Review

Artificial Intelligence and New Technologies in Inclusive Education for Minority Students: A Systematic Review

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Abstract: Artificial intelligence (AI) and new technologies are having a pervasive impact on modern societies and communities. Given the potential of these new technologies to transform the way things are done, it is important to understand how they can be used to support inclusive education, particularly regarding minority students. This systematic review analyzes the advantages and challenges of using AI and new technologies in different sociocultural contexts, and their impact on minority students. In terms of advantages, this review found that AI and new technologies (a) improved student performance, (b) encouraged student interest in STEM/STEAM, (c) promoted student engagement, and (d) showed other advantages. This review also identifies the main challenges associated with the use of AI and new technologies for inclusive education: (a) technological challenges, (b) pedagogical challenges, (c) dataset limitations, (d) low satisfaction using technology, and (e) cultural differences. This review proposes some solutions to these challenges at the pedagogical, technological, and sociocultural levels, and also explores important aspects of inclusive education that address the students' sociocultural diversity. The findings and implications will aid teachers, practitioners, and policymakers in making decisions on the effective use of AI and new technologies to support sociocultural inclusiveness in education.

Keywords: artificial intelligence; new technologies; inclusive education; diversity; minority student; systematic review

1. Introduction

Inclusive education is a key component of the development of a more equitable society. It is also an important component of education systems that aim to improve educational equity and quality for all students. UNICEF [1] defined inclusive education as “a dynamic process that is constantly evolving according to the local culture and context, [ . . . ] to celebrate diversity, promote participation and overcome barriers to learning and participation for all people” (p. 19). Inclusive education applies to students from different groups such as learners with special needs and disabilities [2], girls and women [3], students at-risk [4], and ethnic minority students [5]. However, Tomlinson [6] noted that in inclusive education, the focus has been on learners with disabilities, and other groups have drawn less attention. Engelbrecht [7] highlighted that there is a common perception that “inclusive education” is simply another name for “special education.” As a result, there is a need to understand the situations of other underrepresented groups such as students from minority communities.

1.1. Sociocultural Diversity in Schools

Human society is complex and diverse. A key aspect of this complexity is sociocultural diversity, which refers to the coexistence of two or more groups with different...
cultures (e.g., different languages and customs) within the same territory. Sociocultural diversity provides opportunities for intercultural dialogue but also creates multiple challenges, given the multiplicity of needs [8]. In this sense, diversity is multidimensional, especially as it relates to cultural practices; it reflects the boundaries defined by social groups and communities [9]. Schools also reflect social and cultural contexts. Nowadays, the growth of communication and transportation networks has multiplied human interactions and exchanges, and societies including schools have become culturally diverse milieux [10]. However, there is still the need to incorporate the diversity and inclusive approach into teaching training programs, in order to better prepare pre- and in-service teachers in technology integration among students from underrepresented minority ethnic groups [11–13].

Additionally, the pedagogical strategies and learning content of teaching and learning activities should be re-evaluated to ensure that culturally diverse learners develop capacities that are rooted in their cultural backgrounds [14]. Effective teaching in a diverse school environment is a function of intercultural awareness (cognitive), intercultural sensitivity (affective), and intercultural competence (behavior), which together support a culturally responsive pedagogy [15,16]. Moreover, educational proposals for inclusive education should consider the communities’ contextual realities and emphasize the learners’ identities and cultural backgrounds [7].

1.2. AI and New Technologies and Inclusive Education

Currently, AI and new technologies are having a profound impact on society and are becoming increasingly prevalent in education. AI and new technologies are defined as emerging technologies that are gaining prominence and changing the way things are done [17]. They are novel and fast-growing including not only devices (e.g., smartphones and wearables), but also analytical procedures such as machine learning and AI. These emerging technologies can potentially transform education by changing the learners’ experiences both within and beyond classrooms, producing an impact on the learners’ physical, social-emotional, and intellectual learning outcomes [18,19]. The adoption of these technologies by education systems provides an opportunity to innovate and improve both the learning process and pedagogical strategies [20].

The literature on new technologies and inclusive education has highlighted that these emerging technologies have the potential to support the students’ multisensory engagement, provide low-risk environments, scaffold the students’ learning goals [21], create authentic environments that include disabled students [22], support collaborative learning, and reinforce positive social behavior [23]. However, these technologies also have some limitations such as high costs [22], negative physical outcomes (e.g., headaches and fatigue caused by using virtual reality headsets [23], resistance from some teachers [24], and the need for pre-training of teachers and students [25].

Moreover, although Collins and Halverson [24] highlighted that the new technologies provide more equitable opportunities in education, Bransford et al. [26] noted that the positive effects of the technology do not occur automatically but are dependent on how the technology is used in the learning process. In other words, the effective use of technology depends on several factors such as student and teacher readiness [27], meaningful digital resources [28], the culturally appropriate design of the technology [29], and consideration of the learners’ backgrounds and cultural contexts [30,31].

Additionally, it should be mentioned that there is an important difference between diversity and inclusiveness; diversity refers to the variation inside a group, while inclusiveness carries much more richness when it encourages participation and provides equal opportunities for all [32]. For example, an educational institution might have achieved a certain degree of cultural diversity due to the arrival of students coming from different countries and cultures. However, inside the same educational institution, students from underrepresented populations might not be able to participate as full members [33].
Despite the importance of sociocultural differences in inclusive education, Tomlinson [6] noted that while there have been several studies of students with special needs or disabilities in the inclusive education literature, there have been limited studies of other excluded groups (e.g., minority students). Therefore, the aim of this systematic review was to understand how AI and new technologies are being used to provide quality inclusive education to students with diverse sociocultural backgrounds. The following research questions (RQs) guide this review.

1. RQ1: What types of AI and new technologies have been used in inclusive education for minority students?
2. RQ2: What is the minority students’ sociocultural background in the selected studies?
3. RQ3: What are the advantages and challenges of using AI and new technologies in inclusive education for minority students?
4. RQ4: What solutions have been proposed to overcome the challenges of using AI and new technologies in inclusive education for minority students?

2. Methodology

A systematic review of the literature was conducted to obtain information about AI and new technologies for inclusive education in the past five years (2017–2021). The well-known Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [34] guidelines were used to identify and synthesize the results from previous studies, and collate evidence to answer the RQs.

Three leading scholarly databases that include both journals and conference papers were searched: Web of Science, Science Direct, and IEEE Xplore. The search terms were divided into three categories: (a) inclusive education; (b) AI and new technologies; and (c) student participants. The initial automatic search within these databases employed a Boolean search string including keywords to select papers. This process resulted in the following search strings: ("inclusive education" OR marginalized OR minorities OR ethnic) AND ("artificial intelligence" OR "machine learning" OR "natural language processing" OR "learning analytics" OR robotics OR "virtual reality" OR "augmented reality" OR "game-based learning" OR "mobile learning") AND student. Additionally, the following criteria were used to decide which articles to include in the final revision: (a) articles published from 2017 to 2021; (b) articles published in the English language; (c) articles presenting empirical, primary research; (d) articles published in journals or conferences; (e) articles involving student participants, and (f) articles exclusively related to AI and new technologies used by students from minority groups (Table 1).

