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COMMENTARY

Academic Burden Reduction Endeavors in China in the Context of East Asia's Educational Predicament

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"Education is not the filling of a pail, but the lighting of a fire."
-William Butler Yeats

"HIGH academic achievements accompanied by heavy academic burdens" has been a popular perception of East Asian education, and China's education system is no exception to this paradox. In China, the issue of academic burdens concerns not only the students but also the parents, schools, and private training institutions. Manifestations of the issue include onerous academic burdens and declining learning motivation in the students; the fixation with "advanced education" (having children learn knowledge and skills beyond their developmental phases) in the parents and the attendant education anxiety; the pervasive practice of "teaching to the test" with disregard for the essence of education in the schools; and disorderly competition among private training institutions, a severe disruption to on-campus teaching enactment (Hua & Wu, 2022). Underlying causes of these phenomena are: (i) The mismatched scales of education at various levels have intensified competition for school progression opportunities, which is further exacerbated by the disparities in educational standards between prestigious and ordinary schools. (ii) The examination-worship tradition associated with the imperial examination culture magnifies education anxiety in the popular public. (iii) Systemic problems with present school education, such as defective primary and secondary curricula, unscientific evaluation mechanisms, illegitimate teaching methods, and inadequate school-based tutoring, have contributed to the students' academic burden by compromising teaching and learning efficiency and effectiveness (Xiang, 2019).

East Asian countries have advanced their respective initiatives in response to the issue of excessive academic burden. For instance, Japan, after having experimented with the "Yutori Education" (Relaxation Education), now moves towards "de-relaxation" in

education, providing quality after-school services to the students to alleviate their academic pressure. South Korea introduced the "Equalization Policy" to lessen educational competition, which was followed by the "Free Semester Program" aimed at increasing time for student comprehensive education and mitigating employment anxiety in youth (Hua & Wu, 2022; Xu & Lu, 2024). Singapore advanced such initiatives as "Teach Less, Learn More" and "Learning for Life," focusing on cutting curricular components and homework loads to spare time for personalized learning (Hua & Wu, 2022; Xu & Lu, 2024).

Recent decades have seen China's endeavors to tackle the inordinately heavy academic burdens to its basic education students. In 2000, the State Council of China issued the *Circular on Alleviating Excessive Academic Burdens on Primary School Students*, which emphasizes the urgency of genuinely reducing the loads of schoolwork at the primary level and proposes a range of specific measures (Wang & Tan, 2021; Liu & Zuo, 2023). In 2013, the Ministry of Education of China launched the initiative of "Embarking on the Long Journey of Student Academic Burden Reduction", which specifies the objectives and concrete measures for the campaign and mandates the establishment of an integrated governance and supervision system across provincial, county, and school levels for the purpose of controlling student workloads (Liu & Zuo, 2023). In 2018, the Ministry of Education and other three departments jointly issued the *Circular on Alleviating Extracurricular Burdens to Primary and Secondary School Students through Specialized Regulation of Private Training Institutions* (Wang, 2021). In 2021, the State Council released the *Opinions on Further Reducing the Burden of Homework and Off-campus Training for Compulsory Education Students* (also referred to as the Double Reduction policy), aiming to substantively lower the volume and difficulty of homework at the compulsory education level while also imposing strict regulation on off-campus tutoring services (Wang, 2021; Lin & Li, 2024).

What are the outcomes of all these policies and programs aimed at supporting student healthy growth by reducing illegitimate academic burdens? This question has been a focal topic among Chinese education researchers in recent years. *A Review of Empirical Studies of the Effects of the Double Reduction Policy* in this issue seeks to investigate the effects of the policy on the students, parents, and teachers at the compulsory education level by reviewing relevant empirical studies in the literature. The study finds that the Double Reduction program is effective in lightening homework and after-school training burdens in compulsory education students, which is of vital significance for their all-round development. It also points out the challenges that have arisen in the program's implementation, such as the low satisfaction of the students with the after-school services, unresolved education anxiety in the parents, and increased work burdens to the teachers (Zeng, 2025). While the paper has its limitations, primarily derived from the relatively small sample sizes and constrained scope of regions examined in the empirical studies included in the review, it still successfully showcases the developments in China's endeavor to bolster its basic education and provides implications for future improvement.

References

Hua, Z. & Wu, J. (2022). The features, causes, prevention, and solutions to excessive academic burdens in East Asian education: A discussion on academic burden reduction policies in Japan, South Korea, and Singapore. Journal of Comparative Education, 2022(6), 154-166. Available at: https://kns.cnki.net/kcms2/article/abstract?v=2Z_8GvOTliX2vGeE-rr-ww8-kHdrun-_J31oWCw2UqTcuHun07-1RtICUFwpOA07H8GWc7hs76FL4dI22KeYpfLVDIhvghsMQuWj7XqPXKyIRI0MPDeZA63wBX

fQLoNM7YIb7rnqtVBfaeRyjuD-TEvX6lUnkY43KskC9tjrCz5J01gf1KyKzw==&uniplatform=NZKPT&language=CHS

Lin, L. & Li, Y. (2024). The evolution of academic burden reduction policies for Chinese basic education: An analysis based on the three-dimensional framework of tools, goals, and educational settings. Contemporary Education and Culture, 16(3), 31-38. DOI: https://doi.org/10.13749/j.cnki.cn62-1202/g4.2024.03.012.

Liu, C. & Zuo, Y. (2023). A study of the evolution of academic burden reduction policies for basic education from the perspective of punctuated equilibrium: Textual analysis of policies from 1978 to 2022. Journal of Shangqiu Normal University, 39(2), 94-101. Available at: https://kns.cnki.net/kcms2/article/abstract?v=2Z_8GvOTliU0tbzoQDN5xuJkT6ePVQsSO-RP3wm03YEcgqB3thvURTBsU0gY9Odm6FJu0WVh_Q9mpI5Mosj_ov6EE_Aepu17_LDW9L4BW61P_yRhYgypw9Kywo29ABHbFaamBiZwhg4OFSut-u_d_lWYul404f5jQm-9x_dYRdGLOGGR4Q9x2A==&uniplatform=NZKPT&language=CHS

Wang, X. & Tan, M. (2021). A review of policies on reducing academic burdens on primary and secondary school students: A textual analysis. Moral Education China, 2021(20), 22-26+50. Available at: https://kns.cnki.net/kcms2/article/abstract?v=2Z_8GvOTliV0qM9jR8scFHU1Un6Pt7Gmhb6z2eP46ycs1S138_v2n-DMVlMVNqbcVTj6zV3FAuDGC0gnhme0iWOdFvbTlihYq-NC-cxt0yhbOlDL-baIk_DdLtBi6Mzj8zbJUbFAAwMsg4ZaH6oABwqovIWHk5oNDmOkejtHL61RF5BDAB5MCQ==&uniplatform=NZKPT&language=CHS

Xiang, X. (2019). A historical perspective on the two waves of academic burden reduction in Chinese education over the past 70 years. Journal of East China Normal University (Education Science Edition), 37(5), 67-79. DOI: https://doi.org/10.16382/j.cnki.1000-5560.2019.05.006.

Xu, J. & Lu, J. (2024). Explorations of pathways to reducing student academic burden in the East Asian education world: An analysis based on the PISA 2022 data on time investment in learning and learning outcomes. Global Education, 53(4), 18-29. Available at: https://kns.cnki.net/kcms2/article/abstract?v=2Z_8GvOTliWkZXoA9bGRkceXNZgfx8NQgHblVv8VTAIYC6eg39316e909TZBcJGuY64MisDCojs-Lmt_NF4jBf1Lq-TlQ2XLMF-CAIn9o9m5piNLXHTkSt6VPNM4prkDK5Rlcvbw_KVjoFJq4XW7Fe9eTjnvwCy1S2OFmKwcm-E1pwipa29UFw==&uniplatform=NZKPT&language=CHS

Zeng, Y. (2025). A review of empirical studies of the effects of Double Reduction policy. Science Insights Education Frontiers, 27(2):4517-4531. DOI: https://doi.org/10.15354/sief.25.re496

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COMMENTARY

Learning beyond the Classroom: The Value of Informal Learning Environments

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"Develop a passion for learning. If you do, you will never cease to grow."
-Anthony J. D'Angelo

THE learning environment is a crucial factor in successful learning. Traditionally, only formal learning environments, such as schools and other educational institutions, have been accepted as educational settings, where educational activities are well-organized, following established curriculum programs and teaching objectives. Often disregarded is the fact that from the point of view of lifelong learning, most of our learning takes place in informal learning environments (Sefton-Green, 2004).

Informal learning environments, in their broad sense, span a wide range of settings, including physical educational venues, such as the library, museum, and science center, and virtual learning spaces like the social media platform and online forum (Yang & Ouyang, 2024). In recent years, the scope of informal learning environments has expanded to encompass more diverse settings, such as the street, hospital, shopping center, and marketplace, offering learners broader opportunities for acquiring knowledge and skills. Learning in informal environments is typically enacted without standardized procedures or pre-assigned instructors. It could be incidental learning behaviors or pre-designed activities with explicit learning objectives (Wang & Yang, 2018). Being open, interactive, practical, flexible, and autonomy-supportive (Yang & Ouyang, 2024), such learning is effective in piquing learners' interest and boosting active engagement, as well as fostering their lifelong learning competencies.

Recent decades have witnessed a growing body of literature focusing on the educational value of informal learning environments. Pattison et al. (2016) conducted a

review of studies examining mathematics study in informal learning settings beyond the classroom. The research results reveal that math learning is ubiquitous, happening with a high frequency in day-to-day activities (e.g., shopping, gaming, home activities), and that the use of math knowledge in real-world life is of greater practical education value than in-class math learning. The study also emphasizes that well-designed math projects in informal education environments, such as museums and exhibitions, are particularly supportive of math learning by utilizing colorful interactive activities provided by these venues, and that a balance between the entertaining and educational roles of these informal learning scenarios is warranted to ensure the expected learning outcomes. Ramu and Aziz (2016) surveyed 40 studies on the effects of informal learning environments within the campus on student learning (published between 1979 and 2016). According to their research findings, campus-based informal learning environments, including the library, cafeteria, garden, corridor, and more, have significant impacts on student academic performance and school-life satisfaction. These spaces encourage inquiry, collaboration, and communication in the students, enabling them to better comprehend and apply knowledge acquired in the classrooms.

It is evident that informal learning environments are of equal significance to formal ones. They are mutually complementary and together, create wider ecology of education for the students (Li & Shi, 2016). Meanwhile, it is a misconception that learning in an informal environment must be casual. Rather, informal learning environments can well serve as the settings for structured educational activities. *The Effect of Informal Learning* Environment *on Learning Wastes and Recycling: The Case of Glass Bead Atelier* in this issue looks at the use of the informal learning environment in the teaching of curricular content. Through a case study of a glass bead atelier as an off-campus learning setting, the study investigates the effect of teaching in an informal learning environment on student achievement in the "Wastes and Recycling" study as well as the students' views about learning in an informal education environment. The research findings suggest that informal learning environment-based activities that support formal learning positively affected learning outcomes and that students held positive attitudes toward them (Türkmen & Edis, 2025). It should be noted that the study is not without limitations. The short duration of the experiment makes it difficult to assess the long-term effect of the intervention; the subjects in the study are confined to a single age group from a certain region. Factors like these may compromise the generalizability of its findings. Despite its limitations, the study offers valuable insights to educators seeking to leverage informal learning environments to support official curricular instruction.

References

Li, Z. & Shi, F. (2016). Design and construction of venue-based learning environments. Journal of Distance Education, 34(6), 95-102. DOI: https://doi.org/10.15881/j.cnki.cn33-1304/g4.2016.06.012.

Pattison, S., Rubin, A., & Wright, T. (2016). Mathematics in informal learning environments: A summary of the literature. Institute for Learning Innovation. Math in the Making Project. Available at: http://www.informalscience.org/cimble-conference-integrating-math-informal-building-learning-environments-math-making

Ramu, V., & Aziz, N. T. N. F. (2016). Physical Informal Learning Environment on Campus Ground: A Review. Available at: https://eprints.usm.my/40669/1/ART_50.pdf

Sefton-Green, J. (2004). Literature review in informal learning with technology outside school. Available at: http://eprints.lse.ac.uk/id/eprint/41609

Türkmen, H., & Edis, F. (2025). The effect of informal learning environment on learning wastes and recycling: the case of glass bead atelier. Science Insights Education Frontiers, 27(2):4477-4499. DOI: https://doi.org/10.15354/sief.25.or731

Wang, L. & Yang, M. (2018). Effective integration of learning in informal education environments with the school curriculum. Educational Science Research, 2018(10), 59-63. Available at: https://kns.cnki.net/kcms2/article/abstract?v=5nxW69XXs-7L6oPKQncMPUnCuA-eYRH6cESV78Vly2n9HLVbDriCi_KmifC7xaEZiokYG3UftVXyF4ueDihAzerq-EN5PvyobV9CTJ-CLGzmH6ErTBQ7nTmCKUooFyNOoLVEflN80XyBUYDCo1tvpkRM40jzEa01ZngwXKzSwlbUCG56xtolvg==&uniplatform=NZKPT&language=CHS

Yang, J. & Ouyang, Y. (2024). STEM education in informal learning environments: A case study of museum education services in the United States. Journal of World Education, 37(6), 44-52. DOI: https://doi.org/10.3969/j.issn.1672-3937.2024.06.06

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ORIGINAL ARTICLE

The Effect of Informal Learning Environment on Learning Wastes and Recycling: The Case of Glass Bead Atelier

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***Abstract**: Informal learning supports formal education by facilitating students' learning and helping them to expand their knowledge outside the classroom. This paper explores the impact of informal learning environments on learning outcomes. This study aims to answer the question 'How does the use of informal learning environments within the scope of formal learning affect students' academic achievement and their views on this learning environment?' Fort is purpose, students were taken to Atelier of Making of Glass Artand Beads in the process of teaching the acquisition of "Explains the importance of recycling and recovery" in the 8th grade Environmental Education and Climate Change course. This trip was made in the exploration phase of the 4E teaching model, one of the student-based models of the constructivist approach. At the end of the learning process, the effect of teaching the acquisition in an informal learning environment on students' academic achievement and students' opinions about this environment were examined. A mixed design was adopted in the study. The students participating in the study were selected from a public school in small district of one of the metropole city in Turkiye through purposive-judgmental sampling. Two of the 8th grade classes in the school were randomly selected and 60 students were included in the study, one of which was the experimental group (29) and the other was the control group (31). The Recycling and Recovery Achievement test was used for quantitative data and 6 open-ended questions about informal learning environment were used for qualitative data. Mann-Whitney U test was used to analyze quantitative data and*

descriptive analysis was used to analyze qualitative data. As a result of the analyses, it was concluded that the Recycling and Recovery achievement mean scores of the experimental group students were higher than the control group, and this result was supported by the positive opinions of the students about the informal learning environment.

