Convolutional Neural Network utilized in Teachable Machine

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Abstract:
The integration of technology into education has proven a game-changer, especially in the realm of special education. This article delves into the transformative impact that technology, specifically innovative tools like Teachable Machine, has had on fostering inclusive learning space for children with diverse learning needs. This research investigates primary teachers' perspectives on integrating Teachable Machine for inducing inclusive learning in regular classrooms. Employing a descriptive research method, the study utilized a self-prepared questionnaire to collect teachers' views. Purposive sampling gathered data from 43 primarylevel teachers in Chandigarh, Mohali, Panchkula, and Delhi. Results showcase a strong consensus among teachers, affirming the positive impact of Teachable Machine on student engagement, diverse learning needs, inclusivity, and collaborative learning. The study underscores the significance of understanding educators' perspectives for effective technology integration and inclusive education practices.
Keywords: Transformative, Impact of Technology, Special Education, Pioneering Inclusive Learning, Teachable Machine

In the dynamic landscape of education, the advent of technology has ushered in a new era of possibilities and opportunities, particularly in the realm of special education. The power of technology to dismantle barriers and establish inclusive learning environments that meet the varied requirements of students is just one example of how revolutionary it can be. In the twenty-first century, it is more important than ever to investigate innovative tools that improve education for all children while bridging gaps that have traditionally impeded the educational path of those with special needs. The integration of technology in special education represents a seismic shift from conventional teaching methodologies, opening up avenues for personalized and adaptive learning experiences. In this transformative journey, the emphasis on inclusivity stands out as a guiding principle, recognizing the inherent diversity among students and the need for customised approaches to meet their specific needs. The significance of inclusive learning environments cannot be overstated; they not only foster sense of belonging but also empower students with the tools they need to thrive academically and personally. (1)

In this regard, innovative resources are essential in determining how special education is shaped. Teachable Machine is one such technology that has become a shining example of innovation, a creation of Google that epitomizes the fusion of artificial intelligence and accessibility. This tool serves as a catalyst in the quest for inclusive education, offering a platform where educators and students alike can explore the boundaries of creativity and customization. Teachable Machine is significant not only because of its technical capabilities but also because of its potential to completely change the way we approach special education by making it more interesting, flexible, and customised to meet the individual needs of every student. The main objective of technology in special education is to remove obstacles to learning and establish a setting in which each student can succeed. Thanks to technology, inclusive learning settings may now acknowledge and celebrate the diversity of their students, realising that no one size fits all. Many AI tools are being experimented with by the Google team and global creators. The below table mentions some of the AI tools which can be integrated as an instructional aid in the classrooms. (2)
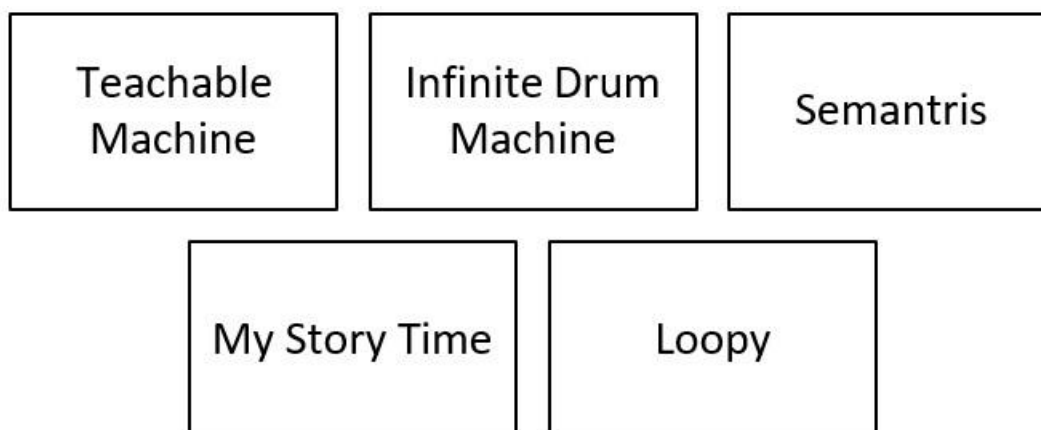
Teachable Machine	Infinite Drum Machine	Semantris