Table 1. The inclusion and exclusion criteria.

| Inclusion Criteria                                          | Exclusion Criteria                                      |
|-------------------------------------------------------------|---------------------------------------------------------|
| • Published between 2017 and 2021                           | • Published prior to 2017                               |
| • English language                                          | • Not in English                                        |
| • Empirical, primary research                               | • Not empirical, primary research                       |
| • Document type: journal or conference paper                | • Other documents types (e.g., books)                   |
| • Studies focused on student participants                  | • Studies focused on other stakeholders (e.g., teachers) |
| • AI and new technologies used by minority groups           | • AI and new technologies used by non-minority groups   |

After conducting automatic retrieval from the databases, the search returned 642 articles; then the titles were screened, yielding 188 potential articles. Next, 12 duplicates were removed, after which 176 articles remained for abstract screening. The abstract screening was guided by the inclusion and exclusion criteria, and 61 articles were left behind. Then, the full-text of these articles were read assessing their eligibility, and 34 articles were considered irrelevant for this review (e.g., conceptual papers or opinion pieces). This afforded a final selection of 27 articles. Figure 1 shows the corresponding flowchart.
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The data extraction was straightforward regarding the title, authors, publication year, the type of new technology used in the study, the students’ sociocultural background, and the students’ educational level. This information was extracted to organize the data, which is presented in the first columns of Table 2. Then, the selected papers were analyzed through inductive and deductive processes including reading and re-reading through the data to identify the advantages, challenges, and solutions proposed to overcome the challenges [35]. Two researchers were involved in the procedures, and reviewed each article independently, achieving an inter-rater reliability of 85% (Cohen’s kappa coefficient). Disagreements were resolved by discussion until agreement was reached. The emerged themes are displayed using frequency tables. Table 2 presents a summary of the analysis carried out with the selected studies.

Figure 1. PRISMA flow diagram of the systematic review.
**Table 2. Summary of the studies included in this review.**

| Author(s) and Year | Country          | New Technologies | Minority Group | Education Level | Advantages                                                                                                    | Challenges                                                                                                                  | Solutions                                                                                                              |
|-------------------|------------------|------------------|----------------|----------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Bell et al., (2020) [36] | United States    | Serious games    | African-American | Primary        | Increase minority students’ comfort with technologies and their positive STEM attitudes.                  | Some students might not have access to a computer at home, making it difficult for them to gain direct experience.       | Provide positive enactive experiences with technology.                                                                  |
| Barreto et al., (2021) [37] | United States    | AI/ML            | Diverse minorities (Asian, African-American, Hawaiian, Hispanic) | University   | Help to explore why underrepresented students are less likely to study AI/ML.                             | Students seem to be interested in topics other than AI/ML, there is also lack of independent research and reading.     | Provide an AI/ML introductory course emphasizing AI’s principles and social and political impacts to encourage the participation of underrepresented students. |
| Bayer et al., (2021) [38] | United Kingdom   | L.A.—prediction  | Diverse minorities (Black, Asian, others) | University   | Identify students at risk that belong to minority groups, in order to provide them early and adequate support. | More research is needed in terms of different adaptations and definitions of fairness to not perpetuate educational gaps. | Learning analytics models can be part of the evaluation process by adding new features.                                  |
| Bell et al., (2019) [39] | United States    | Mobile technology| Diverse minorities (Native American, African-American, Hispanic, others) | Primary        | An interactive mobile mult平台 to increase self-efficacy in minority youth.                              | Developing sophisticated games with technology is extremely costly.                                                      | Offer support to develop and sustain interactive games.                                                                 |
| Cano & Leonard (2019) [40] | United States    | AI/ML            | Diverse minorities (Asian, African-American, Hawaiian, Hispanic) | University   | Technology provides personalized feedback that facilitates early intervention and student support.          | Language, social differences, and cultural barriers.                                                                       | Integrate student information repositories using multiview learning to provide feedback for early warnings.             |
| Chao et al., (2020) [41] | Taiwan           | Mobile learning  | Indigenous people (Atayal) | Primary        | Technology has a significant positive impact and can be used for improving indigenous students’ learning of geometry. | Due to their particular culture and life experiences, indigenous students show different spatial ability.                  | Assess students’ learning performance including indigenous cultural elements.                                              |
| Cybart-Persenaire and Liberal (2019) [42] | United States    | Mobile technology| Diverse minorities (Hispanic, African-American, Indian) | Secondary     | Academic, social and civic benefits that offer a range of opportunities.                                   | Challenges related to using mobile devices.                                                                                 | Allow marginalized students to embrace professional identities by participating in a meaningful community of practice.  |
| DeRocchio et al., (2018) [43] | United States    | LA               | Hispanic        | University   | Help to develop tailored intervention techniques, and to enhance retention in engineering education among underrepresented groups. | Learning analytics depend of the used dataset.                                                                                | Students can take a proactive approach to their learning, useful also for academic advisors to promote student’s success. |
| Fowler and Khosmood (2018) [44] | United States    | Game-based       | Diverse minorities (African-American, Asian, and mixed) | Primary        | Game-based activities are effective for engaging students, and impact on students’ self-efficacy.            | Tight time constraints for creative activities, and also coding problems for some students.                              | Create opportunities for minority students using game-based activities on specific themes according to students’ needs.   |
| Gao et al., (2019) [45] | China            | AI speech/ML     | Indigenous people (Tibetan) | University   | Under a shortage of qualified Mandarin teachers in minority areas, AI speech detects mispronunciation and adjust the speaking rate, which helps Tibetan students to improve their pronunciation. | AI speech employs speaker-dependent models which can affect the training of the models.                                | Slower speech rate helps to correct the pronunciation, especially in sentences, in comparison with syllables, and words. |
| Hartvevld et al., (2020) [46] | United States    | Serious games    | Diverse minorities (Asian, African-American, American Indian, Hispanic, Arab) | University   | Combining traditional engineering curricula elements with virtual ones to make them more engaging.            | Does not have much of an impact, both in terms of missed reality and inclusiveness.                                    | It is important to consider the influence of instructors.                                                               |
| Jun et al., (2018) [47] | United States    | Serious games    | Diverse minorities (African-American, Hispanic, Asian, and Native American) | Secondary     | Innovative game-based learning can be effective to educate on information security and cybersecurity.        | As the game progresses, students are required to select more complex types of defense.                                  | Provide an excellent platform to expose high school students to cybersecurity as a career pathway.                         |
| Jung et al., (2021) [48] | Hong Kong        | VR               | Diverse minorities (Indian, Pakistani, Nepalese, Filipino) | Secondary     | Offer an economical and user-friendly way to situate learners in a 360-degree human-recorded real-world environment. | Requires some pre-training, as learners need to know how to operate the devices.                                        | Provide pre-training for using the equipment.                                                                           |
| Ledje-Osias et al., (2018) [49] | United States    | Mobile technology| African-American | Secondary     | Positively impact students’ attitudes toward STEM, their confidence in problem solving and teamwork, and their interest in STEM subjects. | Although there was an increase in students’ interest, some students prefer subjects outside of STEM.                     | The program should be flexible enough to accommodate students of different ability levels.                               |
| Author(s) and Year | Country     | New Technologies | Minority Group | Education Level | Advantages                                                                 | Challenges                                                                 | Solutions                                                                 |
|--------------------|-------------|------------------|----------------|----------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Lamkin et al., (2021) [50] | United States | AI/ML            | African-American | Secondary      | Impact students by giving them a clear understanding of the engineering field. | It was used coding programs—used only in schools—that are not employed by the software industry. | Employ software used by the industry (e.g., Python). Focus on the requirements of instructors who could motivate and inspire students. |
| Manikutty et al., (2019) [51] | India       | Robotics         | Indigenous people from Kerala | Secondary      | Low-cost educational robotics kit helps to promote technical skills and motivates students to learn STEAM subjects. | Lack of sufficient supporting facilities for learning robotics on a large scale. | Open-ended explorations are recommended with robotics kits and a flexible curriculum to create powerful culturally-sensitive robotics models. |
| Nayak et al., (2020) [52] | United States | AI/NLP           | Diverse minorities (Asian, African-American, American Indian, Hispanic) | University | AI text analytics help to identify cultural capital themes in student essays. | Limited amount of labeled data for performing the algorithms. | Offer a computational framework for cultural capital theme identification to retain historically underrepresented students in the STEM field. |
| Nguyen et al., (2020) [53] | United Kingdom | LA               | Diverse minorities (Asian, African, Caribbean origins) | University | Investigate students’ attainment gaps by analyzing the learning engagement of different ethnic groups. | Other dimensions of engagement such as emotional and agentic engagement, cannot be captured. | Employ learning analytics that could remove the biases of self-reports and provide a more accurate representation of engagement in a distance learning setting. |
| Ocampo Yabuacani et al., (2019) [54] | Peru | Mobile technology | Indigenous people (Huitoto-Amazon) | Kindergarten | Provide interactive content in indigenous languages to facilitates self-learning. | Requires mobile devices, but they are becoming more common in indigenous communities. | Use mobile technology to protect the language and cultural heritage of indigenous communities. |
| Ocampo Yabuacani et al., (2021) [55] | Peru | Mobile technology | Indigenous people (Aymara-Andes) | Primary | Mobile tools offer a user-friendly design characterized by interactions with sounds and images, which helps indigenous language learners meet the curriculum’s standards. | The software only works on Android devices. | Use a mobile tool for bilingual education to support learning while respecting linguistic and cultural diversity. |
| Pinto et al., (2017) [56] | Colombia    | AR               | Indigenous people (Nasa culture-Cauca) | Primary | Support students’ motivation and learning gains, through the appropriation of community’s traditions and values. | More research is needed to obtain a detailed information about indigenous students and their interaction with technology. | Employ technologies and incorporate indigenous students’ daily life to improve their learning processes. |
| Robles-Bykbaev et al., (2018) [57] | Ecuador     | Serious games    | Indigenous people (Cafarri) | Primary | Contribute to the appreciation, recognition, and knowledge of the Cafarri indigenous culture. Students learn in a fun way through activities. | The module does not allow group activities. | Develop games that address indigenous culture, identity, and values. Develop a module that perform group activities. |
| Simley et al., (2020) [58] | United States | Robotics         | African-American | Secondary      | Increase students’ academic performance of math and science, and their confidence in deciding a future STEM career path. | It was unclear if the increase of performance was directly from the learning activities, the lecture, or both. | Develop students’ sense of belonging in the computing field. |
| Sun et al., (2019) [59] | United States | VR               | African-American | University | Assist to reinforce student learning outcomes in higher education. | Some of the participants expressed low satisfaction using VR due to insufficient prior experience with VR, they found it “not easy.” | Include rewards and accommodate more choices for assessment questions. Gaming learning assessments in order to increase students’ sense of involvement. |
| Williams-Dobosz et al., (2021) [60] | United States | LA               | Diverse minorities (Black, Hispanic, and Native American) | University | Help to explore student engagement using measures such as help-seeking, which is related to improvement of learning outcomes. | Datasets could be limited, regarding complex and extensive social networks. | Regarding learners’ interactions and engagement, educators should emphasize asking for help to prevent students struggling to learn. |
| Yi (2018) [61] | United States | Robotics         | Hispanic        | University | Promote interdisciplinary collaboration associated with science and engineering for minority students in architectural design. | When developing design competency, minority students faced technical challenges and limited tool fluency. | Estimate the effectiveness of materials beforehand and prepare multiple levels of support. |
| Yu et al., (2021) [62] | United States | AI/ML            | Hispanic        | University | Predict minority student’s dropout, alerting stakeholders of students who are at risk of dropping out of a degree program. | Models might not capture some contextual factors of dropout that are overlooked by institutional practices, which could affect the accuracy of the prediction. | Include attributes that correspond to student minority background. |