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***Keywords**: Informal Science Education, Informal Learning Environments, 4E Learning Model, Introduction*

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Introduction

Human beings continue to learn and teach throughout their lives. These processes do not only take place at school; information stimuli can appear anywhere at any time. Information can be transferred from friends, family, visual or written media (Türkmen, 2010). What important thing is here that the learner actively internalizes the stimulus. In fact, the most effective learning is the learning that the learner actively experiences and is involved in the process. In this context, it is recommended to use teaching models such as learning cycle, 4E, 5E, 7E, which are based on constructivist learning approach and developed in a way to enable students to use scientific thinking skills by doing in the teaching and learning process (Bıyıklı & Yağcı, 2014). These models increase the learner's motivation and curiosity to learn and cause the learner to exhibit scientific behaviors in the process, as well as creative and critical thinking, metacognitive thinking, improvement in scientific process skills and positive attitudes towards learning scientific subjects (Singer & Moscovici, 2008). Another factor that causes these positive gains in the learner is the learning environment. Research suggests that informal learning environments are the most appropriate environment in which students play a more active role(Dawson, 2014; Demirel & Özcan, 2020; Görecek Baybars, 2017; Hacker & Miller, 2016; Katırcıoğlu, 2019; King & Howard, 2014; Sellmann & Bogner, 2013; Stocklmayer, Rennie & Gilbert, 2010).

It is argued that by establishing a mutually reinforcing link between formal learning and informal learning in schools, students can move away from memorizing information and access information on their own. In addition, individual and peer inquiry in informal learning environments is thought to increase learning (Hung, Lee & Lim, 2012). With the understanding of sustainability in education coming to the forefront in today's education, the view that education cannot be limited to school environments has come to the fore (Brown, 2019; King & Howard, 2014). In addition, it is seen that the lessons taught in informal learning environments increase children's interest in science, and they want to choose science-related courses in their future education life and even progress in science-related fields in their career choices (Bonnette, Crowly, & Shunn, 2019).

At this point, it is seen that many studies have been conducted in our country on informal education and its effect on learning. Such as, Türkmen (2018) revealed in his study that the trip to the Natural History Museum for the 5th grade "Fossils" subject increased the academic achievement of the students, and that the students conducted research together like scientists and provided a high learning motivation. Metin and Bozdoğan (2020) stated that the planetarium trip in the exploration phase of the 5E model within the scope of the 7th grade "Earth and the Universe" subject caused a significant

increase in students' academic achievement, interest level and motivation. Özcan and Kara (2024) stated that informal learning experiences within the scope of the 8th grade "Wastes and Recycling" subject increased student achievement and had positive effects on students' acceptance of informal learning environments.

In addition, there are many study results showing that learning experiences offered to students in informal learning environments increase success in "recycling, waste control and environmental education" (Görcek Baybars, 2017; Türkmen, 2023). Dori and Tal (2020) mentioned the potential of projects carried out in informal learning environments in raising students' awareness of environmental issues and stated that these projects encourage students to take an active role in the decision-making process and participate in environmental activities. In our country, the main purpose of the Environmental Education and Climate Change course, which was included as a course in the primary education curriculum in the 2023-2024 academic year, is to raise individuals who play an active role in environmental problems and to enable permanent learning in this regard. In addition, there are special objectives such as providing opportunities for students to experience environmental problems closely and to produce solutions to these problems through trips to informal learning environments in their immediate surroundings (Ministry of National Education, 2022).

The aim of this study is to investigate the effect of teaching the "Wastes and Recycling" topic of the 8th grade environmental education and climate change course in Nazarköy Glass Bead Workshop, which is an informal learning environment, on students' academic achievement and to learn students' thoughts about this learning environment. Izmir Nazarköy Glass Bead Atelier has been producing glass ornaments and evil eye beads in Nazar Boncuğu furnaces since 1950. Many different items are produced with the skill of the masters from glass that melts at an average temperature of 800-1200 degrees. The craftsmen, who spend 10-12 hours a day in front of the fire, color the melted glass with substances such as cobalt, copper oxide, opaque and lead. Then they shape the melted glass with specially made mercury steel rods coming out of the furnace. In the atelier excursion programs, students have the chance to get information by visiting the bead furnaces, ask questions to the masters while watching the production and make applications themselves.

For this purpose, the 8th grade Environmental Education and Climate Change lesson "Wastes and Recycling" was taught using the 4E teaching model. The 4E teaching model consists of four successive phases: Exploration, Explanation, Extension, and Evaluation. The first phase, Exploration, is the step where students have extensive experience with the concepts to be taught. Teachers ask questions to guide students' thinking and interpretation of the concepts. Students collect data using scientific process

skills. In the second phase, the Explanation step, students make inferences based on the data they collect and reach scientific knowledge with teacher guidance. The third phase, Expansion, involves students applying what they have learned to new and different situations and making connections with life. The last phase, Evaluation, involves evaluations that are intertwined with the process. The teacher questions students' learning and identifies possible deficiencies (Özmen, 2008).

This study, in the context of the selected informal learning environment, is important in terms of students having knowledge about the recycling of glass, which they frequently encounter as waste in daily life, making glass production practically in the glass bead atelier, looking at the concept of waste in their environment from a different perspective and making the use of waste for various purposes into action.

Method

In this study, mixed research method was used. The reason for using mixed models is the principle of Complementarity as defined by Greene, Caracelli and Graham (1989). Because Complementarity reason is qualitative and quantitative data were used together to help the researcher fully understand the research problem and explain the result clearly. Explanatory design from mixed methods was used in this study. First, quantitative data were collected. In the quantitative dimension of the study, a quasi-experimental model with pre-test post-test control group was used to investigate the effect of informal learning environment on student achievement, and the data collected were compared and analyzed in SPSS Program. Then, in the qualitative dimension of the research, a case study was conducted in which students' ideas and opinions about informal learning environments were taken. In this way, after comparing student achievements, student opinions about the learning environment were obtained (Büyüköztürk et al., 2011)

Study Group

As the research study group, a public school in small district of one of the metropole city in Turkiye was determined by purposive sampling. Of the 6 randomly selected branches, one experimental group consisted of 29 students and the other control group consisted of 31 students.

Data Instruments

Within the scope of the 8th grade "Environmental Education and Climate Change" course, the researchers developed an achievement test containing 15 multiple-choice questions related to the outcome "Explains the

importance of recycling and recovery in terms of sustainable development". The developed test was examined by 2 academicians and 3 field teachers in order to get expert opinion before the pre-application and necessary arrangements were made and applied. In the pre-application, 5 items with low discrimination index were removed. The Cronbach α reliability coefficient of the remaining 10-item multiple-choice achievement test was calculated as 0.70. As a result of the item analysis of the questions constituting the test, the average difficulty index of the test was calculated as 0.74 and the discrimination index as 0.47. Thanks to these steps, it is believed that the achievement test developed will have an inclusive and harmonious relationship with the learning outcome content (Akbulut & Çepni, 2013).

In the qualitative part of the mixed design research, interview questions consisting of 6 open-ended questions that the students would answer at the school after the trip were organized in line with same experts' opinions and applied and evaluated after the content validity was ensured.

Data Collection Process

The place chosen for the trip was a place that the researcher had visited before, and it was found to be associated with the selected outcome since all stages such as the production of evil eye beads from waste glass, the supply and transformation of these wastes were within the scope of workshop activities. During this visit, a pre-trip interview was made with the atelier staff who would help the students, and a lesson plan was prepared accordingly by obtaining the necessary information such as day, time, environment, and materials used. The necessary permissions were obtained from the school and parents before the trip and then the trip plan was created. The achievement test developed by the researchers was applied to the experimental and control groups as a pre-test before the exploration phase of 4E. In the lesson, the control group students performed the exploration phase of 4E in the classroom, while the experimental group students performed it in Nazarköy Glass Bead Atelier. While the control group students were shown pictures related to the subject in order for the students to reach scientific knowledge in the exploration phase, the experimental group students were asked 5 research questions prepared before the trip (**Table 1**). These research questions are:

1. What are the important points to be considered in the reprocessing of glass?
2. What kind of materials are preferred as raw materials in bead making and what are the reasons for this?
3. Where are these materials sourced from? How do the atelier staffs collect these materials?

Table 1. Data Collection Process

	Exploration	Explanation	Expansion	Evaluation
Experiment Group	* Pre-Test, * Research, * Bead Atelier * 2 Hours	* Scientific Knowledge * Classroom *1 Hours	* Preparing Materials & Posters * Classroom *2 Hours	*Subject Repetition * Post-Test, * 6 Interview Questions * Classroom *3 Hours
Control Group	* Pre-Test, * Research, * Classroom * 2 Hours	* Scientific Knowledge * Classroom *1 Hours	* Preparing Materials & Posters * Classroom *2 Hours	*Subject Repetition * Post-Test * Classroom *2 Hours

4. List the process of making evil eye beads?
5. What is the importance of evil eye bead making, which is one of the important examples of artistic transformation, in terms of the environment you live in?

In this way, the students were enabled to take an active role in the process, while the teacher's observations and guidance helped them to realize the concepts related to the subject. In the control group, in the Exploration phase of the lesson, concept realization was carried out in the classroom environment with questions and visual materials. Then, in both the experimental and control groups, the Explanation, Expansion and Evaluation phases were applied in the classroom environment. The Explanation and Expansion phases lasted two class hours each in both groups. In the explanation step of the experimental group, the students organize the data obtained from the previous step, that is, the research questions they answered during the trip, with the help of the teacher and present them to the class and interpret the findings they have collected. The teacher gives the scientific equivalents of these concepts while the students construct the concepts and topics with their own words. In the explanation step of the control group, this process proceeds through the student inferences made about the visuals (waste bins, waste collection facilities, etc.) shown in the discovery step. In the Expansion phase, students in both groups designed materials and posters using recycled materials. In this step, which was carried out as a group work, both recycling materials were used and posters were prepared to draw attention to this issue in the school environment and raise awareness. Thus, students had the opportunity to transfer what they learnt to a different situation. The Evaluation phase lasted 2 hours and the test was applied as a post-test to both groups and the subject was repeated. In addition, 6 interview questions were given to the experimental group as written form before the new topic was introduced. Then the students were asked to answer the questions in one

Table 2. Comparison of Achievement Pre-Test Scores Between Experimental and Control Groups.

Test	Group	N	Mean	Mean rank	Sum of rank	Mann Whitney U	Z	p
Pre-test	Experiment group	29	74.83	30.17	875	440	-0.14	0.886
	Control group	31	75.48	30.81	955			

class hour. In total, the research lasted 8 lessons in the experimental group and 7 lessons in the control group.

Data Analysis

For the analysis of the quantitative data, firstly, a normal distribution test was performed on the achievement test data before the comparison of the experimental and control groups before and after the application. Accordingly, it was concluded that the achievement test data did not show normal distribution in line with the analysis values of the Shapiro-Wilk test ($W = 0.821$, $p < 0.05$). For this reason, it was decided to use the nonparametric Mann-Whitney U test to compare the data obtained from the achievement test. Content analysis was used to analyze qualitative data. In content analysis, the data were first coded, themes were created, codes and themes were organized, and the findings were defined and interpreted.

Findings

In line with the analysis of the data, the findings are presented under two headings.

Findings from the Achievement Test

It was applied as a pre-test to determine the achievement status of the students in the two groups before the lesson and the data obtained were analyzed by Mann-Whitney U test. According to the Mann-Whitney U test results, it was found that there was no statistically significant difference between the experimental and control groups in the achievement test scores of waste and recycling before the lesson. It was concluded that the mean values of the two groups in terms of achievement (experiment group; 74.83, control group; 75.48) were in the same range ($U = 440$, $p > 0.05$) (**Table 2**).

Based on these results, the achievement test was applied as a post-test to determine whether there was a difference in the level of academic achievement between the experimental group and the control group after the

Table 3. Comparison of Achievement Post-Test Scores Between Experimental and Control Groups.

Test	Group	N	Mean	Mean rank	Sum of rank	Mann Whitney U	Z	p
Post-test	Experiment group	29	87.24	35.64	1033.5	300.5	-2.26	0.024
	Control group	31	80.00	25.69	796.5			

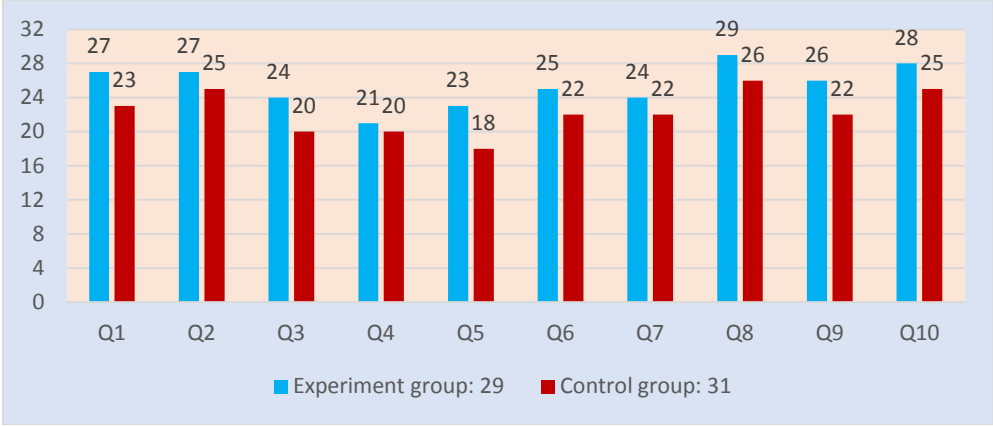

Figure 1: Achievement Test Correct Answer Frequencies.

application. The academic achievement of the students increased for both groups after the applications. While the mean value of academic achievement of the experimental group students increased from 74.83 to 87.24, the mean value of academic achievement of the control group students increased from 75.48 to 80.0. According to the results of the Mann Whitney U test, there was a statistically significant difference in the academic achievement post-test scores between the experimental and control groups ($U = 300.5$, $p < 0.05$) (**Table 3**).

The statistically significant difference was in favor of the experimental group. In other words, the subject taught using the informal learning environment had a significant effect on students' academic achievement in a more positive direction than the course taught in the classroom (**Figure 1**).

When the achievement test questions were analyzed separately, all students of the experimental group answered the 8th question correctly, while all students of the control group could not answer this question correctly, but it was the most correctly answered question of the group.

Similarly, in the experimental group, the most correctly answered questions were 1. question (27 students), 2. question (27 students) and 10. question (28 students), while in the control group, the most correctly answered questions were 2. and 10. questions. These findings show that the learning environment was used effectively in the learning of scientific knowledge in both groups, but in the experimental group, the glass making process observed in the informal environment made a difference in favor of the students. For example;

Question 8: Which of the following wastes can be recycled completely?

A) Cigarette butts B) Waste oil C) Copper wire D) Glass jars

Question 2: Which of the following is a non-recyclable material?

A) Petroleum B) Plastic C) Tin cans D) Newspaper

Question 4 had the least number of correct answers in the experimental group (21 students). Among the control group students, questions 3 (20 students), 4 (20 students) and 5 (18 students) had the least number of correct answers. The reason for this may be that especially the 4th and 5th questions include the skills of establishing a relationship with daily life, supporting and interpreting the scientific concept that is aimed to be acquired, in other words, they are based on the analysis step of Bloom's cognitive taxonomy. For example;

Question 4: An electric car is an exhaust-free automobile driven by one or more electric motors using electricity stored in batteries and other energy storage devices. Which of the following statements about electric cars is incorrect?

A) The use of electric cars helps to reduce environmental problems.

B) The use of electric cars benefits the national economy in terms of sustainable development.

C) The use of electric cars is an innovative and environmentalist project in terms of economical use of resources.

D) The use of electric cars further slows down the recycling process in the country.

