculum content analysis", Procedia Computer Science, Elsevier Science, ISSN:1877-0509, Vol. 172, pp. 331-336, 2020.
https://doi.org/10.1016/j.procs.2020.05.053

Helmrich, B. H. (2010). Window of Opportunity? Adolescence, Music, and Algebra. Journal of Adolescent Research, 25(4), 557- 577.

Ho, Y., et al. (2003). Music Training Improves Verbal but Not Visual Memory: Cross-sectional and Longitudinal Explorations in Children. Neuropsychology, 17(3), 439-450.

Hyde, K. L., et al. (2009). Musical Training Shapes Structural Brain Development. The Journal of Neuroscience, 29(10), 3019- 3025.

Joyce, B., and Weil, M., (2003), Models of Teaching, 5th Edition, Prentice Hall of India.

Leonhard, C. & House, R.W. (1959). Foundations and Principles of Music Education.New York: McGraw-Hill Book Company, INC.

Mc Nergney, R. F. & Herbert, J.M. (2001). The Challenge Professional Practice. U.S.A: A Pearson Educational Company.

Mitra, S. and S. Gupta, (2020) "Mobile Learning under Personal Cloud with a Virtualization Framework for Outcome Based Education", Journal of Education and Information Technologies (EAIT), Springer, Vol. 25, No. 3, pp. 2129-2156, ISSN 1360-2357, (DOI: https://doi.org/10.1007/s10639-019-10043-z).

Mitra, S., and S. Gupta (2019), "Own Device-Based Mobile Learning in Personal Cloud Environment: A framework to address Digital Divide", Journal of Engineering Education Transformation (JEET), ISSN 2349-2473, Volume-32, issue 4, pp. 46-54. (http://dx.doi.org/10.16920/jeet%2F2019%2Fv3 2i4%2F145520)

Neville, H., et al. (2008). Effects of Music Training on Brain and Cognitive Development in Under-privileged 3- to 5-year-old Children: Preliminary Results. In C. Asbury & B. Rich (Eds.), Learning, Arts, and the Brain: The Dana Consortium Report on Arts and Cognition (pp. 105-116). New York, NY; Dana Press.

Nyaradi, A., Li, J., Hickling, S., Foster, J., & Oddy, W. H. (2013). The role of nutrition in children's neurocognitive development, from pregnancy through childhood. Frontiers in human neuroscience, 7, 97.

Nzewi,(2001). Music Education in Africa: Mediating the imposition of Western Music Education with the Imperative of the Indegenous African Practice. In C. Van Niekerk (Ed.), PASMEC Conference Proceedings (pp. 18-37). Lusaka, Zambia.

Ocaña-Fernández, Y., Valenzuela-Fernández, L. A., & Garro- Aburto, L. L. (2019). Artificial Intelligence and Its Implications in Higher Education. Journal of Educational Psychology-Propositos y Representaciones, 7(2), 553-568

Ogunlade, A.O.; Kruger, H.S.; Jerling, J.C.; Smuts, C.M.; Covic, N.; Hanekom, S.M.; Mamabolo, R.L.; Kvalsvig, J. Point-of-Use Micronutrient Fortification: Lessons Learned in Implementing a Preschool-Based Pilot Trial in South Africa. Int. J. Food Sci. Nutr. 2011, 62, 1–16.

Ongati-Omollo, R.A. (2010). Refocusing Indigenous Music for Formal Classroom Practice: A process of Creating Partnership between the School and the Community. Retrieved, 4/5/2013 at 1.30pm, from www.unesco.org/.../fprose

Pallesen, K. J., et al. (2010). Cognitive Control in Auditory Working Memory Is Enhanced in Musicians. PLoS ONE 5(6): e11120.

Richard, P. R., Vélez, M. P., & Van Vaerenbergh, S. (2022). Mathematics education in the age of artificial intelligence. How artificial intelligence can serve the mathematical human learning.

Roberts, M., Tolar-Peterson, T., Reynolds, A., Wall, C., Reeder, N., & Rico Mendez, G. (2022). The effects of nutritional interventions on the cognitive development of preschool-age children: A systematic review. Nutrients, 14(3), 532.

Scott, L. (1992). Attention and Perseverance Behaviors of Preschool Children Enrolled in Suzuki Violin Lessons and Other Activities. Journal of Research in Music Education, 40(3), 225- 235.