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Exploring the Impact of Humanoids on the Future Demand for Teachers

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Abstract

Technological innovations have always redefined and reshaped the structure and nature of labour market. Humanoid teachers unleash a significant leap forward in traditional academic ecosystem. The key concern about the humanoids is its impact on the job market. With immense competencies and human resemblance, humanoids have begun to conquer the teacher labour market. The present article reviews the trend of demand for teachers in Kerala and potential influence of deployment of humanoid teachers on demand for teachers. Results show a declining trend in the demand for teachers in Kerala indicating devastating effects on future demand for human teachers as a result of adoption of humanoid teachers.

Keywords: *Humanoid Teacher*, *Demand for Teachers, Teacher Labour Market, Teacher Demand Trends, Teacher Productivity.*

Introduction

In the dynamic field of educational technology, humanoid robots represent a significant leap forward from traditional learning tools (Graefe & Bischoff, 2003; Ting et al., 2014). A humanoid robot is a type of robot that is designed to resemble and function like a human. It is typically built with a head, torso, arms, and legs, and is able to move and interact with its environment in a way that is similar to humans (Kumar, 2023).

One of the key concern of humanoids is the potential impact on employment and the job market, as humanoid robots may be designed to perform tasks that were previously done by humans. This may result in job loss and changes in the nature of work, which could have significant economic and social consequences (Kumar, 2023). In the teacher labour market, the humanoid teachers with diversified competencies are going to bring about revolutionary changes. When on the one hand, it is going to be a boon for the markets which struggle facing teacher scarcity, on the other it is going to redefine the roles and qualities of teachers and replace the teacher workforce.

Knowing how many qualified teachers are needed for providing quality education to all the learners is crucial. So, it is vital to understand labour market needs and thus ensure that every community has access to a sufficient supply of well-qualified teachers (Sutcher et al., 2019). The demand for teachers refers to the total number of qualified teachers who are willing to work. Estimating the demand for teachers is a complex

process. There are different approaches for estimation of demand for teachers. Demand for teachers can be thought in two ways. Total teacher demand represents the total number of teachers required to educate the nation's students. Another way is considering 'the annual need for teaches to fill vacant positions' (Sutcher et al., 2019).The demand for teachers can be broadly classified as ideal demand and actual demand. Ideal demand requires defining the desired pupil-teacher ratio, geographic teacher distributions, and course requirements to determine the perfect number of teachers necessary each year. The actual demand represents reality- the need for teachers based on the number of teachers actually hired and employed. (Sutcher et al., 2019) . Here we estimate the actual demand for teachers using the recruitment systems adopted by the Government sector.

The State of Kerala is known all over the world as an educationally advanced part of India, which has many outstanding achievements in the field of education. In fact, Kerala is far ahead of the national objectives in primary and secondary education and is striving to attain international standards in education. Kerala is the first State that achieved universal literacy. (Kerala State Planning Board, 2023)

The present paper reviews the demand for teachers in teacher labour market and potential influences of introduction of humanoid teachers in the market on teacher demand. The demand for teachers in the state showing a declining trend. It means a mass adoption of humanoid robots shall further worsen the demand for human teachers. It also implies that the demand for teachers shall be distinguished later as the demand for human teachers and demand for humanoid teachers.

Significance of the Study

Empirical research underscores the specific advantages of integrating humanoid robots into education (e.g., Belapme et al., 2018; Movellan et al., 2009). Multiple abilities and apex level of artificial intelligence make the humanoid teachers highly result oriented. These automated teachers not only perform the assigned duties perfectly but also proves to be specifically useful to resolve the problems and challenges of the prevailing education system in different educational ecosystems. The integration of humanoid robots in education presents a broad range of opportunities to enhance teaching practices and improve student learning (Chalmers et al., 2022). Because of they are programmable, agile, stable, and realistically interactive, robot teachers are excellent teachers (Tuna et al., 2019).

By providing personalized assistance, interactive demonstrations, and collaborative learning experiences, humanoid robots have the potential to enrich education by fostering deeper understanding and enhancing students' motivation (Asghar et al., 2022; Ekström & Pareto, 2022a, b). Humanoid robots also foster collaborative learning by acting as facilitators in group activities (Chalmers et al., 2022). They can moderate discussions, assign tasks, and ensure equal participation among students, encouraging the development of teamwork and problem-solving skills.