The question with the highest difference between the two groups in the correct answers given to the achievement test is 5th question. Although the number of correct answers of the students of the two groups was not very high in this question, the difference in favor of the experimental group (23 in the experimental group, 18 in the control group) is observed. The reason may

Table 4. Student Views on the Learning Contribution of the Field Trip.

Code	Sample	N	%
Acquiring new knowledge	S1: Yes, it did, I learned how it is done and how important recycling is.	15	50
Reinforcement of knowledge	S22: Yes, it helped me remember the transformation process of glass.	12	40
Ease of learning with practice	S14: Yes, it did, I understood the bead making process more easily when I watched it live and did it.	3	10

be that the information about the process in the question was repeated frequently by the craftsmen in the glass bead atelier.

Question 5: Which of the following is not expected to happen when recycling is done successfully in a country?

A) Since waste will decrease; environmental pollution is expected to decrease.

B) It is expected to contribute positively to the country's economy.

C) Products with reduced production costs are expected to be sold at higher prices.

D) The space required for waste storage is expected to shrink.

Findings from the Interview Questions on Informal Learning Environments

At the end of the course taught with the 4E teaching model, the students in the experimental group were given a form consisting of 6 open-ended questions to analyze their opinions about their experiences in the informal learning environment (related to the process in the Glass Bead Atelier). Firstly, the question "Did the visit to Nazarköy bead workshop contribute to your learning? Explain briefly." and all of the students expressed their positive opinions. The codes for their thoughts are "acquiring new knowledge" (50%), "reinforcement of knowledge" (40%) and "ease of learning with practice" (10%) (**Table 4**).

When the students were asked the question "How did you feel during the visit, how does it feel to teach in this way?", 86.5% of the answers were positive emotions, among which the state of being 'excited and joyful' came to the fore with 53.3%. While the percentage of expressing negative feelings was 13.5%, 50% of them expressed their thoughts about the temperature of the workshop environment and the remaining half about the working conditions of the craftsmen (**Table 5**).

When the students were asked the question "Were you able to find answers to the questions given by your teacher and/or the questions you had

Table 5. Students Emotional States in the Field Trip.

Theme	Code	Sample	N	%
Positive emotions (86.5%)	Excited and joyful	S28: It was very funny and exciting, I felt happy when I learned in this way.	16	53.3
	Willing to learn	S11: It was very nice to learn this way, let all lessons be like this.	5	16.7
	Surprising	S6: I may have been very surprised, the recycling of the beads created this feeling in me.	5	16.7
Negative emotions (13.5%)	Hot/Sweltering	S24: It was very hot inside, I felt overwhelmed by the heat.	2	6.7
	Exhausting	S13: Listening and trying to learn in a hot environment and the journey was tiring	1	3.3
	Sorrow for the hardships of the craftsmen	S7: It is very difficult for the craftsmen to work in that heat, I was upset about this situation.	1	3.3

Table 6. Students' Views on the Methods of Finding Answers to the Questions They Have in Their Minds / Questions Given by the Teacher in the Field Trip.

Code	**Sample**	**N**	**%**
Consultation with teacher/glass craftsmen	S10: Glass craftsmen answered all my questions very well.	12	40
In-group discussion	S13: I found the answer to a question I had while talking to my friend.	8	26.6
Both of them	S30: Both craftsmen and friends helped me find answers to my questions.	10	33.4

during the field trip and what did you do for this?", the codes "Consultation with the teacher/glass craftsmen" and "In-group discussion" were reached as a result of the answers given by the students. It is seen that 10 students gave answers including both codes. The rates of these codes are presented in **Table 6**.

When the answers to the question "What were the things that interested you the most during the trip?" were examined, it was realized that some students mentioned more than one interesting situation. The most interesting situation for the students was "the bead making process" with 38.48%, the second was "the temperature of the bead furnace and the environment" with 30.76%, while "the challenging conditions of the work" and "evil eye bead looms" were the other elements that attracted the attention of 15.39% of the students (**Table 7**).

The students were asked the question "What do you think is the difference between learning with this field trip and learning in a regular classroom?" and the students' answers regarding the difference between the

Table 7. Situations That Attracted the Students' Attention During the Field Trip.

Code	Sample	N	%
The Evil bead making process	S8: I was very interested in the stages of evil bead making and the colorful bead looms.	25	38.48
The temperature of the bead furnace and the environment	S29: It was very hot, I don't know how the craftsmen endure it	20	30.76
The challenging conditions of the work	S5: It is very difficult to work in this heat	10	15.39
The evil eye bead looms	S2: The process of cooling the beads on the looms	10	15.39

Table 8. Students' Views on the Difference Between Learning by Field Trip and Learning in the Regular Classroom.

Code	Sample	N	%
Funny	S18: Learning is sometimes fun in the classroom, but not as permanent.	14	46.6
Effective and permanent	S25: It is more effective to teach in such environments	7	23.3
Contributed to scientific process skills	S25: It was nice to be free when we wanted to make observations and ask questions.	3	10
Easy learning environment	S3: Classrooms have a closed and gloomy atmosphere and I can't focus on the lesson when they are talking in class, I gathered my attention more easily outside.	3	10
Challenging learning environment	S27: The environment was warm, I could understand more easily in the classroom.	2	6.6
No difference	S30: They are all the same for me, I can learn in both.	1	3.3

two learning environments were analyzed. Accordingly, 46.6% of the students found the field trip visit "funny", 23.3% found it "effective and permanent", 10% found it "contributed to scientific process skills" and 10% found it "easy learning environment". In addition, 6.6% of the group stated that the conditions of the workshop environment were "Challenging learning environment", while only 3.3% of the group, i.e. 1 person, stated "No difference" (**Table 8**).

When the students were finally asked the question "What do you think are the negative aspects of teaching with this kind of excursion visit?", 39.3% of the students said that there were no negative aspects, while 26.4% of the students stated the "physical conditions of the learning environment (temperature, width, etc.)", 13.2% stated that the "environment was tiring (standing)", 13.2% stated the "danger of traveling (traffic)", 7.9% stated that "the aim was to have fun rather than learning" (**Table 9**).

Table 9. Student Responses Regarding the Negative Aspects of Teaching the Lesson with Field Trips.

Theme	Code	N	%
Yes	Physical conditions of the learning environment (temperature, width, etc.)	10	26.4
	Learning environment was tiring (standing)	5	13.2
	Danger of traveling (traffic)	5	13.2
	The aim was to have fun rather than learning	3	7.9
No negative opinion		15	39.3

Conclusion & Discussion

In this study, the effect of using informal learning environments on student academic achievement level and student opinions on the use of informal learning environments in teaching the concept of "Wastes and Recycling" to 8th grade students within the scope of "Environmental Education and Climate Change" unit in science course were examined.

In this context, while there was no significant difference between the pre-test academic achievement averages of both the experimental and control groups before the lesson, the post-test achievement average of the experimental group was significantly higher after the lesson, and it is seen that informal learning environment activities that support formal learning positively affect learning.

There are many experimental studies in the literature that support this conclusion and show the positive effect of informal learning on academic achievement. Bozdoğan and Yalçın (2006) conducted an experimental study with 6th and 7th graders in the Energy Park and found that there was an increase in students' interest in science and academic achievement, and mentioned the positive effects of the tools and activities in the informal learning environment. Göğebakan (2008) states that the experience of seeing objects live and having information about them by seeing them provides the permanence of knowledge. Türkmen, Topkaç, and Atasayar Yamık (2016) took 5th grade students to Ege University Natural History Museum in the process of teaching the subject "Classification of Living Things and the Environment We Live in" within the scope of science course and concluded that informal learning environments had a positive effect on students' learning. Türkmen (2023) found in his study that the use of the Recycling Facilities in teaching 7th grade students the concepts of "household waste and recycling" increased the academic achievement of the students more than the lessons taught in the classroom. Özcan and Kara (2024) also stated that informal learning experiences on "waste and recycling" increase student

achievement by providing on-site learning, learning from experts and free learning experiences. In this context, there should be a separate course that includes topics related to Environmental Education and/or the lessons should not remain at the theoretical level in schools and should be taught in the form of field trips accompanied by questions that students can actively seek answers in order to increase the level of impact and permanence by transferring it to daily life (Güler, 2013).

After examining the student achievement levels within the scope of the study, the opinions of the students about the course taught in the informal learning environment were also taken, and in this direction, it is seen that the students primarily emphasized the positive aspects of informal activities such as fun, effective and permanent, and facilitating knowledge. While this situation is in line with the literature, there are similar studies in which students talk about the positive effects of informal learning environments. Kulalıgil (2016) states that teaching practices in informal learning environment increase students' motivation towards science learning, and the reason for this is that it attracts students' interest, arouses their curiosity, increases their willingness to learn, and reduces their anxiety about informal learning environments. The students in Demirel and Özcan's (2020) study stated that the trip to the Tropical Butterfly Garden was a very good experience that was fun, instructive, interesting and intriguing.

It is seen that students participating in informal learning activities are also negatively affected by the physical conditions of the informal learning environment such as temperature and crowd. The opinions expressed by the students in this context point to the disadvantage sub-theme of informal learning environments stated in Ocak and Korkmaz's (2018) study. In order to minimize these negativities, the conditions of the environment should be taken into consideration in the planning section and students should be provided with preliminary information about the environment (Baybars, 2017; Türkmen, 2018).

The students' consultation with experts (craftsmen) or in-group discussions while searching for answers to their research questions during the trip provided opportunities such as directing students to cooperation and supporting their scientific process skills. When the literature is examined, the importance of informal education in terms of increasing students' interaction with the environment, accessing and structuring knowledge is frequently emphasized (Açıkgöz, 2006; Dori & Tal, 2000; Öner & Güneş, 2017; Türkmen, Topkaç & Yamık, 2016). When this situation is considered in terms of environmental education, there are studies indicating that providing students with additional learning experiences in subjects such as recycling, environmental science and taking an active role in environmental issues increases success (Dere & Çinikaya, 2023).

Another striking result of the research is the students' responses in the form of acceptance of informal learning environments. As can be understood from the fact that they stated that they would like to come more often and in other lessons, it was concluded that informal learning environments are not preferred by teachers in formal education institutions despite their many positive effects. The reason for this situation may be that teachers do not prefer informal learning environments due to factors such as time, space, economic conditions, leave processes, and process dominance, as stated in Türkmen (2016).

As a result, in this study, the informal learning activities planned and applied in the Exploring phase of the 4E learning cycle made a positive difference in the academic success of the students, and it was determined that their opinions mainly included positive statements including qualities such as fun, facilitating, permanent. The fact that the students remained active in the process in a way to seek answers to the research questions within the plan in the informal learning environment enabled them to "take an active role in environmental problems", which is one of the main objectives of Environmental Education, and played an important role in increasing success.

Limitations

In terms of the limitations of the study, the long-term results of learning could not be evaluated because the implementation period was short. The scope of the study was limited to the subject of "Waste and Recycling" and other environmental education topics were not examined. Since the study covered a specific age group, the learning effects in different age groups were not evaluated. Finally, the findings are limited to a study conducted with students in a specific region and cannot be generalized to students in different geographical regions.

Recommendations

In line with the results of the research and limitations, the following suggestions can be made.

- Students can be given preliminary information about the informal learning environment to be visited in order to prevent possible negative feelings and situations that may arise in students about the environment.
- For an effective "teaching in informal learning environments", it is thought that teachers who will plan and implement it should be informed about pre-trip preparation, planning and post-trip evaluation, and for this purpose, environments that will

encourage teachers more should be created. In particular, in-service courses and seminars should be organized to explain the importance of making trips for teaching purposes.

- Since concepts such as recycling, recycling, waste reduction are intertwined concepts, it is thought that it is important to increase informal learning environment studies such as Glass Bead workshop in order for students to comprehend these concepts in depth and to acquire principles by associating them with daily life. However, in these environments, the information should not be transferred directly to the student, but the student should reach the information by using scientific process skills himself/herself in a way that they can be active, that is, by doing and experiencing. Without ignoring this situation, it is recommended that the environments should be organized and supported, if possible, in consultation with authorized persons.
- Research to be conducted in different informal learning environments that do not find much place in the literature from daily life (effectively and correctly matched and planned with the course curriculum) can bring a different perspective to education.

Reference

Açıkgöz, K.Ü. (2006). Aktif Öğrenme (Active Learning). Biliş Yayınları.

Akbulut, H.İ, & Çepni, S. (2013). Bir Üniteye Yönelik Başarı Testi Nasıl Geliştirilir?: İlköğretim 7. Sınıf Kuvvet ve Hareket Ünitesine Yönelik Bir Çalışma (How to Develop an Achievement Test for a Unit?: A Study for Grade 7 Force and Motion Unit). Amasya Üniversitesi Eğitim Fakültesi Dergisi,2(1), 18-44. https://dergipark.org.tr/tr/pub/amauefd/issue/1728/21171

Baki, A., & Gökçek, T. (2012). Karma yöntem araştırmalarına genel bir bakış (A General Overview Of Mixed Method Researches). Elektronik Sosyal Bilimler Dergisi, 11(42), 1-21. https://dergipark.org.tr/tr/pub/esosder/issue/6156/82721

Bıyıklı, C.& Yağcı, E. (2014). 5E Öğrenme Modeli'ne Göre Düzenlenmiş Eğitim Durumlarının Bilimsel Süreç Becerilerine Etkisi (The Effect of 5e Learning Model Designed According to Learning Experiences on The Science Process Skills). Ege Eğitim Dergisi,15(1), 45-79. https://doi.org/10.12984/eed.59097

Bonnette, R.N., Crowly, K. & Shunn, C.D. (2019). Falling in love and staying in love with science: ongoing informal science experiences support fascination for all children. International Journal of Science Education. 41(12), 1626-1643. https://doi.org/10.1080/09500693.2019.1623431

Bozdoğan, A.E. & Yalçın, N. (2006). Bilim Merkezlerinin İlköğretim Öğrencilerinin Fene Karşı İlgi Düzeylerinin Değişmesine ve Akademik Başarılarına Etkisi: Enerji Parkı (The Effects Of Science Centers On The Change Of "Science Interest" Levels Of Primary Education Students And On

Their Academic Success: Energy Park). Ege Eğitim Dergisi, 7(2), 95-114. https://dergipark.org.tr/tr/pub/egeefd/issue/4915/67282

Brown, K. (2019). Museums and Local Development: An Introduction to Museums, Sustainability and Well-Being. Museum International,71(3–4), 1-13. https://doi:10.1080/13500775.2019.1702257.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö.E., Karadeniz, E., Demirel, F. (2011). Bilimsel Araştırma Yöntemleri (Scientific Research Methods), Ankara: Pegem Publication.