Note. AI = artificial intelligence, AR = augmented reality, ML = machine learning, NLP = natural language processing, VR = virtual reality.
3. Results

This review includes 27 studies based in nine countries, with the following distribution: China, Colombia, Ecuador, Hong Kong, India, and Taiwan contributed one study each; Peru and the United Kingdom provided two studies each; and 11 studies were conducted in the United States. Table 3 shows the selected studies distributed not only by country, but also by educational level: one study at the kindergarten level, seven at the primary level, seven at the secondary level, and 14 at the university level (e.g., undergraduate, master, and doctoral).

Table 3. Selected papers based on country and educational level.

| Country       | Educational Level | Total |
|---------------|-------------------|-------|
|               | Kindergarten      | Primary | Secondary | University |
| China         | 1                 | 1      |           |            |
| Colombia      | 1                 | 1      |           |            |
| Ecuador       | 1                 | 1      |           |            |
| Hong Kong     | 1                 | 1      |           |            |
| India         | 1                 | 1      |           |            |
| Peru          | 1                 | 1      | 2         |            |
| Taiwan        | 1                 | 1      |           |            |
| United Kingdom|                   | 2      | 2         |            |
| United States | 3                 | 5      | 9         | 17         |
| Total         | 1                 | 7      | 7         | 12         | 27         |

3.1. AI and New Technologies Used in Inclusive Education

RQ1: What types of AI and new technologies have been used in inclusive education for minority students?

Six categories of AI and new technologies have been used in inclusive education for minority students: six studies focused on AI/ML, six employed mobile technology, four were about serious games, four focused on learning analytics, three employed virtual reality/augmented reality (VR/AR), and three used robotics. Table 4 presents a summary of the technologies employed in educational settings for supporting inclusive education in the selected studies.

Table 4. AI and new technologies used in inclusive education for minority students.

| AI and New Technologies                               | Reference Number            | Number of Studies |
|-------------------------------------------------------|------------------------------|-------------------|
| Artificial intelligence/machine learning (AI/ML)      | [37,40,45,50,52,62]         | 6                 |
| Mobile technology                                     | [39,41,42,49,54,55]         | 6                 |
| Serious games                                         | [36,44,46,47,57]            | 5                 |
| Learning analytics (LA)                               | [38,43,53,60]               | 4                 |
| Virtual reality/augmented reality (VR/AR)             | [48,56,59]                  | 3                 |
| Robotics                                              | [51,58,61]                  | 3                 |

The findings indicate that the prominent categories regarding the use of AI and new technologies in inclusive education for minority students are AI/ML and mobile technology. In particular, AI/ML is an emergent technology that is increasing its presence in the education sector. Generally, it is considered that AI and ML algorithms could help to personalize learning according to the students’ needs [63]. Among the selected studies, one study focused on exploring why underrepresented students were less likely to study AI/ML subjects [37]. Another study investigated how ML was employed to predict at-risk students from underrepresented populations [40]. One more study examined teaching AI/ML to African-American youth as part of a STEM course [50], while another looked into the use of natural language processing (AI/NLP) for analyzing the reflective essays of minority students [52]. Similarly, Knox et al. [64] stated that AI contributes to inclusive education not only by enhancing personalized learning but also by supporting collective educational...
work through inclusive pedagogies. Additionally, the review showed that another new technology employed by minority students was mobile technology. The main characteristic of mobile devices is their ubiquity and can be used anywhere and at any time. Thus, mobile devices were employed for empowering marginalized students [42], nurturing interest in computing and engineering [49], and learning indigenous languages [54,55]. Lazou and Psychogiou [65] also confirmed this conclusion, indicating that mobile devices are flexible, portable, and relatively affordable and can contribute significantly to high-quality inclusive education.