My Story Time	Loopy

Traditional educational paradigms often struggled to accommodate students with varying abilities, inadvertently leaving some on the periphery of the learning experience. Technology, and tools like Teachable Machine, act as equalizers, providing a platform where every student, regardless of their abilities or disabilities, can actively participate and contribute to the learning process. Beyond just providing resources, technology can help promote diversity by bringing about a fundamental change in the way that education is conceived and implemented. Accessibility, adaptability, and personalised support are given top priority in inclusive learning settings because they understand that every student has different strengths and problems to bring to the classroom. Technology acts as a bridge, connecting educators with innovative solutions that address the diverse needs of their students. As we embrace this technological revolution in education, it is essential to understand not only the capabilities of these tools but also their potential to create a more compassionate and empathetic educational ecosystem. (3)

Teachable Machine, in particular, stands out as a beacon of innovation in this transformative landscape. Its user-friendly interface and adaptability make it an accessible entry point for educators and students, irrespective of their technical expertise. By allowing users to create machine learning models without extensive programming knowledge, Teachable Machine empowers educators to tailor educational content to the specific needs of their students. It transforms the role of educators from mere disseminators of information to creators of personalized learning experiences. In shaping a more accessible educational landscape, Teachable Machine addresses the diverse needs of students, including those in special education. Its applications extend beyond the traditional boundaries of teaching and learning, offering a canvas where educators can paint a picture of inclusivity through customization. Whether it's recognizing sign language gestures, providing gesture-based controls, or developing personalized accessibility tools, Teachable Machine opens up a realm of possibilities for students with diverse learning requirements. As we delve deeper into the potential of Teachable Machine and similar innovative tools, it becomes evident that we are not merely adopting new technologies but undergoing a paradigm shift in the way we perceive and practice education. The integration of such tools is not about replacing traditional methods but about enhancing and expanding the educational toolbox available to educators. It is about recognizing that technology, when harnessed thoughtfully, has the power to amplify the strengths of students, mitigate their challenges, and provide a more equitable learning experience. (4)

Henriikka Vartiainen et.al., studied the impact of content and the teaching process in which children of age group 3-9 years were observed for producing machine learning datasets and models along with exploring and explaining their own interaction with machine learning systems. (5) Chiu et.al., proposed a new framework for pre-posttest multifactor for evaluation about students' perception for AI learning, which showed effectiveness of curriculum in promoting AI learning. And the study showed the co-creation process enhances the capacity to implement AI education. (6) Marques et.al., conducted a comprehensive mapping research to have an overview of the state of the art on teaching Machine Learning principles in elementary through high school. We found 30 course modules, most of which covered the fundamentals of machine learning and neural networks. Because machine learning (ML) ideas can be complicated, some instructional units simply cover the easiest processes to understand, including data management, or they provide model learning and testing on an abstract level, thereby black-boxing some of the underlying ML processes. (7)

In the subsequent sections of this exploration, we will delve into the multifaceted impact of Teachable Machine on special education. We will explore its applications in creating interactive learning tools, facilitating customized accessibility, and fostering collaborative projects that transcend the boundaries of traditional

education. Through these lenses, we aim to uncover the nuances of how innovative tools like Teachable Machine are not just shaping the future of special education but are actively redefining the parameters of inclusive and accessible learning for all. (8)

Objectives
To study primary teachers' perspective on using Teachable machine in regular classroom for inducing inclusive learning.

METHODOLOGY
The present study entails the descriptive method of research. A set of questionnaires was prepared by the research which includes 10 questions to collect the view and reflection of teachers on usage of Teachable machine in regular classroom.

 Sample
In this study, the purposive sampling approach was used. 43 primary school teachers contributed the data that was collected. The region for data collection remains confined to schools of Chandigarh, Mohali, Panchkula and Delhi.