Dawson, E. (2014). Equity in Informal Science Education: Developing an Access and Equity Framework for Science Museums and Science Centres. Studies in Science Education 50(2), 209–247. https://doi:10.1080/03057267.2014.957558

Demirel, R., & Özcan, H. (2020). Ortaokul Öğrencileri ile Bir Okul Dışı Öğrenme Ortamına Alan Gezisi: Tropikal Kelebek Bahçesi Örneği (A Field Trip To An Out-Of-School Learning Environment With Middle School Students: The Case Of Tropical Butterfly Garden). İnformal Ortamlarda Araştırmalar Dergisi, 5(2), 120-144. https://dergipark.org.tr/tr/pub/jrinen/issue/58397/710991

Dere, İ., &Çinikaya, C. (2023). Tiflis Bildirgesi ve BM 2030 Sürdürülebilir Kalkınma Amaçlarının Çevre Eğitimi ve İklim Değişikliği Dersi Öğretim Programına Yansımaları (Reflections of the Tbilisi Declaration and the UN 2030 Sustainable Development Goals on the Environmental Education and Climate Change Course Curriculum). OrduÜniversitesi Sosyal Bilimler Enstitüsü Sosyal Bilimler Araştırmaları Dergisi, 13(1), 1343-1366. https://doi.org/10.48146/odusobiad.1218188

Dori, Y., & Tal, R. (2000). Formal and informal collaborative projects: Engaging in industry with environmental awareness. Science Education, 84(1), 95–113.https://doi.org/10.1002/(SICI)1098-237X(200001)84::1<95:AID-SCE7>3.0.CO;2-W

Göğebakan, Y. (2008). Sanat Tarihi Öğretiminde Gösteri Yöntemi İle Gezi Gözlem Yönteminin Bilginin Kalıcılığı Açısından Karşılaştırılması-Eski Malatya Ulu Cami Örneği (Comparison of Demonstration Method And Field Trips Method in Teaching Art History in Terms of Retention of Knowledge-The Case of Ulu Cami in Ancient Malatya). Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 28(2), 197-221. https://dergipark.org.tr/tr/pub/gefad/issue/6747/90721

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. Educational Evaluation and Policy Analysis, 11(3), 255–274. https://doi.org/10.3102/01623737011003255

Güler, E. (2013). İlköğretim 8. sınıf öğrencilerinin çevre okuryazarlığı düzeylerinin belirlenmesi ve öğrencilerin okuryazarlığı düzeylerinin çeşitli değişkenler açısından incelenmesi(The determination of environmental literacy levels of 8th grade students and examination of students' environmental literacy level in terms of various variables). Master's thesis, Çukurova University. file:///C:/Users/EGE/Downloads/330166.pdf

Hacker, C. E. & Miller, L. J. (2016). Zoo visitor perceptions, attitudes, and conservation intent after viewing African elephants at the San Diego zoo Safari Park. Zoo Biology. 35, 355–361. https://doi: 10.1002/zoo.21303

Hung, D., Shu-Shing, L. & Lim, K.Y.T. (2012). Teachers as brokers: Bridging formal and informal learning in the 21st century. KEDIJournal of Educational Policy, 9(1), 71-89.

Katırcıoğlu, G. (2019). Okul dışı öğrenme ortamlarının 7. sınıf öğrencilerinin geri dönüşüm konusundaki doğa algısı ve bilinç düzeyine etkisi (The Effects of Out-of-School Learning Environments on Nature Perception and Consciousness Level of 7 th Grade Students on Recycling).Master's thesis, Pamukkale University.https://gcris.pau.edu.tr/bitstream/11499/26874/1/G%C3%BCll%C3%BC%20Kat%C4%B1rc%C4%B1o%C4%9Flu.pdf

King, P., & Howard, J. (2014). Children's perceptions of choice in relation to their play at home, in the school playground and at the out-of-school club. Children & Society,28(2), 116–127. https://doi.org/10.1111/j.1099-0860.2012.00455.x

Kulalıgil, A. (2016). Sınıf dışı öğrenme ortamlarında gerçekleşen öğretim uygulamalarının 5. sınıf fen bilimleri dersinde öğrencilerinin akademik başarı, yaratıcılık ve motivasyonlarına etkisi (The Effect of Teaching Practices Occurring in Out-of-Class Teaching Environments on Academic Success, Creativity and Motivation of Fifth Grade Science Class Students). Master's thesis, Pamukkale University. https://gcris.pau.edu.tr/bitstream/11499/930/1/Arma%c4%9fan%20Kulal%c4%b1gil.pdf

Milli Eğitim Bakanlığı (2022). Çevre Eğitimi ve İklim Değişikliği Dersi Öğretim Programı ve Kılavuzu (Ortaokul 6,7 veya 8. sınıflar). Talim Terbiye Kurulu Başkanlığı. Ankara.

Metin, M., & Bozdoğan, A. E. (2020). Fen Bilimleri Dersi Kapsamında Planetaryuma Düzenlenen Bir Gezinin 7. Sınıf Öğrencilerinin Akademik Başarı, İlgi ve Motivasyonuna Etkisi (The Effect of a Trip Organized In Planetarium on Science Course on Academic Success, Interest and Motivation of 7th Year Students). Gazi Eğitim Bilimleri Dergisi,6(2), 240-260.https://dx.doi.org/110.30855/gjes.2020.06.02.004

Görecek Baybars, M. (2017). Determination of Pre-Service Elementary School Teachers' Views About Out-of-School Learning. Researcher: Social Science Studies, 5(9), 218–229. https://dergipark.org.tr/tr/download/article-file/2151363

Ocak, İ., & Korkmaz, Ç. (2018). An Examination of The Views of Science and Pre-School Teachers on NonFormal Learning Environments. International Journal of Field Education, 4(1), 18-38. https://dergipark.org.tr/tr/download/article-file/492395

Öner, Z., & Güneş, T. (2017). Teachers' opinions about informal practices conducted as part of the 'let's travel and learn about the living world' unit. International Journal of Social Sciences and Education Research, 3(2), 583-594. https://doi.org/10.24289/ijsser.270662

Özcan, İ., & Kara, Y. (2024). Atıklar ve geri dönüşüm konusunun öğretimine yönelik okul dışı öğrenme etkinliklerinin başarı, kabul ve görüşler üzerine etkisinin araştırılması (Investigation of the Effect of out-of-School Learning Activities for Teaching the Subject of Waste and Recycling on Achievement, Perceptions and Opinions). Journal of Computer and Education Research, 12(23), 184-208. https://doi.org/10.18009/jcer.1409921

Özmen, H. (2008). Öğrenme kuramları ve fen bilimleri öğretimindeki uygulamaları(Learning theories and their applications in science teaching.) Çepni (Ed.), Kuramdan uygulamaya fen ve teknoloji öğretimi (Science and technology teaching from theory to practice) (pp. 33-98). Ankara: Pegem Yayıncılık.

Sellmann, D. & F. X. Bogner (2013). Climate Change Education: Quantitatively Assessing the Impact of a Botanical Garden as an Informal Learning Environment. Environmental Education Research, 19(4), 415–429. https://doi:10.1080/13504622.2012.700696.

Singer, F.M. ve Moscovici, H. (2008). Teaching and learning cycles in a constructivist approach to instruction. Teaching and Teacher Education, 24, 1613-1634.https://doi:10.1016/j.tate.2007.12.002

Stocklmayer, S. M., Rennie, L. J., & Gilbert, J. K. (2010). The roles of the formal and informal sectors in the provision of effective science education. Studies in Science Education, 46(1), 1-44. https://doi.org/10.1080/03057260903562284

Türkmen, H. (2010). İnformal (sınıf dışı) fen bilgisi eğitimine tarihsel bakış ve eğitimimize entegrasyonu. Çukurova Üniversitesi Eğitim Fakültesi Dergisi, 3(39), 46-59. https://www.researchgate.net/publication/331320854_Informal_Sinif-Disi_Fen_Bilgisi_Egitimine_Tarihsel_Bakis_Ve_Egitimimize_Entegrasyonu#fullTextFileContent

Türkmen, H., Topkaç, D. D., & Atasayar Yamık, G. (2016). İnformal Öğrenme Ortamlarına Yapılan Gezilerin Canlıların Sınıflandırılması ve Yaşadığımız Çevre Konusunun Öğrenilmesine Etkisi: Tabiat Tarihi Müzesi ve Botanik Bahçesi Örneği (The Effect of Field Trips to Informal Learning Environment on Learning of "Classification of Living Things": Case of the Natural History Museum and Botanical Garden). Ege Eğitim Dergisi, 17(1), 174-197. https://doi.org/10.12984/eed.20218

Türkmen, H. (2018). İnformal Öğrenme Ortamının Fosiller Konusunun Öğrenilmesine Etkisi: Tabiat Tarihi Müzesi Örneği (The Effect of Informal Learning Environment on The Learning of Fossils: Case of The Natural History Museum). Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi, 20(3), 137-147. https://doi.org/10.32709/akusosbil.417266

Türkmen, H. (2023). The Impact of Visiting a Recycling Facility on Students' Meaningful Learning. Pedagogia Jurnal Ilmu Pendidikan 21(2) (2023) 89-102. https://doi.org/10.17509/pdgia.v21i2.52854.

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APPENDIX

ENVIRONMENTAL ACADEMIC ACHIEVEMENT TEST

Question 1. Which of the following is the leading cause of environmental pollution?

A) Humans B) Plants C) Animals D) Inanimate beings

Question 2: Which of the following is a non-recyclable material?

A) Petroleum B) Plastic C) Tin cans D) Newspaper

Question 3. Environmental pollution poses a threat to which of the following?

A) People living in undeveloped countries

B) People living only in cities

C) Only wild animals

D) All living things on earth

Question 4: An electric car is an exhaust-free automobile driven by one or more electric motors using electricity stored in batteries and other energy storage devices. Which of the following statements about electric cars is incorrect?

A) The use of electric cars helps to reduce environmental problems.

B) The use of electric cars benefits the national economy in terms of sustainable development.

C) The use of electric cars is an innovative and environmentalist project in terms of economical use of resources.

D) The use of electric cars further slows down the recycling process in the country.

Question 5: Which of the following is not expected to happen when recycling is done successfully in a country?

A) Since waste will decrease; environmental pollution is expected to decrease.

B) It is expected to contribute positively to the country's economy.

C) Products with reduced production costs are expected to be sold at higher prices.

D) The space required for waste storage is expected to shrink.

Question 6: A group of researchers are preparing an article on the benefits of a successful recycling process. An excerpt of their paper is given below.

" With paper and derivative wastes recovered through successful recycling, approximately 4.100.000 trees can be prevented from being cut down. Similarly, 7.200.000.000.000 liters of water can be saved with recycled paper and derivative wastes. In this way ..... "

According to this, the parts left blank in the rest of the article can be filled with which of the following options?

A) Effective savings are achieved.

B) Extra energy is consumed during recycling.

C) There is a loss of quality in recycled products.

D) The need for raw materials increases.

Question 7: Which of the following is more compatible with the message intended to be conveyed in the next poster?

A) Increasing the use of raw materials by giving importance to recycling

B) Not using energy from renewable energy sources

C) Increasing activities on zero waste, conscious society and conscious consumers

D) Establishment of new industrial facilities in each city to ensure sustainable development in line with the desired plan

Question 8: Which of the following wastes can be recycled completely?

A) Cigarette butts, B) Waste oil, C) Copper wire, D) Glass jars

Question 9: Which of the following activities related to waste is different from the others?

A) Collecting and recycling electronic waste

B) Throwing old books and notebooks in the recycling bin

C) Reuse of waste glass by melting

D) Obtaining fuel from waste in an oxygen-free environment

If the sentence given below is true, mark it with D, if it is false, mark it with Y.

Question 10: (D) Recycling of wastes contributes to the national economy.

ORIGINAL ARTICLE

Teachers' Expectations Regarding the Family's Contribution to the Education Process in Special Education

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***Abstract**: This study aims to examine teachers' expectations regarding the family's contribution to education process in special education. This study was conducted with a qualitative research design. Accordingly, the study group consisted of 23 teachers (15 females, 8 male) working in totally 7 schools in the Karamürsel district of Kocaeli province in Türkiye. A semi-structured interview form was used as a data collection tool in the study. Content analysis was used to analyze the qualitative data collected through semi-structured interviews. The findings of the study were gathered under 4 main themes within the framework of the research questions. These themes were defined as; (1) expectations regarding what needs to be done in special education courses, (2) expectations regarding what needs to be done in school, (3) expectations regarding what needs to be done outside school, (4) expectations regarding what needs to be done for students receiving special education in rehabilitation centers. When the findings are evaluated in general, it was seen that teachers had expectations especially in terms of parent-teacher cooperation, and parents supporting both their children and teachers inside and outside the school by considering the physical and mental conditions of the students..*

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Introduction

TODAY, in some countries such as Türkiye, there is an education system that includes various levels of 12-year compulsory education (Şahin, 2023). In this system, family support and cooperation require the family and school to work in harmony with each other (Tschannen-Moran, 2001). Research shows that children spend approximately 11% of their time at school and 89% of their time with their families outside of school (Şahin, 2023; Ülker & Barış, 2019). It can be said that the family is one of the important factors affecting the quality of education given to students. In fact, some studies have shown that the family environment in which education is provided and supported makes significant contributions to student success (Wong, 2018). In general, studies approach the subject from two different perspectives. The first of these includes family-teacher communication as well as the participation of families in school communities and institutional activities at school. The second is aimed at investigating behaviours such as family helping with homework and child care (Rogers et al., 2009).

It is seen that the importance of family participation in the education process and school-family cooperation is understood in developed countries and is reflected in education policies. In the legal regulations made on this subject, certain responsibilities are assigned to both schools and educators and families (Erdoğan & Demirkasımoğlu, 2010). In order to create effective and successful school-family cooperation, the schools can organize various activities such as organizing home visits, planning activities such as trips, observations, and conferences for parents, teachers, and children, using parents as in-class resource persons, using parents for vocational guidance, scheduling and announcing meetings with parents, giving parents opportunities to use school resources, conducting surveys to obtain parents' opinions about the school, assigning tasks to parents in celebrating important days, having parents write for the school bulletin, organizing classroom demonstrations at certain intervals and ensuring that parents are informed about student performance in this way, and demonstrating a sample lesson to parents (Arslan & Nural, 2004; Erdoğan & Demirkasımoğlu, 2010). However, although the importance of the issue has been understood and reflected in education policies, there are some obstacles to the participation of families in the education process (Erdoğan & Demirkasımoğlu, 2010). On the other hand, Accardo et al. (2020), who stated that positive family-school relationships are associated with student success, also emphasized that establishing successful relationships with parents can be a difficult task for teachers. In some studies, teachers reported that they were not ready to involve parents in their children's education (Collier, 2015; Wagner et al., 2012). Moreover, many teachers report that they are afraid of

communicating with parents and see working with parents as an anxiety-provoking and stressful challenge (Gartmeier et al., 2017).

In contemporary societies, instead of schools or teachers that do not care about the family, an approach that shares the responsibilities of the family and the school should be adopted. In fact, the family is the most important stakeholder of the school (Şahin, 2023). In parallel, researchers have focused on the fact that the family's participation in education increases the academic and social success of children. However, the necessity of helping parents with the responsibility of educating their children has been adopted and cooperation between parents and schools has gained importance (Machen et al, 2005). This situation becomes even more important when children with special needs are considered. As known, individuals with special needs are individuals who differ significantly from their normal peers in terms of both their physical characteristics and learning abilities (İlgar, 2017). Due to these disadvantages, parents of children with special needs may face various difficulties throughout their lives, which can put stress on the family unit (Burke & Hodapp, 2014).