The traditional classrooms, where one teacher manages the learning levels and abilities of 30 or 40 students at once, is failing too many students. Teachers are forced to "teach to the middle". Consequently, neglecting students who need more attention and leaving more advanced students and disengaged (Price, 2024). The humanoid teachers augment teaching, offering assistance and enrichment beyond traditional methods by acting as tutors, playmates, and entertainers (Christodoulou et al., 2020; Pande & Mishra, 2023; Wang et al., 2023), thereby improving student understanding, engagement, and nonverbal communication (Kennedy et al., 2015). A humanoid teacher can customise itself into different roles and cater the needs of diversified learners. For a humanoid teacher, it is very easy to quickly switch into teaching styles and lesson plans.

Because of their increased productivity and efficiency, there is a universal tendency to adopt humanoids in every field including education. Schools have started using humanoid teachers in their academic and non-academic activities. Kerala has taken progressive steps towards technological advancement of the education sector. To ensure an all-inclusive education, Kerala Infrastructure and Technology for Education (KITE), a Govt of Kerala enterprise set up to foster, promote and implement modernisation of educational institutions in the State of Kerala, has developed audio books for visually challenged, and sign-adapted classes for hearing impaired students of Classes 10 and 12. Kerala state government has converted 45000 classrooms in 4752 schools into Hi-tech classrooms.

The first humanoid teacher in India was introduced in Kerala in the year 2021. The KTCT Higher Secondary School, Thiruvananthapuram introduced the first humanoid teacher called 'Iris'. Iris is part of the Atal Tinkering Lab (ATL) project, a 2021 NITI Aayog initiative designed to boost extracurricular activities in schools. Iris is an excellent multilingual AI teacher. Iris can answer complex questions across various subjects, providing personalised voice assistance and facilitating interactive learning experiences. Another government lower primary school at Punalur in Kollam district also adopted a humanoid called 'Nova'as a teaching assistant in their school. Kerala is taking significant gallops in the field of technological innovation and humanoid adoption in its classrooms. Hence the present article is significant because it analyses the potential effects of adoption of humanoid teachers on demand for teachers and teacher labour market.

Objectives

The main objectives of the paper are the following:

1. To review the demand for teachers in teacher labour market of Kerala
2. To review the potential influence of humanoid teachers on demand for teachers.

Methodology

To review the demand for teachers, document analysis was used. The government sector in education follows a systematic recruitment process in the state. The recruitment in government sector is done through Kerala Public Service Commission. So, the researcher collected and analysed 178 teacher recruitment notifications along with their examination schedules issued by Kerala Public Service Commission from the year 2015 to 2022.

Forces of demand and supply determines the direction of every labour market. The demand refers to the total number of qualified teachers required by the schools in the state. Demand can be estimated in two ways: An ideal demand can be calculated by estimating aggregate number of students in schools and ideal pupil teacher ratio. The concept of real demand represents the number of teachers that the institutions are actually willing to hire. The real demand for teachers in Kerala for a period of eight years from 2015 to 2022 was estimated and its trend was observed.

Analysis and Interpretation

Results of the analysis carried out on the basis of objectives are presented here.

i) Demand for Teachers in Kerala Teacher Labour Market

Investigator estimated the real demand for school teachers in government schools in Kerala from the data extracted from Kerala PSC notifications. Table 1 shows the number of teachers that the government wanted to hire over the period of 8 years from 2015 to 2022.

Table 1

Demand for Teachers in Kerala from 2015 to 2022

District	2015	2016	2017	2018	2019	2020	2021	2022
Alappuzha	73	567	568	45	--	168	2	63
Ernakulam	91	164	228	56	--	116	7	214
Idukki	95	132	329	51	--	82	2	34
Kasargod	186	903	759	67	1	254	5	161
Kozhikode	173	514	370	155	5	363	72	171
Kollam	124	818	610	153	5	447	18	74
Kannur	205	603	500	104	--	49	55	407