Tools
Description of the Questionnaire:
The initial draft of the questionnaire contains 18 questions. To obtain the content validity, the Questionnaire was reviewed by the Experts who were Associate professor in Department of Education and eliminated few questions which were found irrelevant to the study. The final draft contained 10 questions for the survey. Now, the reliability of the test is conducted through Test-Retest reliability. The obtained correlation coefficient of 0.61 suggests good reliability, indicating that participants' responses to the questionnaire were moderately consistent over the one month of interval.

Final draft of the Questionnaire:

Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Teachable Machine enhances student engagement in the learning process.					
I believe that Teachable Machine can cater to the diverse learning needs of students in my classroom.					
The use of Teachable Machine promotes a sense of inclusivity among students.					
Teachable Machine allows for differentiated instruction to address individual learning styles.					
I feel confident in integrating Teachable Machine into my regular classroom activities.					
Teachable Machine supports collaborative learning opportunities among students.					
I perceive Teachable Machine as a valuable tool for fostering a positive and inclusive learning environment.					
The use of Teachable Machine facilitates personalized learning experiences for students.					
Teachable Machine allows for effective assessment of students' understanding and progress.					
I believe that integrating Teachable Machine contributes to a more inclusive classroom for students with diverse abilities.					

RESULTS
         The objective of this study is to investigate primary teachers' perspectives on the integration of Teachable Machine in regular classrooms with the goal of inducing inclusive learning environments. The increasing role of technology in education, particularly the use of machine learning applications like Teachable Machine, has prompted a need for comprehensive insights into how educators perceive and utilize these tools to foster inclusive learning experiences. Understanding primary teachers' perspectives is essential for addressing the challenges and opportunities associated with the integration of technology in the classroom, especially in the context of inclusivity. By exploring teachers' viewpoints, this study aims to contribute valuable insights that can inform educational practices, policy development, and the ongoing evolution of technology-enhanced learning in primary education.
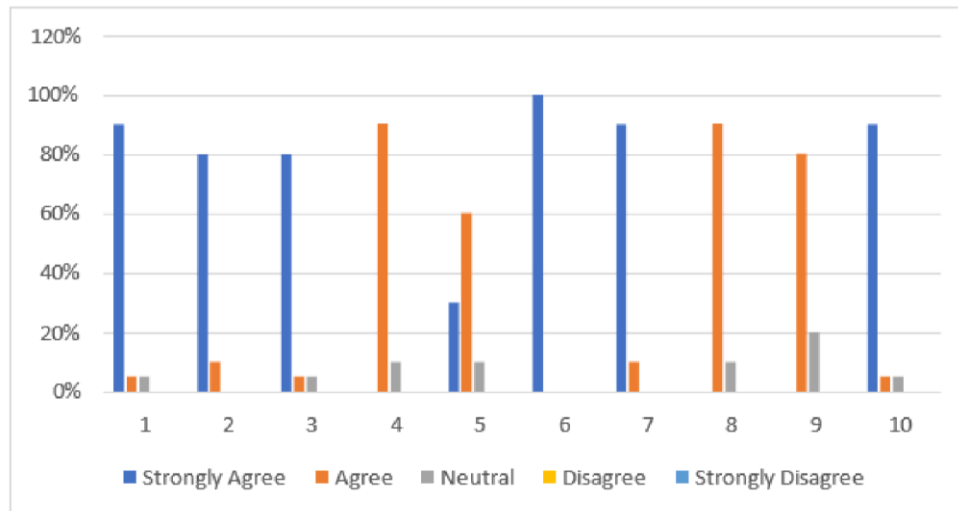
Figure 1: Primary teachers' perspective on using Teachable machine in regular classroom for inducing inclusive learning

The Following is the result based on the obtained data:

Item 1: The majority of surveyed primary teachers express a positive perspective regarding the impact of Teachable Machine on student engagement in the learning process. Notably, 90% of respondents strongly agree that Teachable Machine enhances student engagement, affirming its potential as a valuable tool for fostering active participation and interest among students in the classroom. A minimal percentage, 5%, agree with this statement, while an additional 5% remain neutral. The overwhelmingly positive response suggests a consensus among primary teachers regarding the positive influence of Teachable Machine in promoting student engagement within the educational setting.