The cooperation of special education teachers and families is essential to support students with special needs (Accardo et al., 2020). In order for these students to benefit from the education provided in the educational institution at the highest level, parents must actively participate in the child's education and support this education at home (Taytak Küçük & Taşkın, 2023). Families are the first teachers and advocates of their children with special education. They actively play a role in the special education process and are key to ensuring children's social and sensory development and their self-confidence. The family, which has an important place in the education process of all children, is gaining more importance in the education of individuals with special needs, namely children. The duty of the family is to take an active role by being included in the individual education program that determines the path of their children in need of special education. At the same time, it is seen that some legal regulations have been made regarding special education (Gul & Ozay Kose, 2024, Özkan, 2024). In Turkey, with the Special Education Services Regulation in 2006, the educational services to be provided directly or indirectly to those in need of special education were established in detail. The regulation took its final form in 2018 (Özkan, 2024). It also included regulations regarding the active role of families in every aspect throughout special education and the provision of education (Kartal et al., 2024). However, such regulations and partnerships are often inadequate in practice, and teachers state that they are not sufficiently prepared to work with families. In addition, it is reported that parents' beliefs that they can increase their children's adaptive functioning and behaviour are positively affected by strong parent-teacher relationships (Accardo et al., 2020). At this point, the importance of the

Table 1. Descriptive Statistics of the Participants.

		f	%
Profession	Special education teacher	16	69.6
	Subject teacher	7	30.4
Gender	Female	15	65.2
	Male	8	34.8
Professional experience	0-5 years	7	30.4
	6-10 years	1	4.4
	11-15 years	4	17.4
	≥ 16 years	11	47.8
Professional experience in special education	0-5 years	12	52.2
	6-10 years	2	8.7
	11-15 years	4	17.4
	≥ 16 years	5	21.7

family's effects or contributions to the process in creating a positive teacher-family-school unity cannot be denied. In achieving this, determining teachers' expectations from families can contribute to the development of the mentioned cooperation.

Purpose of the Research

The purpose of this study is to determine teachers' expectations regarding the family's contribution to education process in special education. Considering the importance of the family in both the mental and physical development of children with special needs, determining the expectations of teachers from the family in schools where these children study can contribute to the detection and elimination of problems that may arise in this process. It is also thought that this study can serve as an example for similar studies to be conducted in the future.

Method

Research Design and Sample

In this study conducted with a qualitative research design, the study group was determined by the convenience sampling method. Convenience sampling is one of the purposive sampling methods. In this method, the researcher selects a case that is close and easy to access (Yıldırım & Şimşek, 2011). Accordingly, the study group consists of 23 teachers (15 females, 8 male) working in totally 7 schools determined by convenience sampling in the Karamürsel district of Kocaeli province in Türkiye (**Table 1**).

When **Table 1** is examined, 7 of the teachers are branch teachers (religion, science, Turkish, etc.) while 16 of them are teachers working in the field of special education. While the majority of the teachers have 16 years or more of professional experience, it is seen that more than half of them (52.2%) have very little experience in the field of special education.

Data Collection Tool

A semi-structured interview form was used as a data collection tool in the study. The interview form was developed by the researchers and included 4 open-ended questions to investigate the teachers' expectations regarding the families' contributions of students with special needs to education: (1) What are your expectations from parents regarding the courses you teach in special education?, (2) What are your expectations from parents regarding what needs to be done for students receiving special education in school?, (3) What are your expectations from parents regarding what needs to be done for students receiving special education outside of school?, (4) What are your expectations from parents regarding what needs to be done for students receiving special education in rehabilitation centers outside of school?. The questions were examined by two teachers (field teacher, special education teacher) in terms of language, scope, comprehensibility, etc. and were found appropriate for the purpose of the study.

Before the interview, the participants were informed about the purpose of the interview, how it would be conducted, and how long it would take. The interviews were conducted face-to-face. Each interview lasted approximately half an hour. All analyses were conducted in Turkish, but only the necessary parts were translated into English in this study. For example, the direct quotations from teachers' opinions given in the section "Discussion and Conclusion" were translated from Turkish to English.

Analysis of Data

In the study, content analysis was used to analyze the qualitative data collected through semi-structured interviews. In this process, the researchers examined the data several times to ensure reliability and grouped the data according to the main themes. Then, categories were determined by grouping similar and different views in each theme and the content analysis was completed. In some theme, more than one category was specified by the same teacher. Therefore, the total may exceed 23.

Table 2. Teachers' Expectations About What Needs to be Done in Special Education Courses.

Teachers' opinions	f	%
Control or provision of course materials	6	26.1
Repeating classroom work and activities at home	11	47.8
Helping with and checking homework	10	43.5
Supporting students' reading and writing skills	2	8.7
Teaching that classroom rules and negative behavior rules are also valid at home	2	8.8
Ensuring attendance	6	26.1
Supporting the child by allocating special time	5	21.7

Table 3. Teachers' Expectations About What Needs to Be Done in School.

Teachers' opinions	f	%
Requesting that playgrounds be built within the school	1	4.4
Supporting the teacher in the child's integration or communication with other students	3	13.0
Assisting the teacher in the development of the child's self-regulation and creativity skills	1	4.4
Cooperating with the teacher in every matter	8	34.8
Assisting the teacher in meeting the child's individual needs (such as the toilet)	3	13.0
Informing the school about changes in the child's mental or physical condition	2	8.7
Regularly attending parent meetings	2	8.7
Trying to get to know the child's friends or their families	1	4.4
Not comparing students with each other, accepting the child's situation	3	13.0
Showing more interest in the child	3	13.0
Correcting the child's misbehavior	1	4.4

Findings

The findings of the study were gathered under 4 main themes within the framework of the research questions. These themes were defined as; (1) expectations regarding what needs to be done in special education courses, (2) expectations regarding what needs to be done in school, (3) expectations regarding what needs to be done outside school, (4) expectations regarding what needs to be done for students receiving special education in rehabilitation centers. The teacher opinions gathered under four themes and the analysis results of the categories belonging to each theme are presented respectively. Accordingly, the findings regarding the teachers' expectations from parents regarding what needs to be done in special education courses are shown in **Table 2**.

When **Table 2** is examined, teachers' opinions on expectations from parents regarding what needs to be done in special education courses are grouped under seven categories. According to the findings, most teachers stated that parents should make more efforts in the areas of repeating the

Table 4. Teachers' Expectations about What to Do Outside of School.

Teachers' opinions	f	%
Making trips to nearby areas	1	4.4
Following the education process outside of school	7	30.4
Setting rules at home	1	4.4
Raising awareness of the negative attitude of society	1	4.4
Collaborating with the teacher outside of school	3	13.0
Accepting the child, not being ashamed	5	21.7
Sending the child to a rehabilitation center or other centers	4	17.4
Meeting the child's basic needs such as nutrition and cleaning	1	4.4
Spending quality time with the child during the day	4	17.4
Including the child in activities that will help them adapt to society (shopping, park, swimming, volleyball etc.)	4	17.4
Giving the child the opportunity to use the information they learn in class in their daily lives	3	13.0
Participating in courses or seminars that will contribute to the child's development and increase their awareness of their child	3	13.0

classroom work and activities at home (47.3%), helping and checking homework (43.5%), checking or providing course materials (26.1%), ensuring attendance in the course (26.1%) and supporting the child by allocating special time for them (21.7%). The findings regarding teachers' expectations from parents regarding what should be done in the school are shown in **Table 3**.

When **Table 3** is examined, teachers' opinions on expectations from parents about what to do for students receiving special education in school are grouped under eleven categories. According to the findings, the majority of teachers stated that parents should be in constant cooperation and communication with the teacher on every issue (34.8%). However, 13% of teachers stated that they expect more effort from parents in issues such as supporting the teacher in the integration or communication of the child with other students, helping the teacher in meeting the child's individual needs (such as the toilet), accepting their child's situation and not comparing students with each other, and showing more interest in the child. The findings of the study regarding teachers' expectations from parents about what to do outside of school are shown in **Table 4**.

When **Table 4** is examined, teachers' opinions on expectations from parents about what to do outside of school are grouped under twelve categories. According to the findings, the majority of teachers stated that parents should follow the education process outside of school (30.4%). On the other hand, most teachers stated that they should accept their children's situation outside of school as well as inside (**Table 3**) and should not be ashamed (21.7%). On the other hand, 17.4% of teachers stated that they expect more effort from parents in matters such as sending the child to a rehabilitation centre or different centers, spending quality time with the child during the day, and including the child in activities that will ensure their

Table 5. Teachers' Expectations Regarding What Should Be Done for Students Receiving Special Education in Rehabilitation Centers.

Teachers' opinions	f	%
Coordinating between the rehabilitation center and the school	14	60.9
Sharing the actions taken in the rehabilitation center with the teacher and the school	9	39.1
Making sure that the rehabilitation center is qualified	2	8.7

adaptation to society (shopping, park, swimming, etc.). The findings of the study regarding the teachers' expectations from parents regarding what should be done for students receiving special education in rehabilitation centres outside of school are shown in **Table 5**.

When **Table 5** is examined, teachers' opinions about expectations from parents regarding what should be done for students receiving special education in rehabilitation centers are grouped under three categories. According to the findings, the majority of teachers stated that parents should provide coordination between the rehabilitation centre and the school (60.9%). On the other hand, most teachers stated that parents should share the actions taken at the rehabilitation centre with the teacher and the school, while two teachers (8.7%) stated that parents should pay attention to the quality of the rehabilitation centre they send their children to.

Discussion and Conclusion

This study was conducted to determine teachers' expectations regarding the contribution of families with children with special needs to the education process. Individuals with special educational needs encounter various difficulties in their education life due to the difficulties created by their differences and are forced to change schools or leave the education system because of these problems (Küçük & Taşkın, 2023). It is important for schools and families to cooperate in overcoming the difficulties encountered by individuals with special needs. In these cooperation processes, teachers may need guidance and support to educate students, and also students and families may have similar needs (Taytak Küçük. & Taşkın, 2023; Wakeman et al., 2006). Teachers play an important role in providing them with the support they need. In this context, this study examined teachers' expectations regarding the contribution of families to the education process in special education.

The results of the study reveal that teachers who teach students with special needs have expectations from parents on various issues. These issues are grouped under four main themes. When the findings are examined in

detail, it is determined that teachers have certain expectations from parents regarding what needs to be done in special education courses. Most teachers emphasized the necessity of repeating classroom work and activities at home, helping with homework and checking. They also stated that parents should help with checking or providing course materials, allocating special time for their children and ensuring that the child attends class. When these findings are considered, it is clear that teachers want families to actively participate in the education process. Teachers may have thought that family participation in the education process will both reduce the teacher's burden and positively affect the child's cognitive development. The findings are parallel to the results of many studies in the literature (Epstein & Sheldon, 2002; Fishman & Nickerson, 2015; Forlin & Hopewell, 2006; Sheldon & Epstein, 2002). Erdoğan and Demirkasımoğlu (2010) also emphasized the importance of family involvement in the education process and stated that both educators and families should be made aware of this issue. Studies in the literature have also found that family involvement in the education process leads to a decrease in absenteeism (Epstein & Sheldon, 2002) and an increase in academic success (Erdoğan & Demirkasımoğlu, 2010; Jeynes, 2007; Sheldon, 2003). On the other hand, some teachers in the study expect parents to teach the child that the classroom rules and negative behaviour rules are also valid at home. In the study conducted by Sheldon and Epstein (2002), it was determined that there was a decrease in disciplinary incidents when families were included in the process. During the interviews, some teachers told that;

> *TM1 (Teacher Male-1): "…On days when we have classes, it would be beneficial for parents to check that the course materials are prepared before the students arrive at school...".*
>
> *TM3: "I am teaching a 'Technology and Design' course for special education students. This course is more focused on creativity and skill-based work. We need various tools and equipment to do these activities. We may need help and support from parents in this regard."*
>
> *TF7 (Teacher Female-7): "It is very easy to forget the information learned in special education. For this reason, reviewing homework and repeating the subjects taught to children at home by parents will be useful in reinforcing and making the information acquired permanent."*

In the study, teachers had expectations from parents not only what needs to be done in special education courses but also in some subjects that

should be done in school in general. The vast majority of teachers stated that parents should be in constant cooperation and communication with teachers in every subject regarding the school. In addition, teachers want parental support regarding some individual needs of the students. However, when the findings are examined in general, teachers argue that parents should be involved in the education-teaching process both in terms of the course and the school. This result shows that although the parent-teacher relationship is relatively weak in the course and school, teachers want this relationship to be developed. On the other hand, when the opinions of the teachers are examined, especially regarding the things that should be done in the school, it is seen that they mostly want support from parents regarding the individual needs of the students. However, some teachers stated that parents cannot accept the special situations of their children. This situation necessitates that families receive support in terms of raising awareness. When the findings obtained regarding the things that should be done in the school are evaluated in general, it is concluded that teachers support the participation of parents in the process. These results are supported by many studies in the literature (Accardo et al., 2020; Arnold et al., 2008; Fishman & Nickerson, 2015; Forlin & Hopewell, 2006; Johnsen & Bele, 2013). However, different research results that contradict the findings of this study have also been encountered (Christenson, 2004; Erdoğan & Demirkasımoğlu, 2010; Shannon, 1996; Walker & Dotger, 2012). For example, Shannon (1996) and Christenson (2004) stated in their studies that educators had negative attitudes towards families and did not believe in the importance of family involvement. According to the results of the study conducted by Erdoğan and Demirkasımoğlu (2010), teachers and administrators complained about families' unconscious behaviour regarding their participation in the education process. Teachers and administrators are uncomfortable with some parents intervening in their areas of expertise and pressuring them on what to do and how to do it, and therefore they tend to be lukewarm about the participation of families in the education process. According to Erdoğan and Demirkasımoğlu (2010), schools do not provide sufficient space for practices that will raise awareness of families on this issue and ensure their effective participation. For this reason, they recommended that seminars be organized for families on their responsibilities regarding participation in the education process. In fact, in a study conducted by Acardo et al. (2020), a Family Collaboration Project was included in a special education teacher education program course taken simultaneously with clinical practice in the field in order to prepare teachers who are capable of working with families. The results showed that candidates who participated in the experimental group understood teacher-parent collaboration better and learned communication skills better compared to candidates who did not complete the Family Collaboration Project. During the interviews, some teachers told that;

TM1: "Playgrounds can be built for students with special needs within the school. Parents can request this from the school administration."

TF2: "……. At the same time, if the child has needs, parents can help the teacher to meet only their basic needs without interfering with the child's education and training at school."

According to the results of the study, teachers stated that they have some expectations from parents not only in school but also outside the school. According to the findings, the majority of teachers stated that parents should follow the education process outside the school. Teachers stated that parents should make more efforts, especially in matters such as spending quality time with the child during the day and including the child in activities that will ensure their adaptation to society (shopping, park, swimming, etc.). Ensuring their children's participation in social life, providing opportunities and preparing the necessary environment are among the most important benefits that families can provide to their children in this regard. At this point, it is necessary to ensure that children with special needs participate in environments and activities where they can integrate with their peers (Özkan, 2024). In this way, children with special needs can develop as a whole, not only cognitively, but also emotionally and physically. During the interviews, some teachers told that;

TF11: "Parents should not limit students' education only to school. ……. In addition, they should direct the student to activities that will improve their development (such as swimming, volleyball, physical therapy, etc.)

TF12: "Providing the child with environments that are open to various sports activities or social events will contribute to the child's development. The more stimulating, the easier and more effective it will be to explore the child's interests."

TM4: "If the child is receiving education outside the school, parents should inform the school about the developments there."