Additionally, the reviewed studies have identified other new technologies such as serious games, learning analytics, virtual reality/augmented reality, and robotics. Serious games are digital games that have the purpose of cultivating the students’ knowledge and skills by integrating educational elements [66]. The use of serious games was reported in some of the articles. For instance, games were used to increase the minority students’ positive attitudes and engagement toward STEM and engineering [36,46] as well as to foster their creativity in game design and reinforce learning outcomes [57,59]. Another new technology identified by the review was learning analytics; this technology can be employed to analyze data from the learner’s activities, and provide meaningful insights and visualizations [67]. For instance, the review found studies that employed learning analytics to develop tailored interventions to enhance retention [43], to reveal inequality in academic attainment [53], and to explore student engagement [60]. With regard to virtual reality/augmented reality (VR/AR), it was found that VR was employed by students to enhance their intercultural sensitivity [48], and as an assessment tool in higher education [59], while AR was used to support student motivation [56]. Robotics was also employed for inclusive education by some articles. For instance, low-cost robotics kits helped to motivate minority students in STEAM subjects [51,58] as well as to promote interdisciplinary collaboration for minority students in architectural design [61].

3.2. Students’ Sociocultural Context

**RQ2: What is the minority students’ sociocultural background in the selected studies?**

In the present study, the minority students’ sociocultural context was relevant in order to understand the cultural environment where new technologies have been introduced. Moreover, the culture influences “not only what people learn, but how people learn” [68] (p. 23). Thus, 12 studies were carried out with students from diverse minorities, five with African-American students, three with Hispanic students, and seven with Indigenous students (Table 5).

| Sociocultural Context                  | Reference Number                      | Number of Studies |
|----------------------------------------|---------------------------------------|-------------------|
| Diverse minorities                     | [37–40,42,44,46,47,52,53,60]           | 12                |
| Asian, African-American, Hispanic,     |                                       |                   |
| Hawaiian, and others                   |                                       |                   |
| Indian, Pakistani, Nepalese, Filipino  | [48]                                  |                   |
| African-American                       | [36,49,50,58,59]                      | 5                 |
| Hispanic                               | [43,61,62]                            | 3                 |
| Indigenous minorities                  |                                       |                   |
| Atayal indigenous people               | [41]                                  |                   |
| Tibetan—Himalayas indigenous people    | [49]                                  |                   |
| Indigenous people from Kerala          | [51]                                  |                   |
| Huitotos—Amazonian indigenous people   | [54]                                  |                   |
| Aymaras—Andean indigenous people       | [55]                                  |                   |
| Nasas—Indigenous people from Cauca     | [56]                                  |                   |
| Cañaris indigenous people              | [57]                                  |                   |

Most of the studies were carried out in learning environments with the participation of students from diverse sociocultural backgrounds. For instance, studies conducted in the United States included diverse participants from minority groups [37,39,46] such as
Asian, African-American, Hispanic, Hawaiian, and Native American. Another study was based on Hong Kong’s diverse students of Indian, Filipino, Nepalese, and Pakistani backgrounds [48]. Moreover, some studies have focused solely on African-American students or Hispanic students. Interestingly, the main goal of these studies was to encourage minority students to pursue STEM/STEAM, computing, and engineering courses [36,49]. Similarly, Figueroa [69] mentioned that minority students, in general, are significantly underrepresented in STEM careers, where technology plays an important role. Additionally, other reviewed studies have examined the impact of new technologies on Indigenous minorities such as the Atayal from Taiwan, the Tibetans from China, the Nasas from Colombia, the Cañaris from Ecuador, the Hitotos from the Peruvian Amazon, the Aymaras from the Andes, and Indigenous people from Kerala (India). In these studies, mobile technologies were used to foster indigenous language education [54,55], to maintain the cultural heritage [57], and to develop technical skills through robotics [51]. Lakhan and Laxman [70] also concluded that technology plays the role of enhancing the academic performance of Indigenous minority students. Advancing diversity in education and STEM fields requires employing new technologies to nurture the interest of underrepresented minority students [16]. Moreover, an inclusive education should not only ensure the use of new technologies by minority students but also their participation in the design, development, and adaptation of the technology to their own needs [28,71].

3.3. Advantages and Challenges of AI and New Technologies for Inclusive Education

RQ3a: What are the advantages and challenges of using AI and new technologies in inclusive education for minority students?

Four categories regarding the advantages of using AI and new technologies for inclusive education were identified. Specifically, nine studies highlighted student performance, seven studies mentioned the interest in STEM/STEAM, five studies pointed out student engagement, and six studies indicated other advantages (Table 6).

Table 6. Advantages of using AI and new technologies in inclusive education for minority students.

| Advantages                               | Reference Number | Number of Studies |
|------------------------------------------|------------------|------------------|
| Improve student performance              | [39–42,45,47,54,55,59] | 9                |
| Encourage student interest in STEM/STEAM | [36,37,49–51,58,61] | 7                |
| Promote student engagement              | [44,46,53,56,60]  | 5                |
| Other advantages                         | [38,43,48,52,57,62] | 6                |

The review found that the main advantage of using AI and new technologies in inclusive education for minority students was to improve student performance, for instance, [40] employed machine learning and AI algorithms to provide personalized feedback, and [59] found an increase in the students’ self-efficacy. Similarly, Kazimzade et al. [72] stated that inclusive education could benefit from the use of technology to increase the students’ performance and competence. Our review also found that using AI and new technologies raised the students’ interest in STEM/STEAM. For example, [49] used a mobile application and 3D modeling with minority students to encourage their interest in computing and engineering subjects. Another case was reported by [58], who explored the potential of robotics as a mediating tool to increase the minority students’ interest and positive attitude toward STEM/STEAM. These findings coincide with the results of Sisman et al. [73], who identified the positive effects of new technologies such as robotics on the students’ attitudes toward STEAM. Another finding indicates that new technologies play an important role in engaging minority students and broadening their participation in learning activities. For instance, the use of technology such as serious games can make topics related to engineering more engaging [46], and augmented reality also motivates students to achieve the planned learning outcomes [56,60]. Similarly, Bond and Bedenlier [74] indicated that new technologies were an influential factor for student engagement. Other advantages found in the reviewed articles were about personalization, the identification of at-risk students, and
contributing to the appreciation of Indigenous cultures. For example, learning analytics can help to identify at-risk students [38], provide tailored interventions to support minority students [43], and contribute to promote cultural awareness [56], which fulfills the learning needs of minority students. Thus, culturally contextualized digital technologies help students to understand and learn in a meaningful way [75].