Item 2: The survey findings reveal a substantial level of optimism among primary teachers regarding the adaptability of Teachable Machine to cater to diverse learning needs within their classrooms. A significant 80% of respondents express a belief that Teachable Machine can effectively address the diverse learning requirements of their students. Additionally, 10% of teachers agree with this perspective. This positive reception underscores the perceived potential of Teachable Machine as a versatile tool capable of accommodating various learning styles and needs, reflecting a positive outlook toward its inclusive applications in the classroom.

Item 3: The survey outcomes highlight a prevailing perception among primary teachers regarding the role of Teachable Machine in cultivating a sense of inclusivity among students. A notable 80% of respondents express the belief that the use of Teachable Machine contributes to fostering inclusivity in the classroom. In addition, 5% of teachers agree with this perspective, while another 5% remain neutral. This indicates a perceived congruence between the integration of Teachable Machine and the promotion of an inclusive educational experience for all students, suggesting a considerable consensus among educators regarding the technology's favourable effects in fostering an inclusive learning environment.

Item 4: The survey results indicate a strong consensus among primary teachers regarding the capability of Teachable Machine to facilitate differentiated instruction tailored to individual learning styles. A significant 90% of respondents express the belief that Teachable Machine allows for adapting instructional approaches to cater to the diverse learning preferences of students. Additionally, 10% of teachers concur with this viewpoint. This widespread agreement underscores the perceived potential of Teachable Machine as a tool that enables educators to customize their instructional methods, accommodating the unique needs and learning styles of each student in the classroom.

Item 5: The survey findings reveal varying levels of confidence among primary teachers regarding the integration of Teachable Machine into their regular classroom activities. A significant 60% of respondents express a high level of confidence in incorporating Teachable Machine, indicating a substantial degree of comfort with its integration. Conversely, 30% of teachers express moderate confidence, and a smaller percentage, 10%, exhibit less confidence in utilizing Teachable Machine in their regular teaching practices. These diverse responses suggest a range of comfort levels among educators, emphasizing the importance of further exploration and support mechanisms to enhance teachers' confidence in effectively integrating this technology into their daily instructional activities.

Item 6: The survey results demonstrate a unanimous and strong consensus among primary teachers regarding the perception that Teachable Machine supports collaborative learning opportunities among students. A remarkable 100% of respondents express agreement with the statement, indicating a collective belief that Teachable Machine plays a significant role in fostering collaborative learning environments within the classroom. This overwhelming agreement underscores the perceived potential of Teachable Machine as a tool that not only enhances individual learning experiences but also actively contributes to creating collaborative and interactive educational settings for students.

Item 7: The survey findings underscore a predominant positive perception among primary teachers regarding the value of Teachable Machine in fostering a positive and inclusive learning environment. A substantial 90% of respondents express agreement with the statement, affirming their belief in the efficacy of Teachable Machine as a valuable tool for cultivating a positive and inclusive educational atmosphere. Additionally, 10% of teachers concur with this viewpoint. This high level of agreement suggests that a majority of educators perceive Teachable Machine as instrumental in contributing positively to the overall learning environment, aligning with principles of inclusivity and positive pedagogical practices.

Item 8: The survey outcomes reveal a strong consensus among primary teachers regarding the role of Teachable Machine in facilitating personalized learning experiences for students.
A significant 90% of respondents express the belief that the use of Teachable Machine enables the creation of personalized learning opportunities tailored to individual student needs. Additionally, 10% of teachers concur with this viewpoint. This widespread agreement underscores the perceived effectiveness of Teachable Machine as a tool that supports a personalized approach to learning, emphasizing its potential to cater to diverse educational needs and enhance the overall learning experience for students.