Considering the above situations, the importance and contribution of rehabilitation centers cannot be denied. Indeed, teachers emphasized the importance of rehabilitation centers and stated that parents should play a role in ensuring coordination between the rehabilitation centre and the school. In addition, the quality of the rehabilitation centre has been identified as an

important issue that teachers emphasize. In fact, the results of the study conducted by Mengi and Enginoğuz (2024) revealed that parents of students with special needs face some difficulties in special education and rehabilitation centres. At this point, it is considered important to inspect such institutions. During the interviews, some teachers told that;

> *TF8: "Rehabilitation centres and schools need to progress in a synchronized manner, and parents need to take an active role in this process, ensuring continuity and helping the process to be completed efficiently."*

> *TF12: "Parents should follow the activities carried out in rehabilitation centres…."*

When the findings of the study are evaluated in general, it is seen that teachers have expectations especially in terms of parent-teacher cooperation, and parents supporting both their children and teachers inside and outside the school by considering the physical and mental conditions of the students. On the other hand, it has been determined that some teachers have deficiencies in terms of parents' negative attitudes, their inability to accept their children's situation, comparing them with other children and communication with the teacher. Based on these results, it can be said that cooperation and coordination between parents-school-teacher-rehabilitation centres should be increased. In order to achieve this, families should be made aware that education is a process that should not be left only to schools; that families are also responsible in this process and that quality education can only be provided with family participation (Erdoğan & Demirkasımoğlu, 2010). In this direction, the following suggestions are offered for future research:

- Parent-teacher communication should be improved and, if necessary, teachers should be given seminars for this.
- Families who cannot accept the inadequacy of their children should be directed to receive support.
- Family participation should be increased in supporting the child's physical needs, especially in the school.
- It has been determined in the study that family participation in the education process is low in some areas. In future studies, factors affecting family participation in the education process can be examined.
- Only teacher opinions were included in the study. In future studies, parent and administrator opinions can also be used.
- Inspections aimed at improving the quality of rehabilitation centers can be increased.

- More coordination should be provided between the rehabilitation centre and the school, and parent support should be obtained in this regard.

Reference

Accardo, A. L., Xin, J. F., & Shuff, M. (2020). Special education teacher preparation and family collaboration. School Community Journal, 30(2), 53-72.

Arnold, D., Zeljo, A., Doctoroff, G. & Ortiz. C. (2008). Parent involvement in preschool: predictors of involvement to preliteracy development. School Psychology Review, 37(1), 74-90.

Arslan, Ü. & Nural, E. (2004). Okul öncesi eğitiminde okul-aile iş birliğinin önemi [The importance of school-family cooperation in preschool education]. Milli Eğitim Dergisi, 162, 99-108.

Burke, M. M., & Hodapp, R. M. (2014). Relating stress of mothers of children with developmental disabilities to family-school partnerships. Intellectual and Developmental Disabilities, 52, 13-23.

Christenson, S. L. (2004). The family-school partnership: An opportunity to promote the learning competence of all students. School Psychology Review, 33(1), 83-104.

Collier, M., Keefe, E. B., & Hirrel, L. A. (2015). Preparing special education candidates to collaborate with families. School Community Journal, 25(1), 117-135.

Epstein, J. L., & Sheldon, S. B. (2002). Present and accounted for: Improving student attendance through family and community involvement. Journal of Educational Research, 95(5), 308-318.

Erdoğan, Ç., & Demirkasımoğlu, N. (2010). Ailelerin eğitim sürecine katılımına ilişkin öğretmen ve yönetici görüşleri. Kuram ve Uygulamada Eğitim Yönetimi, 3(3), 399-431.

Fishman, C., & Nickerson, A. (2015). Motivations for involvement: A preliminary investigation of parents of students with disabilities. Journal of Child and Family Studies, 24(2), 523-535.

Forlin, C., & Hopewell, T. (2006). Inclusion - The heart of the matter: Trainee teachers' perceptions of a parent's journey. British Journal of Special Education, 33(2), 55-61.

Gartmeier, M., Aich, G., Sauer, D., & Bauer, J. (2017). "Who's afraid of talking to parents?" Professionalism in parent-teacher conversations. Journal for Educational Research Online/Journal für Bildungsforschung Online, 9(3), 5-11.

Gul, S., & Ozay Kose, E. (2024). The opinions of prospective teachers about biology and nature-related activities for mentally disabled students. Science Insights Education Frontiers, 22(1), 3499-3512.

İlgar, Ş. (2017). Öğretmen adaylarının özel gereksinimli öğrencilerle ilgili farkındalığının incelenmesi (İÜ Hasan Ali Yücel Eğitim Fakültesi örneği) [An investigation of the awareness of teacher candidates about children with special needs (IU Hasan Ali Yücel Faculty of Educatıon Sample). HAYEF Journal of Education, 14(1), 313-338.

Jeynes, W. H. (2007). The relationship between parental involvement and urban secondary school student academic achievement: A metaanalysis. Urban Education, 42(1), 82-110.

Johnsen, A., & Bele, I. (2013). Parents of students who struggle in school: Are they satisfied with their children's education and their own involvement?. Scandinavian Journal of Disability Research, 15(2), 89-107.

Kartal, A., Alaybeyoğlu, M., Çolakça, A., Kesme, Ü., & Salan, D. (2024). Özel eğitimde ailenin katılımı ve rolü [Family participation and role in special education]. Socrates Journal of Interdisciplinary Social Studies, 10(43),

111-118.

Machen, S., Wilson, J., & Notar, C. (2005). Parental involvement in the classroom. Journal of Instructional Psychology, 32(1), 13- 16.

Özkan, E. (2024). Engelleri aşmak için el ele: Özel eğitimde ailenin önemi [Hand in hand to overcome obstacles: The importance of family in special education]. Socrates Journal of Interdisciplinary Social Studies, 10(41), 1-8.

Rogers, M. A., Theule, J., Ryan, B.A., Adams, G. R., & Keating, L. (2009). Parental involvement and children's school achievement. Canadian Journal of School Psychology, 24(1), 34-57.

Shannon, S. M. (1996). Minority parental involvement: A mexican mother's experience and a teacher's interpretation. Education and Urban Society, 29(1), 71-84.

Sheldon, S. B., & Epstein, J. L. (2002). Improving student behavior and school discipline with family and community involvement. Education And Urban Society, 35(4), 4-26.

Sheldon, S. B. (2003). Linking school-family-community partnerships in urban elementary school to student achievement on state tests. The Urban Review, 35(2), 149-165.

Şahin, M. (2023). The place and importance of family in Education. Milli Eğitim Dergisi, 52(240), 3195-3220.

Taytak Küçük, E. & Taşkın, P. (2023). School principals' perspectives on parental involvement in the educational process in special education. Trakya Journal of Education, 13(2), 1471-1490

Tschannen-Moran, M. (2001). Collaboration and the need for trust. Journal of ducational Administration, 39(4), 308-331.

Ülker, M., & Barış, E.T. (2019). Relationship between school, family and environment, according to school principals' views. Educational Research and Reviws, 15(3), 115 122.

Wagner, M., Newman, L., Cameto, R., Javitz, H., & Valdes, K. (2012). A national Picture of parent and youth participation in IEP and transition planning meetings. Journal of Disability Policy Studies, 23(3), 140-155.

Wakeman, S. Y, Browder, D.M., Flowers, C. & Ahlgrim-Delzell, L. (2006). Principals' knowledge of fundamental and current ıssues in special education. NASSP Bulletin, 90(2), 2006 153-174.

Walker, J. M. T., & Dotger, B. H. (2012). Because wisdom can't be told: Using comparison of simulated parent-teacher conferences to assess teacher candidates' readiness for family-school partnership. Journal of Teacher Education, 63(1), 62-75.

Wong, W.L. (2018). Associations between fathers' work-to-family spillover and their ways to track children's whereabouts and doings: A Hong Kong study. The Journal of Men's Studies, 27, 204-221.

Yıldırım, A., & Şimşek, H. (2011). Sosyal bilimlerde nitel araştırma yöntemleri (8. Baskı) [Qualitative research methods in social sciences (8th ed)], Seçkin yayıncılık.

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REVIEW

A Review of Empirical Studies of the Effects of Double Reduction Policy

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***Abstract**: The Double Reduction policy represents a significant educational reform endeavor of the Chinese government to alleviate the overly heavy burdens of homework and off-campus training for compulsory education students. Using the method of literature review, this study surveys the existing empirical research on the effects of the policy on the students, parents, and teachers to find that it has a positive effect on student all-round development by reducing their academic burdens, whereas it also faces challenges, such as less ideal after-school services, persistent education anxiety in the parents, and increased workloads for the teachers. The study proposes recommendations for improving the policy's implementation, including enhancing the digital educational resources, strengthening home education guidance, and bolstering teachers' well-being via multi-agency efforts.*

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Introduction

THE ONEROUS academic burdens in Chinese primary and secondary education have negatively affected the physical and mental development of the students as well as the quality of China's compulsory education. Ma and Yang (2015) classify student academic burdens into three categories: (i) time- and energy-consuming burdens induced by school curricula and off-campus training; (ii) excessive cognitive burdens caused by unscientific instructional methods and arrangements; (iii) psychological burdens from overly frequent tests and the attendant performance rankings. The Chinese educational authorities have made a lot of efforts to alleviate student academic pressures, such as implementing curricular reforms and strengthening in-service teacher training to optimize pedagogical methods to mitigate students' cognitive loads and setting limits to the incidence of tests and exams while also prohibiting the public ranking of test results in compulsory students (Cheng, 2018). However, disproportionate homework and off-campus training burdens remained the pronounced, persistent issues at the compulsory education level (In China, compulsory education consists of primary and junior secondary education). These burdens deprived students of their leisure time and their self-motivation in learning as well (Zhou & Qi, 2022). Furthermore, out-of-school tutoring adds financial pressure to parents by increasing home educational expenses, and excessive homework exacerbated the workloads of the teachers, who needed to spend a lot of time marking student homework and explaining the marking results to them.

To address these issues, the central government of China released the *Opinions on Further Reducing the Burden of Homework and Off-Campus Training for Compulsory Education Students* (also referred to as the Double Reduction policy) in July 2021, which emphasizes the importance of strengthening the role of the schools as the primary education institutions and regulating the off-campus training and tutoring services and underlines the significance of high-quality after-school services for student holistic development and healthy growth (State Council of China, 2021). In response to the Double Reduction policy, regional governments have also advanced a series of moves to alleviate academic burdens on students. For instance, a portion of schools in Zhejiang Province try to control the volume of homework, stratify and individualize assignments, and give prompt feedback by employing digital tools, thereby improving the efficiency and effects of homework (Lin et al., 2022). Despite high expectations for the policy's outcomes, several challenges have arisen during its implementation. For example, the popularization of after-school services has largely increased the teachers' working hours and duties (Long et al., 2021). Additionally, certain researchers noted that the Double Reduction policy was not the first of its

kind in the recent history of Chinese education. Prior academic burden reduction programs have typically gone through a cycle as follows: "excessive burden → reduction → renewed burden → repeated reduction" (Zhou & Qi, 2022). The current program has instigated concerns in academia for the consistency and endurance of its execution.

Since the policy's release nearly four years ago, many empirical studies have been conducted to examine its outcomes. By reviewing these empirical studies, this article seeks to investigate the effects of the policy on student learning, home education, and teacher well-being. Using the search words "Double Reduction policy," "academic burden reduction measures," "primary and secondary school students," "parents of compulsory education students," "primary and secondary teachers," and "compulsory education," we searched for literature in the China National Knowledge Infrastructure (CNKI) and finally obtained 17 empirical studies relevant to our research topic. Based on their research findings, this survey summarizes the achieved outcomes and analyzes the existing challenges of the program, with a view to providing implications for further optimization of its implementation.

A Brief Overview of the Double Reduction Policy

The overarching goal of the Double Reduction policy is defined as enhancing students' school-based learning by improving the teaching quality and service level of compulsory education schools and systematically regulating training and tutoring services of private institutions (State Council of China, 2021). To reach this goal, the policy proposes the following measures:

- *The schools lighten students' homework burden by controlling and coordinating the total amount of homework and aligning the difficulty of homework with the curriculum standards*. No written homework is to be assigned to first and second graders; homework completion time for third to sixth graders and junior secondary students should not exceed 60 and 90 minutes, respectively. The teachers should be encouraged to assign stratified, personalized, and flexible homework to the students. Additionally, the students should be given adequate homework completion direction to ensure that primary school students can basically complete homework, and junior secondary school students finish doing most homework on the campus.
- *The schools elevate the level of after-school services by pooling resources available to broaden the spectrum of after-school activities (including homework tutoring, physical exercise, mental health education, club activity, etc.) to meet diverse needs of the students*. After-school services should finish no earlier than the

general off-work hour of the local workers, with extended care services available if needed. It is mandatory for the school to develop a detailed after-school service scheme that explicitly lay out service content and forms and not to deliver new lessons during after-school sessions. The teaching staff should be the primary providers of after-school services, while retired teachers and professionals from outside the school can also be engaged to help with these services. Furthermore, the schools can leverage community resources and public venues to enrich their after-school services, and local education authorities have the responsibility to sponsor the development of high-quality digital educational resources as free offerings to the students.

- *Heighten regulation of private training and tutoring services*. Private training institutions are prohibited from conducting advanced teaching or organizing "subject-based" training programs (for subjects included in the national compulsory education curriculum like Chinese language, mathematics, and English) during national holidays, weekends, or winter or summer breaks; non-subject-based training institutions, such as those offering training on martial arts, painting, musical instruments, or programming, are not allowed to provide subject-based training services. Local authorities shall not approve additional subject-based training institutions targeting compulsory education students. Existing subject-based training institutions are to be uniformly registered as non-profit organizations and are prohibited from going public for raising funds. Educational authorities are responsible for creating registration and monitoring systems to supervise teaching materials of these institutions and prevent illegitimate advertising and vicious competition in the training sector.
- *Narrow inter-school disparities in educational quality. Regional governments are accountable for supporting the development of education groups and urban-rural education communities to close gaps between compulsory education schools*. Local educational authorities need to direct schools to improve their teaching arrangements and management to optimize students' learning outcomes within the school. Senior secondary school admission should take account of both the student's results in the entrance examination and their comprehensive competence. Schools and teachers should not be solely evaluated by the progression rates in students. The school district's performance in implementing the Double Reduction strategy is treated as an essential measure of their compulsory education work, with the after-school service participation rates in students and the reduction in home expenditure

on off-campus tutoring being incorporated as significant indicators in the evaluation framework.

Other supporting moves include increasing funding for after-school services and teacher compensations; encouraging family-school-community co-education and accelerating the construction of community centers for home education guidance; heightening regulation of training service advertisements targeting school-age children, with prohibition of their appearance in mainstream media and public places.

The Policy's Effects on Students

The effect of the Double Reduction program in easing the burden of homework and the impact of after-school services on student development are the topics receiving the most discussions in the "Double Reduction" literature, as the compulsory education students are the direct subjects of the program. According to the research findings of the studies included in this review, the program is significantly effective in reducing academic burdens on the students (Ning & Yang, 2022; Jin, 2022; Liu & Zhao, 2022; Zheng, 2024). Research also demonstrates the positive impact of after-school services on student holistic development; yet, students' satisfaction with these services is lower than expected (Wang & Chen, 2024; Fu & Zhang, 2023; Liu, Z., 2023; Yin, 2023; Gong, 2022).