**RQ3b: What are the challenges of using AI and new technologies for inclusive education of minority students?**

Five categories regarding the challenges of using AI and new technologies for inclusive education were found. Eleven studies indicated technical challenges, seven studies highlighted pedagogical challenges, four studies mentioned data limitations, three studies indicated as a challenge the low satisfaction using technology, and two studies mentioned cultural differences (Table 7).

| Challenges                        | Reference Number | Number of Studies |
|-----------------------------------|------------------|-------------------|
| Technological challenges          | [36,38,39,42,45,46,51,53–55,62] | 11                |
| Pedagogical challenges            | [44,47,48,50,57,58,61]          | 7                 |
| Dataset limitations               | [43,52,56,60]          | 4                 |
| Low satisfaction using technology  | [37,49,59]            | 3                 |
| Cultural differences              | [40,41]              | 2                 |

Our review found that the most prominent challenges of using AI and new technologies for inclusive education of minority students were the technological issues such as lack of access to technology [36,54], advanced technology can be costly [39], the lack of technological facilities on a large scale [51], and AI algorithms might not capture contextual factors related to minority students [62]. Additionally, Walters [76] arrived at the same conclusion, that educational institutions serving disadvantaged students needed more technological resources to help them close the digital gap and increase their access to new technologies. Some of the reviewed studies also highlighted that sophisticated technologies can be costly [39,51]. This finding is consistent with Chambers [77], who noted that high-tech devices used for inclusive education were frequently expensive. However, affordable low-tech devices (e.g., the open-source electronic Arduino platform) that provided similar or higher academic outcomes could be a substitute for costly technology. Thus, low-tech and low-cost devices are an alternative technology for inclusive education [78]. Additionally, pedagogical challenges were present in the selected studies that limited the learning process of minority students, for instance, tight time constraints for creative activities [44], group activities could not be carried out using some new technologies [57], and the need of pre-training for the learners [48]. Similarly, Ferri et al. [79] highlighted that when using technologies, the pedagogical challenges are related to the lack of digital skills, which require training. Moreover, teachers are still unaware of the possibilities of new technologies [80], especially regarding their transformative impact for empowering and providing social representation to minority students.

Other reviewed studies have also mentioned that dataset limitations can be a constraint. For example, the lack of datasets to more precisely evaluate the students’ performance [43], the limited amount of labeled data for performing the algorithms [52], and the need for detailed data about the minority students’ interaction with technology [56]. Another disadvantage was the minority students’ low satisfaction of using technology. In the case of VR, some students found it “not easy” [59], some students seemed to be interested in topics other than AI/ML (37), or preferred subjects outside of STEM [49]. Similarly, Autio [81] reported that when tasks are too difficult, some students might show little interest and low satisfaction using technology. Therefore, the learning activities should be designed to match the students’ needs and preferences. This review also found that cultural differences can be a significant challenge, as it requires an understanding of the complexities of sociocultural interactions. These barriers are highly complex and could be
overcome through (a) changing the communication methods, (b) using the knowledge and skills of minority groups, (c) developing culturally sensitive and linguistically appropriate learning materials, and (d) listening carefully to minority stakeholders [82]. Similarly, Kazimzade et al. [72] stated that to make educational technologies inclusive, it is necessary to discuss cultural bias and cultural inclusion; otherwise, these issues will continue to be a hidden barrier for inclusive societies.

3.4. Proposed Solutions

RQ4: What solutions have been proposed for overcoming the challenges of using AI and new technologies in inclusive education for minority students?

The studies under review provided several solutions to the challenges that minority students face regarding the use of AI and new technologies. The solutions can be organized by three levels or themes: at the pedagogical, technological, and sociocultural levels, and also by sub-themes (Table 8).

Table 8. Solutions recommended for using AI and new technologies in inclusive education for minority students.

| Suggested Solutions | Sub-Themes | Reference Number | Examples |
|---------------------|------------|------------------|----------|
| Students            | [36,43,48,49] | • Consider students’ needs and abilities  
                     • Provide meaningful learning experiences |
| Teachers            | [41,44,46,50,60] | • Create opportunities for minority students  
                     • Teachers who could motivate and inspire |
| Curricula           | [37,51] | • AI principles as an introduction course  
                     • Flexible curriculum to create culturally-sensitive robotics models |
| Assessment          | [38,41,59] | • Learning analytics can be part of the evaluation process  
                     • Gamify assessments to increase students’ sense of involvement |
| Contextualize the technology | [42,45,56–58,62] | • Develop students’ sense of belonging  
                     • Include attributes that correspond to student minority background |
| Provide adequate resources | [39,40,47,50,53,61] | • Provide high-quality software  
                     • Estimate the effectiveness of materials beforehand |
| Cultural values     | [41,52,54,55] | • Include content relevant to minority people  
                     • Use technology to protect the language and cultural heritage of minority people |

The reviewed papers proposed pedagogical, technological, and sociocultural solutions to overcoming the challenges of using AI and new technologies to promote inclusive education. At the pedagogical level, solutions are classified into four sub-themes: (a) students, to offer them learning experiences [36] considering their abilities and preferences [48,49]; (b) teachers, to have teachers that motivate and inspire [46,50], which create opportunities for learning [44,60]; (c) curricula, to provide flexible curriculum that is culturally sensitive [37,51], and (d) assessment, to introduce gamified evaluations [41,59] and learning analytics [38]. The pedagogical solutions are related to the students’ preferences, abilities, and experiences, which are crucial components of inclusive education, especially when students come from different sociocultural contexts. Kazimzade et al. [72] suggested that the learners’ cultural background should be taken into account when implementing inclusive educational technologies. Our review also found that the teachers’ capabilities and the curricula should be designed to foster inclusive education. Our findings are consistent with Loreman [83], who indicated that the pedagogy for inclusive education requires teachers who are motivated and committed to support all learners and to provide an appropriately designed curriculum that meets the needs of diverse students.
Solutions at the technological level were also provided by the selected studies. These solutions can be classified into two sub-themes: (a) **contextualize the technology**, which means that AI and new technologies should be contextualized to include minority students’ attributes and background promoting diversity [45,56,57], and (b) **provide adequate resources** such as software that can be used on low-configuration computers, and data that include different sociocultural contexts [40,47,50]. These findings indicate that in order to effectively use AI and new technologies to promote diversity and inclusion, the contextualization and adaptation of the technologies is required. Such contextualization consists of not only of meaningful digital resources, but also technological support. Simaeva et al. [84] arrived at the same conclusion, indicating that the implementation of technologies at every stage of inclusive education required the integration of culturally relevant digital resources. Moreover, the availability of technical resources has a positive impact in enhancing the learning activities and is a significant factor in the general satisfaction of students [85].

Sociocultural solutions were also highlighted by some of the reviewed studies, and are represented by a unique sub-theme: **cultural values**, indicating that the challenges faced by minority students could be solved through the inclusion of content related to minority people [41,52], providing bilingual alternatives to support the inclusiveness of minority students [55]; and enriching the classroom with cultural meaningful and authentic learning [54]. This finding coincides with Gaston et al. [86], who emphasized the importance of ensuring that learning processes integrated cultural content for minority students including the values and traditions of their own communities.

4. Discussion

This review explored how AI and new technologies are being used in the field of inclusive education, specifically for learners from minority groups. The findings provide teachers, practitioners, and governmental decision-makers with an overview of the present situation.

First, the review identified a relative number of studies on minority students in inclusive education, despite the considerable significance of inclusiveness and diversity in education. This could indicate the need to expand the representation of minority groups with a different sociocultural background in academic studies. Similarly, Tomlinson [6] and Ainscow [87] warned about the risk of neglecting some groups in studies of inclusive education.