Item 9: The survey results reveal a strong agreement among primary teachers regarding the effectiveness of Teachable Machine in assessing students' understanding and progress. A substantial 80% of respondents express agreement with the statement, indicating a prevailing belief that Teachable Machine serves as an effective tool for evaluating students' comprehension and monitoring their academic progress. Additionally, 20% of teachers remain neutral on this perspective. This widespread agreement highlights the perceived value of Teachable Machine as an assessment tool, reflecting the consensus among educators regarding its potential contribution to the evaluation of student learning outcomes. Item 10: The survey findings indicate a strong consensus among primary teachers regarding the belief that integrating Teachable Machine contributes significantly to fostering a more inclusive classroom environment for students with diverse abilities. A substantial 90% of respondents express strong agreement with the statement, emphasizing the perceived positive impact of Teachable Machine on inclusivity. Additionally, 5% of teachers agree with this perspective, while another 5% remain neutral. This overwhelming agreement underscores the perceived potential of Teachable Machine as a valuable tool in creating an inclusive educational setting that caters to the diverse needs of students with varying abilities.

Data Analysis and Interpretation
The survey results provide valuable insights into primary teachers' perspectives on the integration of Teachable Machine in regular classrooms for inducing inclusive learning. The findings reveal a predominantly positive outlook among educators, highlighting several key themes:
- **Enhanced Student Engagement:** The overwhelming agreement (90%) among teachers that Teachable Machine enhances student engagement suggests a perceived positive impact on student participation and interest in the learning process.
- **Catering to Diverse Learning Needs:** The majority (80%) of teachers believe that Teachable Machine can effectively address the diverse learning needs of students. This indicates a positive perception of the adaptability of this technology to cater to individualized learning styles.
- **Promoting Inclusivity:** The high percentage (80%) expressing that Teachable Machine promotes a sense of inclusivity aligns with the aim of creating diverse and welcoming learning environments for all students.
- **Differentiated Instruction:** The significant agreement (90%) that Teachable Machine allows for differentiated instruction emphasizes its potential to tailor teaching methods to individual student needs, fostering a personalized learning experience.
- **Teacher Confidence:** The varying confidence levels (30% highly confident, 60% moderately confident) in integrating Teachable Machine into regular classroom activities indicate the need for targeted support and professional development to enhance educators' comfort with the technology.

• **Support for Collaborative Learning:** The unanimous agreement (100%) that Teachable Machine supports collaborative learning opportunities highlights its potential to facilitate cooperative and interactive learning experiences among students.

• **Perceived Value and Positivity:** The high agreement (90%) that Teachable Machine is perceived as a valuable tool for fostering a positive and inclusive learning environment indicates a positive overall perception among teachers.

• **Facilitating Personalized Learning:** The strong agreement (90%) that Teachable Machine facilitates personalized learning experiences underscores its potential to provide tailored educational opportunities, catering to the individual needs of students.

• **Effective Assessment:** The significant agreement (80%) that Teachable Machine allows for effective assessment of students' understanding and progress suggests its perceived utility in evaluating student learning outcomes.

• **Contributing to Inclusivity:** The strong agreement (90%) that integrating Teachable Machine contributes to a more inclusive classroom for students with diverse abilities affirms its potential impact on creating inclusive educational spaces.

CONCLUSION

In conclusion, the study sheds light on primary teachers' positive perspectives regarding the integration of Teachable Machine for inducing inclusive learning in regular classrooms. The overwhelmingly favorable responses suggest that educators recognize the potential of this technology to enhance engagement, address diverse learning needs, and contribute to the creation of inclusive and collaborative learning environments. However, the varying confidence levels in integrating Teachable Machine highlight the importance of professional development opportunities to support teachers in effectively incorporating this technology into their teaching practices. As technology continues to play a significant role in education, understanding teachers' perspectives becomes crucial for informed decision-making, curriculum development, and the successful implementation of inclusive learning strategies in primary classrooms. Future research could delve deeper into specific challenges and opportunities associated with the integration of Teachable Machine, further informing educational policies and practices.

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