In the wake of the policy's introduction, the volume and difficulty of homework have both significantly decreased in primary and secondary students, leading to the increase in their leisure time. The drop in the quantity of homework results in alleviated academic pressure in the students (Jin, 2022); the lowered difficulty of assignments helps diminish their aversion to homework while enhancing their senses of fulfillment in doing it, successfully mitigating their learning anxiety (Ning & Yang, 2022). Nevertheless, some students in certain regions claimed that they had not experienced any reduction in homework burdens, with some even reporting increased academic pressure (Zheng, 2024). That may be because some students need to do homework assigned by their parents despite the reduction in assignments from their teachers, and some parents even utilize the increased free time of their children to enroll them into more off-campus tutoring programs. Another reason may be that among higher-grade students who are preparing for the school progression, the quantity and difficulty of homework remain basically the same as before the introduction of the policy.

Furthermore, most of the studies included suggest that after-school services have positive impacts on student all-round development. As per Zhaofeng Liu's (2023) investigation, the majority of students polled reported the significant difference the after-school services made to their personal growth, such as the increased capacity for independent completion of

homework and the development of favorable habits. Fu and Zhang' (2023) research findings demonstrate that after-school services are a major contributing factor in students' physical and mental health development. Yin (2023) focused on investigating the benefits of after-school sports to find that student participants experienced noticeable improvements in BMI, body fat percentage, lung capacity, endurance, strength, and reaction, though with gender differences in physical flexibility and explosive power enhancement. Despite their benefits revealed by research, student satisfaction with on-campus after-school services is lower than expected. While a small number of schools have deployed colorful, engaging after-school programs (Gong, 2022), most schools confine the arrangements and delivery of after-school services within their campuses, seldom utilizing external resources, such as science museums, youth palaces, museums, and other education bases, or online resources to diversify their offerings (Wang & Chen, 2024). As a result of the limited choice of after-school activity, some students even prefer doing homework to participating in those monotonous club or outdoor activities in after-school sessions (Ning & Yang, 2022). These findings underscore the necessity of exploring better-designed, more innovative after-school services to better serve the diverse needs of students.

It is noteworthy that students' misconceptions of the policy and the term "burden reduction" can compromise the outcomes of the program. According to Jin's (2022) study, a portion of students equated "burden reduction" to "zero burden," rarely paying serious attention to written assignments from their teachers, which end up in severe declines in academic achievements. Hence, it is important for the school and teachers to help their students develop proper understanding of the purpose of the policy, which is to get rid of repeated, ineffective work to allow them to devote more time to their interests and to all-round competence development, rather than simply reducing learning tasks. In the meantime, the teachers should also educate their students to cultivate appropriate learning methods and habits to increase active engagement in on-campus learning.

The Policy's Impacts on Home Education

The implementation of the Double Reduction program has not only brought reforms to school education but has also considerably affected home education. Studies included in the review have investigated the effects of the program on parental education anxiety and home education expenses, as well as parents' perceptions of the program's outcomes. Their research findings reveal that the strategy has mitigated education anxiety in the parents to varying degrees and reduced the families' out-of-school education expenses (e.g., Liu, 2024; Liu, J., 2023). The majority of parents showed positive attitudes towards the policy and recognized its significance for compulsory

education enhancement (e.g., Shi et al., 2022; Ding, 2021). Nonetheless, because the program brought changes to the students' study routines and habits, a portion of the parents struggled to adapt to the new pattern of home education in the short term, feeling concerned about the program's prospects (e.g., Ning & Yang, 2022; Liu & Zhao, 2022).

First off, the Double Reduction program has a noticeable impact on parents' involvement in child learning. The provision of after-school services, particularly the on-campus homework tutoring, has significantly lightened the burden of homework tutoring on parents, thereby reducing their education anxiety (Liu, 2024; Ding, 2021). In Gong's (2022) investigation, approximately 70% of the parents surveyed reported the program had mitigated their education anxiety, whereas it was not the case for the rest. This may be because homework completion is only one of the educational concerns in the parents, who are, meanwhile, suffering worries of child school progression and academic competition. In the meantime, the program's introduction has resulted in less use of off-campus training services in a portion of the parents, although a sizeable number of them feel the need to adhere to the prior out-of-school tutoring arrangements, with some of them even enrolling their children into more private tutoring programs since the latter have more spare time in the wake of the policy's release. According to Junyan Liu's (2023) survey, among parents who were paying for off-campus tutoring, 28.2% would continue to use the chosen programs, and 9.5% intended to enroll their children in additional courses. Pang et al.'s (2025) study finds that parents' socioeconomic status (SES) mediates the effect of the policy on home expenditure on off-campus tutoring. Specifically, the Double Reduction program is effective in reducing out-of-school tutoring expenses of middle and low-SES households, but without significant effect on those of high-SES families.

Regarding their perceptions of the Double Reduction program, the parents rate the provision of after-school services as the most valuable among all its moves. Most parents are satisfied with the outcomes of after-school services, claiming that they are beneficial to the children's learning and day-to-day life by assisting with the diversification of interests and cultivation of favorable behavioral habits (Shi et al., 2022; Ding, 2021; Gong, 2022). On the other hand, parental views vary on the outcomes of other moves like homework burden reduction and strict regulation of off-campus training services. Some parents said that the eased homework burden and reduced out-of-school training participation allowed their children to spend more time on rest, physical exercise, and interest development, facilitating their all-round growth (Liu & Gao, 2024; Ning & Yang, 2022), whereas others are concerned that reduction in academic workload and limited access to private tutoring may lead to declines in student academic performance, potentially hindering children's academic advancements (Liu & Zhao, 2022).

Researchers also analyzed the reasons for these worries: (1) A considerable number of students, lacking the self-regulation ability, may not use the increased leisure time for productive activities but instead, spend it on ones that can easily induce addictive behavior, such as social media browsing and online gaming (Ning & Yang, 2022). (2) Many parents relied heavily on off-campus training services because of their inability to provide their children with proper tutoring at home (Liu & Zhao, 2022). The limited access to off-campus training as a result of the execution of the Double Reduction strategy, in a certain sense, poses higher requirements for home education, imposing psychological pressure on this group of parents, who may have to seek for more private training opportunities for their children. (3) With the tradition of exam-focused education in China, some parents see the heavy loads of homework and extra tutoring after school as the key pathways to academic success (Jia et al., 2023), thus feeling uneasy about the program's moves to reduce the academic burdens on children.

The Policy's Impacts on Teacher Well-Being

The Double Reduction strategy raises the standards for teachers' work, and the across-the-board implementation of the program is somewhat at the expense of their well-being. First, the provision of after-school services increases teachers' working hours and workloads, and the reduction in homework assignments requires greater instructional design capacity, adding complexities to their responsibilities (Zhou et al., 2024). Particularly among homeroom teachers, longer working hours and increased administrative duties have subjected them to greater pressure in comparison with regular teachers. According to Liu and Zhao's (2022) investigation, one-third of homeroom teachers polled reported lowered intention to continue with the role after the program's introduction. Furthermore, in schools that have the issue of uneven teacher staffing, certain teachers are required to provide tutoring irrelevant to their specialties in after-school service sessions. For instance, Chinese language teachers may be assigned to supervise art clubs. Additional workloads like this render them more prone to professional burnout, and such a way of staffing the after-school services undermines the outcomes of after-school activity (Wang & Chen, 2024). Second, the teachers received insufficient compensations for the additional workloads induced by the Double Reduction program. According to Ding's (2021) investigation, the majority of the teachers surveyed claimed their responsibilities in after-school services are disproportionately undercompensated, with only 9% being happy with the current level of compensations, pointing to low satisfaction of the teachers with the rewards they get for their engagement in after-school services. Similar findings have been documented by other studies (Liu & Zhao, 2022; Zhou et al., 2024;

Gong, 2022). Although many researchers had raised their concerns for the funding issue and proposed relevant measures before the across-the-board implementation of the program (Yu & Yang, 2022), the schools and educational authorities still failed to provide adequate support for the teachers in the enactment of the program. Moreover, the school's immature management system for after-school services has compromised the teachers' work efficiency in these services (Shi et al., 2022) while also disrupting their regular teaching responsibilities and professional development. Third, the teachers' longer working hours in the school means reduced time for their own families. As an adult family member, the teacher has their own home education issue and other household responsibilities. The increased workplace burdens under the Double Reduction policy make it more difficult for the teachers to strike the balance between work and home commitments (Zhou, 2024).

Despite the challenges of the program's implementation, the teachers have identified themselves with its goals and fully realize its significance for student all-round development (Shi et al., 2022). Still, they hold mixed views of the specific practices in the execution of the policy in the face of issues like increased workloads and low compensations. The schools and education departments should actively explore solutions to issues like these.

Discussion

The review of Double Reduction literature reveals that the policy has produced positive effects in certain areas. Homework burden alleviation makes the development of non-academic competence in students possible; mitigated parental education anxiety has led to the reduction in home expenditure on child out-of-school training. On balance, the education community is getting closer to the realization of the policy's ultimate goals.

On the other hand, the Double Reduction program, as a major educational reform endeavor, faces a lot of challenges. There are conflicts between the traditional pursuit of exam-focused education and academic achievement-first education and the program's advocate for prioritizing student competence development and healthy growth (Zhou & Qi, 2022), which caused much confusion among the students and parents at the initial stage of the program. A considerable number of the parents had the worry that the reduction in homework and off-campus tutoring might negatively affect child academic performance and school progression; some students were at a loss what to do with the increased free time as a result of the drop in learning tasks. In addition, the Double Reduction program has elicited additional work burdens to the teachers, who have not received proper compensations and support correspondingly. This is not favorable for encouraging active engagement in the program in the teachers or ensuring

the sustainable development of the strategy. In response to these challenges, we propose the following recommendations:

Strengthening Educational Technology Use: Increasing the provision of digital educational resources and intelligent learning tools can help improve the availability and diversity of learning materials for compulsory education students, assisting with the development of self-directed study ability and comprehensive competence in them. It can also diminish parents' worries about their children's academic success. Developing digital technology-enabled home-school co-education tools to offer services like online specialist consultations and live-streaming thematic activity will lead to the increase in parental confidence in school education. Furthermore, intelligent homework design and assessment tools can be used to optimize the procedure of assignment management, supporting the creation of personalized tasks and automation of marking and diagnostic feedback (Ke et al., 2022), which may contribute to the alleviation of the teachers' workloads.

Enhancing Home Education Guidance: Helping parents develop scientific notions of education is beneficial to the enactment of the program. First, it is important to guide parents to look at the value of education from the perspective of holistic development, raising in them the awareness of inherent individuality and uniqueness in children, the harm of the utilitarian attitudes towards children's test scores, and the importance of cultivating extensive personal interests and favorable learning habits (Bian & Zhang, 2022). Second, parental education on knowledge about child development can prevent parents from being misled by illegitimate recommendations from those mercenary training institutions, such as advanced learning (requiring children to study materials intended for the next grade or even next education phase), teaching materials with inordinately high levels of difficulty, and over interference in children's autonomous learning. Third, it is advisable to boost the effects of home education guidance by using a diverse variety of devices, such as the parental school, parents committee, and dedicated phone line or e-mail address, which can potentially assist parents in releasing their education anxiety (Yu & Yao, 2022).

Alleviating Teachers' Work Pressure via Efforts of All Stakeholders: To sustain the program's implementation, the school and education department should adopt the flexible working-hour policy to increase the flexibility of teachers' schedules and ensure they enjoy adequate rest. In the meantime, it is imperative to elevate the teachers' compensations to heighten their identification with the program as well as their job satisfaction. It is also important to educate parents to comprehend the division of responsibility between home and school education and respect teachers' role as professionals. At the community level, all sectors ought to be mobilized to support the advancement of the program with their respective resources,

particularly public institutions like youth palaces and adolescent activity centers, which can be deeply engaged in providing diverse after-school services to assist student all-round development.

Conclusion

The article analyzes the impact of the Double Reduction policy on compulsory education students, their parents, and teachers by reviewing relevant empirical studies. The program is effective in alleviating student academic burdens and is well-received by the majority of the parents. While it brings positive changes to the educational ecology, it fails to pay adequate regard for the teachers' well-being, which constitutes a potential threat to its sustainability. Handling issues that arise in the enactment of the program warrants the joint efforts of the schools, families and the community. Relentless efforts to improve the program will culminate in a significant elevation of the teaching and service standards of compulsory education schools.

The study's literature search may not be sufficiently exhaustive, which can compromise the generalizability of its conclusions. Also, the study is confined to examining the outcomes of the Double Reduction program and challenges of its implementation from the standpoints of the students, parents, and teachers, without delving into systemic issues, such as the coordination between various measures, optimal allocation of educational resources, and evaluation and supervision mechanisms. Issues like these are pending further research.

It is noteworthy that prior empirical studies in the literature primarily adopt the questionnaire survey as the data collection method, which raises issues like the representativeness of the sample and objectivity of the data. We suggest that future research use more integrative approaches that blend the interview, case study, experimental study, and more to enhance the objectivity and generalizability of research findings. Furthermore, most studies included in the review draw on samples from developed regions without paying enough attention to underdeveloped areas. Certain researchers have observed that despite its mandatory nature, the program's implementation in underdeveloped regions is less ideal than expected due to factors like backward economic conditions, inadequate fiscal funding, and a dearth of supporting policies (Shi et al., 2022). Hence, more specialized investigations targeting the program's enactment in underdeveloped areas and comparisons of its outcomes across different regions are needed in the future.