Second, from a technological perspective, this review could contribute to demonstrating the continued importance of using new technologies for the inclusive education of minority students. Similarly, Kazimzade et al. [72] pointed out the significance of AI and new technologies as tools that could offer useful experiences for inclusive education. However, some challenges were also reported such as the lack of access and the high-cost of AI and new technologies. As Rodriguez-Segura [88] highlighted, cost is a persistent issue for communities lacking in economic resources. Nevertheless, there may be opportunities to provide an equitable education through the use of low-tech, cost-effective alternative educational technologies that can support the students’ learning and achievement [89].

Third, from a pedagogical perspective, our review highlights the increasing importance of STEM/STEAM subjects that encourage students of minority background to pursue a career in science and technology. This finding could indicate the efforts to reduce the gap between students belonging to minority groups and those from dominant groups in society. Lima and Almeida [71] also highlighted that an inclusive education for minority students should not only ensure their use of new technologies but also their participation in the design, development, and adaptation of the technology to their own needs. Moreover, Loreman [83] concluded that the pedagogy for inclusive education requires motivated and committed teachers who can support and provide culturally appropriate learning designs that meet the needs of minority students.

Fourth, as AI and new technologies are reaching every corner of the globe, it seems likely that their application will enhance the learning processes of minority students.
The advantages presented in this review could indicate that AI and new technologies provide inclusive educational opportunities through the development of culturally sensitive learning environments that support minority students; for example, by providing content in their native language [55]. However, it is important to emphasize that the effective use of AI and new technologies is not only about technology, but also about the integration of appropriate pedagogical and sociocultural approaches into the design of technology-based resources. Knox [90] highlighted that those who designed AI and new technologies should become more culturally sensitive and adapt the technology to the learners’ specific social contexts and cultures.

Finally, we hope that this review will improve the understanding of the challenges associated with cultural barriers and inequity that recreate existing disparities that have a negative impact on minority students. Moreover, education systems might be more proactive in including students from minority groups, and reduce the inequalities that disadvantaged groups face, particularly by providing technological access, contextualized content, and by acknowledging sociocultural diversity. AI and new technologies for inclusive education—particularly technologies that support the inclusion of students from minority groups with different sociocultural backgrounds—warrant attention from teachers, practitioners, educational authorities, and decision-makers at the governmental level.

This review had some limitations that further research could address. First, the review was based on the inclusion and exclusion criteria, incorporating only studies focused on the inclusive education of minority students regarding their sociocultural background and did not focus on other marginalized groups (e.g., based on gender, immigration, or economic status). Thus, it is recommended that researchers examine these other minority groups in future studies. Additionally, the review selected studies focused particularly on students. Future research may select studies that are focused on the teacher’s practices and perspectives regarding inclusive education. Second, non-English studies were omitted in this review. Therefore, we suggest that future reviews may consider literature from journals in non-English languages. Third, because of limited resources including limitations of the databases available to us, the present study does not constitute an exhaustive review of the literature, but highlights the more important new technologies such as AI, machine learning, VR, AR, and so on, for inclusive education. Therefore, further studies could review other emerging technologies (i.e., blockchain, Internet of Things, digital storytelling, and big data). Finally, the generalizability of these findings is limited by the sample size. In circumstances where there is an insufficient amount of published research on inclusive education regarding minority students of diverse cultural backgrounds, our intent is to lay a foundation for further research.

5. Conclusions

AI and new technologies for inclusive education must consider the situation of the minority groups that need access to quality education. Such technologies can play an important role in supporting the inclusion of minority students—identified by their ethnicity, culture, and languages—in an increasingly digitalized world. It is also important to note that technology does not exist in isolation but is immersed in a society. Thus, technology and society mutually shape each other.

In this review, we identified the types of AI and new technologies used for inclusive education, and their major advantages such as improving student performance and encouraging student interest in STEM/STEAM. On the other hand, it identified technological and pedagogical challenges, dataset limitations, low satisfaction using technology, and cultural differences. The solutions provided by the studies can be summarized as (a) pedagogical solutions, which respond to the needs of minority students and change the curricula accordingly; (b) technological solutions, which offer contextualized technologies that are adapted to minorities’ diverse contexts; and (c) sociocultural solutions, which develop the cultural sensitivity to facilitate the inclusion of minority groups. These solutions reveal the
potential of AI and new technologies and the importance of quality education as the basis for promoting an inclusive education, an inclusive society, and an inclusive world.

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References
1. UNICEF. Conceptualizing Inclusive Education and Contextualizing it within the UNICEF Mission. 2014. Available online: https://www.unicef.org/eca/sites/unicef.org.eca/files/IE_Webinar_Booklet_1_0.pdf (accessed on 5 January 2022).
2. De Bruin, K. The Impact of Inclusive Education Reforms on Students with Disability: An International Comparison. Int. J. Incl. Educ. 2019, 23, 811–826. [CrossRef]
3. Latorre-Cosculluela, C.; Vázquez-Toledo, S.; Lías-Orús, M.; Ramón-Palomar, J. Contextualizing Gender Issues and Inclusive Education: An Analysis of the Perceptions of Primary Education Teachers. Teach. Dev. 2022, 26, 189–205. [CrossRef]
4. Slowik, J.; Gażáková, E.; Holeček, V.; Zachová, M. Comprehensive Support for Pupils at Risk of School Failure in Inclusive Education: Theory and School Practice in the Czech Republic. Int. J. Incl. Educ. 2021, 1–17. [CrossRef]
5. Cucio, M.R.R.; Roldan, M.D.G.Z. Inclusive Education for Ethnic Minorities in the Developing World: The Case of Alternative Learning System for Indigenous Peoples in the Philippines. Eur. J. Sustain. Dev. 2020, 9, 409. [CrossRef]
6. Tomlinson, S. The Irresistible Rise of the SEN Industry. Oxf. Rev. Educ. 2012, 38, 267–286. [CrossRef]
7. Engelbrecht, P. Inclusive Education: Developments and Challenges in South Africa. Prospects 2020, 49, 219–232. [CrossRef]
8. Dreamson, N. Cultural Diversity Pedagogy and Meta-Case Design: A New Approach to Diversity in Education; Routledge: New York, NY, USA, 2021.
9. White, H.L.; Rice, M.F. The Multiple Dimensions of Diversity and Culture. In Diversity and Public Administration. Theory, Issues, and Perspectives; Rice, M.F., Ed.; Routledge: New York, NY, USA, 2015; pp. 11–31.
10. Banks, J.A. Cultural Diversity and Public Administration: Foundations, Curriculum, and Teaching; Routledge: New York, NY, USA, 2015.
11. Beacham, N.; McIntosh, K. Student Teachers’ Attitudes and Beliefs Towards using ICT within Inclusive Education and Practice. J. Res. Spec. Educ. Needs 2014, 14, 180–191. [CrossRef]
12. Belda-Medina, J. Promoting Inclusiveness, Creativity and Critical Thinking Through Digital Storytelling among EFL Teacher Candidates. Int. J. Incl. Educ. 2022, 26, 109–123. [CrossRef]
13. Hopcan, S.; Polat, E.; Ozturk, M.E.; Ozturk, L. Artificial Intelligence in Special Education: A Systematic Review. Interact. Learn. Environ. 2022, 1–19. [CrossRef]
14. UNESCO. UNESCO World Report: Investing in Cultural Diversity and Intercultural Dialogue; UNESCO Publishing: Paris, France, 2009; Available online: http://www.un.org/en/events/culturaldiversityday/pdf/Investing_in_cultural_diversity.pdf (accessed on 5 April 2022).
15. Yuen, C.Y. Dimensions of Diversity: Challenges to Secondary School Teachers with Implications for Intercultural Teacher Education. Teach. Teach. Educ. 2010, 26, 732–741. [CrossRef]
16. Salas-Pilco, S.Z. Empowering Rural Children’s Learning through Meaningful Technology-Enhanced Learning Designs. Ph.D. Thesis, The University of Hong Kong, Hong Kong, China, 2017. Available online: https://hub.hku.hk/bitstream/10722/239959/1/FullText.pdf (accessed on 21 June 2022).
17. Peters, L.S.; Narayanan, V.K.; O’Connor, G.C.; Tribbitt, M. Innovation at the National Level. In Wiley Encyclopedia of Management; Cooper, C., Ed.; John Wiley & Sons: Hoboken, NJ, USA, 2015; Volume 13, pp. 1–10. [CrossRef]
18. Chauhan, S. A Meta-Analysis of the Impact of Technology on Learning Effectiveness of Elementary Students. Comput. Educ. 2017, 105, 14–30. [CrossRef]
19. Salas-Pilco, S.Z. The Impact of AI and Robotics on Physical, Social-Emotional and Intellectual Learning Outcomes: An Integrated Analytical Framework. Br. J. Educ. Technol. 2020, 51, 1808–1825. [CrossRef]
20. Grimus, M. Emerging Technologies: Impacting Learning, Pedagogy and Curriculum Development. In Emerging Technologies and Pedagogies in the Curriculum; Yu, S., Ally, M., Tsinakos, A., Eds.; Springer: Singapore, 2020; pp. 127–151.
Sustainability 2022, 14, 13572