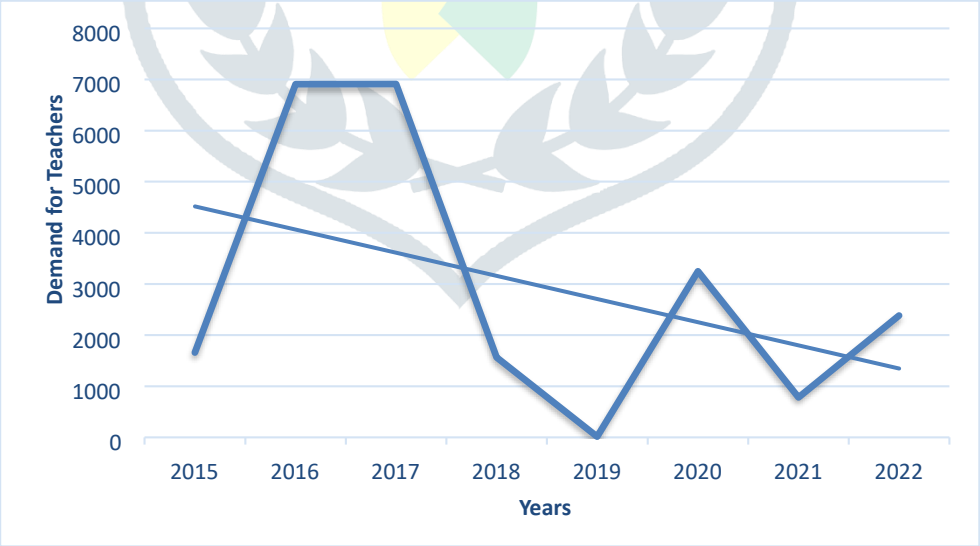
Kottayam	32	88	435	37	--	135	14	90
Malappuram	302	1139	1593	433	--	457	330	347
Palakkad	152	639	764	65	--	152	103	179
Pathanamthitta	15	241	26	32	--	176	23	72
Thrissur	21	216	293	165	--	448	35	259
Thiruvananthapuram	56	571	96	128	--	347	77	272
Wayanad	131	313	339	73	--	54	38	37
Total	**1656**	**6908**	**6910**	**1564**	**11**	**3248**	**781**	**2380**

Source: Kerala PSC Notifications from 2015 to 2022

The aggregate demand for teachers in government sector was at the highest in 2016 and 2017 i.e., 6908 and 6910 respectively. The data shows afterwards, a decline in the number of teachers demanded. There was an increase in demand in 2020 and 2022. In 2022, the demand showed a sudden hike from 11 to 3248. The demand for teachers in 2021 was only 781 and later it was increased to 2380 in 2022. In 2019, in which the number of examinations held was only 2, the number of required teachers was only 11. It was a demand from only 3 districts, Kasargod, Kozhikode and Kollam. The number of teachers demanded in each year and in each district are different. It is very clear from Table 1 that the demand in each district is highly different and it also varies significantly in different years. These differences result in swings in the aggregate demand each year. The demand for teachers in Kerala does not show a steady increase or decrease. It varies over time because of the influence of different factors.

Figure 2

The Trend of Demand for Teachers from 2015 to 2022



The trend of demand for teachers in the state is illustrated with the help of a diagram in Figure 2. Years from 2015 to 2022 is given on X axis and demand for teachers over these years are given on Y axis. It is very clear from the diagram, that the demand for teachers was increased from 1656 in 2015 to nearly 7000 in 2016. The same demand was maintained in 2017 too before it suddenly declined in 2018 and further in 2019. Demand line attains a moderate increase thereafter in 2020. It slightly falls down again and it continues to rise in 2022. But the trend line which falls downwards from left to right shows a decreasing tendency of teacher demand over the period from 2015 to 2022. It gradually going downwards over the 8 years from where it began before it reaches 2022 showing the declining trend of demand for teachers in the state of Kerala.

ii. Potential Influence of Humanoids on Demand for Teachers

Robot adoption has reduced total employment (Acemoglu & Restrepo, 2020) in various countries across the globe. Robots substitute for tasks otherwise performed by human employees. Thus, there is a negative displacement effect (Autor & Dorn, 2013) which leaves millions of workers jobless. The displacement effect refers to the phenomenon where automation and technological advancements replace human labour, leading to job losses in affected industries. According to studies, technological advancements, particularly in routine and manual jobs, have displaced many workers, reducing employment opportunities in these sectors. The displacement effect because of the introduction of humanoid teachers shall lead to job loss of a great number of teachers. Because of their increased productivity and affordability, humanoids can very easily replace the human teachers in schools and other educational institutions. There is a positive productivity effect since robots can lower production costs and thus increase productivity (Autor & Dorn, 2013). Increased productivity may create demand for more labour. But in fields such as education, the enhanced productivity of humanoids shall lead to decrease in demand for human teachers.