48. Jong, M.S.-Y.; Ng, N.; Luk, E.; Leung, J.; Jiang, M.Y.-C.; Lau, D.; Tai, C.-C. Motivating Ethnic Minority Students in Hong Kong to Learn Chinese Culture with EduVenture. In Proceedings of the 29th International Conference on Computers in Education (ICCE), Bangkok, Thailand, 22–26 November 2021; Rodrigo, M.M.T., Yver, S., Mitrovic, A., Eds.; Asia-Pacific Society for Computers in Education: Taoyuan, Taiwan, 2021; pp. 707–710. Available online: https://icce2021.apscce.net/wp-content/uploads/2022/01/ICCE2021-VoII-PP-706-709.pdf (accessed on 12 April 2022).

49. Ladeji-Osias, J.O.; Partlow, L.E.; Dillon, E.C. Using Mobile Application Development and 3-D Modeling to Encourage Minority Male Interest in Computing and Engineering. IEEE Trans. Educ. 2018, 61, 274–280. [CrossRef]

50. Lamkin, D.; Ghosh, R.; Asino, T.I.; Kwembe, T.A. Informally Teaching Black Youth STEM Concepts Virtually Using Artificial Intelligence and Machine Learning. In Intelligent Computing. Lecture Notes in Networks and Systems; Arai, K., Ed.; Springer: Cham, Switzerland, 2021; Volume 285, pp. 446–461. [CrossRef]

51. Manikutty, G.; Frey, L.M.; Natarajan, A.; Chilakapati, U.; Venilla, V.; Rao, B.I. Can also Make Robots! Inspiring Rural Indian Children to Learn Robotics. In Proceedings of the 2019 IEEE Tenth International Conference on Technology for Education (T4E), Goa, India, 9–11 December 2019; pp. 78–85. [CrossRef]

52. Nayak, K.; Krishna, S.; Tran, K.; Harris, M.; Barrera, A.M.; Coble, K.; Kulkarni, A. Using Text Analytics on Reflective Journaling to Identify Cultural Capitals for STEM Students. In Proceedings of the 2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA), Miami, FL, USA, 14–17 December 2020; pp. 797–804. [CrossRef]

53. Nguyen, Q.; Rienties, B.; Richardson, J.T.E. Learning Analytics to Uncover Inequality in Behavioural Engagement and Academic Attainment in a Distance Learning Setting. Assess. Eval. High. Educ. 2019, 45, 594–606. [CrossRef]

54. Ocampo Yahuarcani, I.; Campos Baca, L.E.; García Cortegano, C.A.; Gutiérrez Gómez, E.; Cárdenas Vigo, R.; Bellido Collahuacho, J.J.; Saravia Llaja, L.A.; Núñez Satalaya, A.M.; Reategui Pezo, A.; Guipal Tamani, M.; et al. Mobile Apps Use in Indigenous Language Education of Pre School Children of Huitoto People in Peruvian Amazon. In Proceedings of the 2019 IEEE World Conference on Engineering Education (EDUNINE), Lima, Peru, 17–20 March 2019; pp. 1–5. [CrossRef]

55. Ocampo Yahuarcani, I.; Saravia Llaja, L.A.; Núñez Satalaya, A.M.; Sosa Bitulas, L.A.; Gutiérrez Gómez, E.; Jeri Lagos, K.D.; García Cortegano, C.A.; Matienzo Alcantara, G.A.; Sánchez Atuncar, G.; Reategui Pezo, A.; et al. A Digital Educational Tool for Learning the Aymara Language in the Region of Ayacucho, Peru. In Proceedings of the 2021 IEEE World Conference on Engineering Education (EDUNINE), Guatemala City, Guatemala, 14–17 March 2021; pp. 1–5. [CrossRef]

56. Pinto, D.; Mosquera, J.; Gonzalez, C.; Tobar-Muñoz, H.; Fabregat, R.; Baldiris, S. Augmented Reality Board Game for Supporting Learning and Motivation in an Indigenous Community. In Proceedings of the Actas del V Congreso Internacional de Videojuegos y Educació (CIVE’17), Tenerife, Spain, 7–9 June 2017; pp. 1–7. Available online: https://dialnet.unirioja.es/servlet/articulo?codigo=8414317 (accessed on 12 October 2022).

57. Robles-Bykbaev, Y.; Galán-Montesdeoca, J.; Segarra-Vanegas, V.; Robles-Bykbaev, V.; Pesantez-Aviles, F.; Viñanzaca-Padilla, E. An Interactive Educational Platform Based on Data Mining and Serious Games to Contribute to Preservation and Learning of the Cañari Indigenous Cultural Heritage in Ecuador. In Proceedings of the 2018 IEEE Biennial Congress of Argentina (ARGENCON), San Miguel de Tucuman, Argentina, 6–8 June 2018; pp. 1–6. [CrossRef]

58. Simley, T.; Mack, N.A.; Pittman, T.; Cook, C.; Cummings, R.; Moon, D.; Gosha, K. Assessing the Efficacy of Integrating Computer Science, Math, and Science in a Middle School Sphero Robotics Summer Program. In Proceedings of the 2020 Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT), Portland, OR, USA, 10–11 March 2020; pp. 1–8. [CrossRef]

59. Sun, B.; Chikwem, U.; Nyingifa, D. VR Learner: A Virtual Reality Based Assessment Tool in Higher Education. In Proceedings of the 2019 IEEE Conference on Virtual Reality and 3D User Interfaces (VR), Osaka, Japan, 23–27 March 2019; pp. 1640–1645. [CrossRef]

60. Williams-Dobosz, D.; Azevedo, R.F.L.; Jeng, A.; Thakkar, V.; Bhat, S.; Bosch, N.; Perry, M. A Social Network Analysis of Online Engagement for College Students Traditionally Underrepresented in STEM. In Proceedings of the 2018 IEEE Biennial Congress of Argentina (ARGENCON), San Miguel de Tucuman, Argentina, 6–8 June 2018; pp. 1–6. [CrossRef]

61. Yi, H. Robotics and Kinetic Design for Underrepresented Minority (URM) Students in Building Education: Challenges and Opportunities. Comput. Appl. Eng. Educ. 2018, 27, 351–370. [CrossRef]

62. Yu, R.; Lee, H.; Kizilcec, R.F. Should College Dropout Prediction Models Include Protected Attributes? In Proceedings of the Eighth ACM Conference on Learning @ Scale, Postdam, Germany, 22–25 June 2021; pp. 91–100. [CrossRef]

63. Popenici, S.A.D.; Kerr, S. Exploring the Impact of Artificial Intelligence on Teaching and Learning in Higher Education. Res. Pract. Technol. Enhanc. Learn. 2017, 12, 22. [CrossRef] [PubMed]

64. Knox, J.; Yu, W.; Gallacher, M. Artificial Intelligence and Inclusive Education; Springer: Singapore, 2019.

65. Lazou, C.; Psychogiou, M. Mobile Devices as a Vehicle for Inclusive Educational Practices: A Case Study. Scand. J. Educ. Res. 2020, 64, 1105–1119. [CrossRef]

66. National Academies of Sciences, Engineering, and Medicine. How People Learn II: Learners, Contexts, and Cultures; The National Academies Press: Washington, WA, USA, 2018. [CrossRef]
69. Figueroa, T. Underrepresented Racial/Ethnic Minority Graduate Students in Science, Technology, Engineering, and Math (STEM) Disciplines: A Cross Institutional Analysis of Their Experiences. Doctoral Dissertation, University of California, Los Angeles, CA, USA, 2015. Available online: https://www.proquest.com/openview/25ce6dc7cb252f4f2bcae51b9e886017 (accessed on 3 May 2022).

70. Lakhan, R.; Laxman, K. The Situated Role of Technology in Enhancing the Academic Performance of Indigenous Students in Mathematics Learning: Application within a Maori Cultural Context in New Zealand. J. Educ. Technol. 2018, 15, 26–39.

71. Lima, B.A.V.; Almeida, L.D.A. Designers in Contemporary Participatory Design: Practices and Agendas. IADIS Int. J. Comput. Sci. Inf. Syst. 2019, 14, 92–105.

72. Kazimzade, G.; Patzer, Y.; Pinkwart, N. Artificial Intelligence in Education Meets Inclusive Educational Technology—The Technical State-of-the-Art and Possible Directions. In Artificial Intelligence and Inclusive Education; Knox, J., Yu, W., Gallagher, M., Eds.; Springer: Singapore, 2019; pp. 61–73.

73. Sisman, B.; Kucuk, S.; Yaman, Y. The Effects of Robotics Training on Children’s Spatial Ability and Attitude Toward STEM. Int. J. Soc. Robot. 2021, 13, 379–389. [CrossRef]

74. Bond, M.; Bedenlier, S. Facilitating Student Engagement through Educational Technology: Towards A Conceptual Framework. J. Interact. Media Educ. 2019, 2019, 1–14. [CrossRef]

75. Salas-Pilo, S.Z. Aesthetics and Power: Reforming Access to and the Inclusion of Cultural Content in ICT-Supported Education: A Peruvian Case. In ICT and International Learning Ecologies; Lubin, I.A., Ed.; Routledge: New York, NY, USA, 2021; pp. 109–131.

76. Walters, A. Inequities in Access to Education: Lessons from the COVID-19 Pandemic. Brown Univ. Child Adolesc. Behav. Lett. 2020, 36, 8. [CrossRef]

77. Chambers, D. Assistive Technology Supporting Inclusive Education: Existing and Emerging Trends. In Assistive Technology to Support Inclusive Education. International Perspectives on Inclusive Education, 14; Chambers, D., Ed.; Emerald Publishing Limited: Bingley, UK, 2019; pp. 1–16. [CrossRef]

78. Tsiastoudis, D.; Polatoglou, H. Inclusive Education on STEM Subjects with the Arduino Platform. In Proceedings of the 8th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-Exclusion (DSAI), Thessaloniki, Greece, 20–22 June 2018; pp. 234–239. [CrossRef]

79. Ferri, F.; Grifoni, P.; Guzzo, T. Online Learning and Emergency Remote Teaching: Opportunities and Challenges in Emergency Situations. Societies 2020, 10, 86. [CrossRef]

80. De Coito, I.; Richardson, T. Teachers and Technology: Present Practice and Future Directions. Contemp. Issues Technol. Teach. Educ. 2018, 18, 362–378.

81. Autio, O. Elements in Students Motivation in Technology Education. Procedia Soc. Behav. Sci. 2011, 29, 1161–1168. [CrossRef]

82. Caffarella, R.S. Viewing Cultural Barriers as Opportunities to Enhance Learning: An International Perspective. In Proceedings of the 51st Annual Adult Education Research Conference (AERC), Sacramento, CA, USA, 3–6 June 2010; pp. 62–67. Available online: https://newprairiepress.org/cgi/viewcontent.cgi?article=3671&context=aerc (accessed on 14 May 2022).

83. Loreman, T. Pedagogy for inclusive education. In Oxford Research Encyclopedia of Education; Oxford University Press: Oxford, UK, 2017. [CrossRef]

84. Sismaeva, I.N.; Budarina, A.O.; Sund, S. Inclusive Education in Russia and the Baltic Countries: A Comparative Analysis. Balt. Reg. 2019, 11, 76–91. [CrossRef]

85. Khaksar, S.M.S.; Slade, B.; Wallace, J.; Gurinder, K. Critical Success Factors for Application of Social Robots in Special Developmental Schools: Development, Adoption and Implementation. Int. J. Educ. Manag. 2019, 34, 677–696. [CrossRef]

86. Gaston, N.M.; Fields, A.; Calvert, P.; Lilley, S. Raranga te kete aronui: Weaving Social and Cultural Inclusion into New Zealand Library and Information Science Education. In Perspectives on Libraries as Institutions of Human Rights and Social Justice; Gorham, U., Taylor, N.G., Jaeger, P.T., Eds.; Emerald Group Publishing: Bingley, UK, 2016; pp. 373–398.

87. Ainscow, M. Making Sense of Inclusive Education. Trinity Educ.Pap. Examining Theory Pract. Incl. Educ. 2013, 2, 2–11.

88. Rodriguez-Segura, D. EdTech in Developing Countries: A Review of The Evidence. World Bank Res. Obs. 2021, 37, 171–203. [CrossRef]

89. Mandal, I.B. Assessing the Feasibility of a Circular Economy for 3D Printed Tactile Educational Aids for Visually Impaired (VI) Students in India. Master’s Thesis, Massachusetts Institute of Technology, Cambridge, MA, USA, 2021. Available online: https://dspace.mit.edu/handle/1721.1/140078 (accessed on 3 May 2022).

90. Knox, J. The Limitations of Access Alone: Moving Towards Open Processes in Education Technology. Open Prax. 2013, 5, 21–29. [CrossRef]