Kerala has a well-developed education system, with a network of schools, as well as higher education institutions. Kerala spends about 17 per cent of its total expenditure on education. Budget spending on education has increased in recent years. The 14th Five-Year Plan envisages ending the digital divide, ensuring better connectivity to school education, and ensuring access to digital study material and library networks. Under the Little KITE programme, Robotics is an important training component, through which students in public schools gets an opportunity for hands-on training in latest technological areas such as Robotics, IoT, Artificial Intelligence etc. As part of this program, in the year 2022, about 9000 Robotic Kits have been deployed to 2000 schools where Little KITES IT Clubs are functioning. More than 4000 KITE Masters have been trained in schools on how to use this equipment in schools. Using these KITE Masters, KITE has imparted training to 60, 000 students, who would in turn train a total of 12 lakh students. Further, the state of Kerala is also attracting IT investors through its well-established Governmental policies, and cost-effective operational expenses (Kerala State Planning Board, 2023).

These factors show that the state of Kerala is moving in pace towards a mass procurement of humanoid teachers into its classrooms. The effects of invasion of humanoid teachers into the teacher labour market shall lead to grand transformations in the market as indicated below:

(i) Decline in the Demand for Human Teachers

The massive shifts in the role of teachers, also lead to the fall in the number of human teachers required by the educational institutions. The humanoid teachers which handle different subjects reduce the need for teachers specialised in different subjects. The works of planning lessons, classroom interactions and presentations, evaluation of students etc. are shouldered by the humanoid teachers, the human teacher is left with managerial functions like content planning, programming and scheduling the educational activities. It leads to a decrease in the number of human teachers required by the institution. In the long run, with sophisticated technology, the humanoids could take up the administrative positions at local and institutional levels. A centralised monitoring and feedback system can effectively provide instructions and get the jobs done in various educational institutions.

(ii) Oligopsony Market Situations

Oligopsony is a market of imperfect competition with excessive suppliers and limited employers. The mismatch between demand and supply lead to oligopsony market situations in Kerala as part of mass adoption of humanoid teachers. The teacher labour market of Kerala, which is already overcrowded because of the excess supply of teachers, eventually becomes an Oligopsony market. Manufacturers of humanoid teachers shall occupy a significant portion of teacher labour market. It leaves the human teachers striving hard against the economic and competent humanoid teachers.

Consequently, the abundance of humanoid teachers is also going to redefine the established roles and job description of human teachers. It means an absolute change in the prescribed qualification and thorough revision of the teacher training. The name ‘teacher’ could also be replaced by the terms such as ‘facilitator’ or ‘programmer’. Instead of abilities in lesson planning and transaction, an excellent teacher could be expected possession of effective programming skills along with deep content knowledge. But still the number of required human resources shall be less due to the centralised co-ordination of humanoid teachers.

As the cost of acquisition come cheaper, there are possibilities for household purchasing of humanoid teachers. The cost of a humanoid teacher in India begins from Rs.70, 000/- which is less than the price of a smart phone or laptop and cost of maintenance is reported to be 10 to 20 percentage of its purchase price. It will consequent to total restructuring of educational system. The individualised learning could be dominated over the social system of learning. The teacher labour market shall be filled up with humanoid teachers produced by different manufacturers and household consumers who want to purchase them.

Conclusion

In short, the invasion of humanoid teachers who resemble like human beings who outperform normal teachers could bring about a revolutionary transformation in teacher labour market. In spite of all the challenges, the rapid technological growth implies that these challenges shall be met or redefined by the innovative technological advancements. The paper reviewed the highlighted competencies of humanoid teachers and the challenges which are hindering the mass adoption of such robotic teachers in schools and the impact of shift of education sector into humanoid teachers upon teacher labour market. All the technological gallops have come up with some inherent drawbacks. Humans were capable of controlling the drawbacks and make use of the advantages of such technological inventions. Still, the prospective transformations that the humanoid teachers can bring about into teacher labour market is disarming. Prediction of Stephen Hawking still lies crystal clear, “I fear that AI may replace humans altogether. If people design computer viruses, someone will design AI that improves and replicates itself. This will be a new form of life that outperforms humans, "(Medeiros, 2017)

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