References

Bian, Y. & Zhang, X. (2022). The provision of home education guidance under the Double Reduction policy. China Educational Technology, 2022(5), 8-12+34. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCAZ3_Ev7JOi7qPhBGkEFjnOPW194E23AZFrdhm9yDdMDc_DEIlH9dIzM6slHYeiuWF18eW-DZY412H-wrGbP_iKmgEuKuCrHtRwCRH2xsCoNfgj_d2X3uxCFNfh0ar263V44zwmk-hnQgNLtJYXug0qOmZt6NynCXNpm4UpTdEfKw==&uniplatform=NZKPT&language=CHS

Cheng, Q. (2018). Prohibiting the exhibition of the rankings of students' exam results to maintain the dignity of education. Educators, 2018(4), 20. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCCub8B_dFQeEigAaQXDAZGdflthbFJgRNVpBjpymPyH_t8Mi83TwU0QOglaOt3BB43CqgD8nwqPX6KMlydUEjaAnn_MA2MGL99h2SmynMUtWKrusKtFlq3_2GouEx7CD99iWqsfuYpVfaAsBP1p_Jt08iURAwd53LsBpR5OE-p3Dg==&uniplatform=NZKPT&language=CHS

Ding, Q. (2021). "5+2" after-school services in primary schools under the Double Reduction policy (master's thesis). Tianjin Normal University. Available at: https://link.cnki.net/doi/10.27363/d.cnki.gtsfu.2021.000743

Fu, W. & Zhang, S. (2023). The role of after-school services in supporting students' physical and mental health development under the Double Reduction policy: An empirical study of 30 counties (districts) in six provinces in eastern, central, and western China. Educational Science Research, 2023(1), 14-21. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCAHP10JdvPKsgY4ME2WPp8LBYA_aKOgEmV_LBLO10hKDDX3SVA9XJUXOOObaL8tBohKZZnvmGYSAgtsijRWlORHzlbzjvSW4OZCpDSCkAuXVAKZDgvYii5iafnLs4YxR8N3gn_pYsp19dKatYinelnwAxzSJlAv-6p4iPSoWCOdng==&uniplatform=NZKPT&language=CHS

Gong, L. (2022). The Implementation of After-school Services in Primary Schools in Shanghai under the Double Reduction Policy (master's thesis). Shanghai Normal University. Available at: https://link.cnki.net/doi/10.27312/d.cnki.gshsu.2022.001281

Jia, W., Qu, C., & Cai, Q. (2023). Does parental homework anxiety remain under the Double Reduction policy? An empirical study of 1648 parents in nine districts of C city based on grounded theory. China Educational Technology, 2023(5), 95-104. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCAf9geBtE35mLVoYA4P8Jjh6qyGeOe5BObIkeTJOfolbX9VCPk4a2E5K9pHHstIIxXtNJ8WCZ63js9sAhxY-cfXW2LSEXsKq1vkaTd38scfjQY_oTyjNeS9hWLwS4fdALRbTUulNGKH-fkASS5KXiH4kDYLr3F8arPWoETyn2C9aw==&uniplatform=NZKPT&language=CHS

Jin, M. (2022). An Empirical Study on How to Ease the Burden and Enhance the Effects of Homework in Primary Mathematics Education under the Double Reduction Policy (master's thesis). Xi'an Foreign Studies University. Available at: https://link.cnki.net/doi/10.27815/d.cnki.gxawd.2022.000491

Ke, Q., Bao, T., & Lin, J. (2022). The supply of digital education resources and service innovation under the Double Reduction policy. China Educational Technology, 2022(1), 17-23. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCA-OE_58bUlTOUw--KBIQlLAUnvDqvLT66VDlfBxsj2t0braUxCilAmndxygyqDjF3Sg1CkNTj5mpWTWcgg3syCKKy7YCUagUwifedw17hbr6qpgu_S3a_6LLDd-IISqdC11E9r4__3sqv2dms5SIjmTjqJNUl04oV4Jl3sFH1dug==&uniplatform=NZKPT&language=CHS

Lin, L., Le, N., Chen, K., Zhang, J., Chen, W., & Wen, S. (2022). Digital technology-powered implementation of the Double Reduction policy: Practical exploration of digital processes of homework completion. China Educational Technology, 2022(4), 34-39. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCC1Y4IHVOLvPiCdNks5hE-XegbU9qcEj-8n_0OnPlSAf0zPNm9NqZ5RIOxWvPaxdjYJgo6t3_pyZhada7q0XBon0Nd1cPTzRKWytOZl70KnDwsM6kiZaROFHHqJNfAzPx40AJ2xNJL5gragHYKCMiOG3hFACRQ-_hrWhTAFM5BlPw==&uniplatform=NZ

KPT&language=CHS

Liu, A. & Gao, Y. (2024). Perceptions of the Double Reduction policy in parents of primary school students and Influencing Factors: An empirical study of R City, Zhejiang Province. Journal of Jianghan University (Social Sciences Edition), 41(5), 106-118. DOI: https://doi.org/10.16387/j.cnki.42-1867/c.2024.04.011.

Liu, J. (2023). Can the Double Reduction program eliminate the demand for subject-based off-campus training services? An empirical study based on the bounded rationality theory. Journal of East China Normal University (Education Science Edition), 41(9), 71-84. DOI: https://doi.org/10.16382/j.cnki.1000-5560.2023.09.005.

Liu, J. & Zhao, F. (2022). The work of primary and secondary school homeroom teachers under the Double Reduction policy: An analysis based on a questionnaire survey of 16166 homeroom teachers nationwide. Educational Science Research, 2022(8), 44-52+63. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCAt91f1QPEHy83u91oV1BEMY3Uobzq6PEbt0X6i5H38xCxAypfSOevwT6rYW3pZxOrqZe8oTbEEWexvGj41fOCi6u1ZeuGxXW_Pw9RQc0gRPeq5rOxnzChm_lrCknlY2Wakf3fWzDYkLoqFPxJkIJMPqzbSJkXN3D1IkmDW1JscJQ==&uniplatform=NZKPT&language=CHS

Liu, Y. (2024). The Implementation of After-School Services in Urban Secondary Schools under the Double Reduction policy (master's thesis). Hubei University. Available at: https://link.cnki.net/doi/10.27130/d.cnki.ghubu.2024.002476

Liu, Z. (2023). The Implementation of After-school Services in Primary Schools under the Double Reduction policy (master's thesis). Jiangsu University. Available at: https://link.cnki.net/doi/10.27170/d.cnki.gjsuu.2023.002478

Long, B., Yang, J., & Cai, W. (2021). Causes of excessive burdens to primary and secondary teachers and the ways to alleviate them: An analysis of the lists of burdens to be reduced for teachers in 27 provinces across China. Contemporary Education Sciences, 2021(5), 62-71. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCDEo5pZgH1JiSBfYR7bslYQKFYusTwamSizd7dRM_8zM-ydft0mOEMAB3hTc8CFWtHpxqFBI_DQ84pEyF8SdW2d0n6SIpEXH7D_Ywae8oAM0I5nZ-_qnvsUFef6la5SziHaBe-9l1dqfFnCK57l4Ffqr8pv4QZNftRjS8cfYp2Y6g==&uniplatform=NZKPT&language=CHS

Ma, K. & Yang, C. (2015). Academic burden reduction: Connotations and perspectives. Contemporary Education Sciences, 2015(14), 50-53. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCA3GRTfqegXjucVNOarvsBqggECJNSgigA8ZQkHv0XhPj8KHrU4KViI7f0ipNF3Rq3IdRxhUGwvWifN3-SOs1n61Xom_yGeOrZxhVsmIOruP7ZX7hCwgfnCXWEGG2Zg5gR2LbSJzxobbIQ9Vpf1_UIAxD231quBOJBjr3Jco1pCUA==&uniplatform=NZKPT&language=CHS

Ning, B. & Yang, L. (2022). The outcome of the homework reduction policy for primary and secondary school students and its coordination mechanism: An analysis based on a survey of 137 cities in 30 provincial administrative regions across China. China Educational Technology, 2022(1), 9-16+23. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCA8vRM2ReFbskIsegKjDXK2dc1m3wpBQd5-ShK4Jz0cLaL8SR5Nif0b7MxVSiDfEagooXbaLDzFfzG3Lsr_qT-4CZfp9o8FkaM0otZxjAj8eql7797FjNdm6fRCQVRrdJhXIN2lR91347SnZUQj7n0Vz81zZg6-qvZWgj5PnrkXkA==&uniplatform=NZKPT&language=CHS

Pang, X., Xue, H., & Xiao, F. (2025). The impact of the Double Reduction policy on student participation in off-campus training and family education expenditure. Journal of East China Normal University (Education Science Edition), 43(1), 17-36. DOI: https://doi.org/10.16382/j.cnki.1000-5560.2025.01.002.

Shi, D., Li, L., Zhao, S., & Chu, L. (2022). After-school services in primary schools under the Double Reduction policy: Current state, problems, and coping measures: A study based on a survey of nine counties and one district in H City, Yunnan Province. China Educational Technology, 2022(11), 17-22+31. Available at: https://kns.cnki.net/kcms2/article/abstract

?v=uXGtp3S0eCC-9VSrTllFzVNuhhWy4e2XABhEleTyQS3h6hjEhmNR8-xU_tlR0TZCMqkKrujumduWreR-QTx1Ssm0Ca0ylNpFuaVWNAKgFsmMwUmpAO05dMr9XM7dQX3Z-HJnu68A55hisdCFq-CdEXjE7lxcAy4bZZ1Y5Y7TDVilGsrdLYly4g==&uniplatform=NZKPT&language=CHS

State Council of China. (2021). Opinions on Further Reducing the Burden of Homework and Off-Campus Training on Compulsory Education Students. Gazette of the State Council of China, 2021(22), 14-19. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCBP391Nx_Ex5gzOsDedK8tlTKJGW08dLuJbir9L-XppTtaUkDqXgVrrqrY8eldMcrwmmOwf7vUSGjpHBCNeFtQT_5HfPBzn6DsGBuBzM7Keub1Ltu8xSr7GBbzktkxbCQcDGmQjdyYZ5JHaJYzyeGQREXjR1Cf2BKsiBsWFMaAqSQ==&uniplatform=NZKPT&language=CHS

Wang, J. & Chen, L. (2024). An empirical study of the evaluation of the quality of after-school services in primary and secondary schools under the Double Reduction policy: A case study of N City, Sichuan Province. Contemporary Teaching and Research, 10(10), 76-82. DOI: https://doi.org/10.3969/j.issn.2095-6517.2024.10.018

Yin, M. (2023). An empirical study of the impact of after-school sports on the physical fitness of junior secondary school students under the Double Reduction policy. Tao Xingzhi Journal, 2023(1), 45-49. Available at: https://kns.cnki.net/kcms2/article/abstract?v=uXGtp3S0eCAi7Bzq19w7IomzNaCjI97RIx7_S-nDXTTvLWolK0g-BDvul8sExnj6V2Hjcny9OIWN2TgowH4vdfrvU_pI2S1h1OrPagwrXyDyGaSlJ0AhLJbLhijhBaGs6bD9ylm7EGSHLT8Hbx1DUMx4I7KCljmsEXkntmZnYcte7XDNEUAuhA==&uniplatform=NZKPT&language=CHS

Yu, C. & Yang, L. (2022). Teachers' work burdens under the Double Reduction policy. Forum on Contemporary Education, 2022(1), 87-96. DOI: https://doi.org/10.13694/j.cnki.ddjylt.20211105.001.

Yu, Y, & Yao, Z. (2022). Parental educational anxiety and the paths to its alleviation in the context of the Double Reduction policy. Journal of Xinjiang Normal University (Philosophy and Social Sciences Edition), 43(4), 39-49+2. DOI: https://doi.org/10.14100/j.cnki.65-1039/g4.20220215.001.

Zheng, L. (2024). The Effects of the Double Reduction Policy and Optimization Measures (master's thesis). Central China Normal University. Available at: https://link.cnki.net/doi/10.27159/d.cnki.ghzsu.2024.001282

Zhou, C., Zhu, J., Tao, A., & Liao, D. (2024). Work burdens of primary and secondary teachers in county regions in the context of the Double Reduction policy: An empirical study based on a survey of six schools in S County. Journal of Jilin Provincial Institute of Education, 40(3), 166-175. DOI: https://doi.org/10.16083/j.cnki.1671-1580.2024.03.026.

Zhou, H. & Qi, Y. (2022). The implementation of the Double Reduction policy: Focuses, difficulties, and suggestions. Journal of Xinjiang Normal University (Philosophy and Social Sciences Edition), 43(1), 69-78. DOI: https://doi.org/10.14100/j.cnki.65-1039/g4.20211022.001.

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REVIEW

China's Endeavors to Promote Educational Equity through Technology Use

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***Abstract**: Nowadays educational equity constitutes a fundamental component of social fairness, and technology is deemed a vital means for mitigating educational inequalities. This article is a survey of China's experiments in harnessing modern technologies to promote equity in education. This study, after giving a summary of common conceptions of educational equity in researchers, focuses on reviewing China's endeavors to leverage technology to close disparities in education, including introducing high-quality educational resources into underdeveloped regions through information technology; developing distance education models; providing customized teacher training and specialized vocational education; and using smart teaching platforms to supply personalized learning opportunities to underprivileged groups. Also discussed are the challenges of the application of educational technology, such as inadequate digital competence in teachers and students, widening digital divides, quality gaps in educational resources, and ethical issues in technology use. The article concludes with moves proposed for addressing these issues.*

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Introduction

EDUCATIONAL equity, as a crucial part of social fairness, has been a focal topic in global education conversations. Despite the unwavering commitments of governments and international organizations to promote the balanced distribution of educational resources, the issue of inequity in education remains. Particularly in developing countries, many children have been deprived of up-to-par learning opportunities due to geographical, social, and economic constraints. In this context, technology, especially ever-advancing information technology, is seen as the overriding vehicle for enhancing educational equity.

According to existing research, technology can help narrow the disparities in education standards between regions and individuals and realize relative equity in education outcomes because of its role in optimizing education and instruction processes (He, 2011). Specifically, technology applications can break down the constraints of time and space, creating online learning environments and communication communities that enable learners from diverse origins to have equal access to educational opportunities; at the same time, technology assists underserved schools and districts in improving their standards and efficiency of education by facilitating the sharing of high-quality educational resources (Aksu & Canturk, 2015; Li & Fan, 2018; Han, 2021).

On the other hand, concerns about the across-the-board effects of educational technology are also pervasive in academia despite its widely acknowledged prospects. For instance, the effects of educational technology on the individual's learning could be heavily affected by their family's cultural capital and socioeconomic status (SES). Underprivileged students cannot take full advantage of technological advances, and the widened digital divides are impeding the mitigation of educational inequity (Chen & Gu, 2019).

China, a populous developing country, is also facing the issue of educational equity. Hence, the nation is actively exploring the possibilities of using modern technologies, particularly the internet, artificial intelligence, and big data, to overcome geographic restrictions on educational resource distribution in a bid to enable as many children as possible to benefit from high-quality education. China's experiments in this regard are of vital significance to its own educational development while also providing implications for global endeavors to achieve the ideal of educational equity. Using the method of literature review, this study investigates China's experiments in leveraging technology to advance educational equity with the view to contributing to educational technology and equity literature.

Educational Equity and Technology

There are different and even opposing conceptions of educational equity in the education community despite it being their common goal. Levinson et al. (2022) expound on these competing conceptions and pinpoint five popular meanings of educational equity in current use: (i) equal distribution of outcomes across populations (e.g., equal percentage of college graduates or of people living fulfilled lives across racial groups, genders, SES, nations, etc.); (ii) equal resources allocated toward education across students, schools, districts, states, or nations, which is measured by money or by other criteria such as the student-teacher ratio, infrastructure and facilities, the number of advanced courses, etc.; (iii) equal experiences for each child (e.g., experience of being respected or challenged, opportunities for play, social inclusion); (iv) equal levels of growth or development by each learner; (v) equal outcomes for every learner (academic, social-emotional, etc.). According to Levinson et al.'s argument, each of these conceptions may represent a significant aim or value of educational equity; nevertheless, they are often mutually competing and can never be simultaneously realized in practice. For instance, equal growth from unequal starting places will result in unequal outcomes; equal outcomes may necessitate unequal resource distribution; and even equal experiences can lead to unequal educational outcomes or opportunities.

Apparently, there is no such thing as a conclusive or universally applicable definition of educational equity; it can mean different things and be achieved by different means, depending on the specific goal, context, or value orientation. This perception underscores the importance of ascertaining the purpose of technology use in equity promotion efforts. If the priority is to equalize educational resources, technology applications should be focused on optimizing resource redistribution; if it is to provide equal education experiences to every child, technology should be applied to create more favorable learning environments; and if it is to privilege disadvantaged student populations, technology ought to be used to identify these groups and support them with extra services.

In China, there have also been debates on the definition of educational equity. The following conceptions represent those well-accepted understandings: (i) Educational equity is not identical with educational equality. It is a value judgment regarding resource distribution and outcomes rather than the idea of allocating equal resources to each individual student (Chu, 2006; Chu & Yang, 2008). For instance, providing more educational resources to disadvantaged students than their ordinary peers is counted as equity. The focus here is on the equal right to education and equal opportunities for every child; it is reasonable to strive to close disparities in educational outcomes, but without a rigid requirement for absolute equality of outcomes. (ii) Educational equity necessitates diversification of educational resources. The idea of equating educational equity with the

provision of uniform and homogeneous education should be abandoned. It is important to make structural transformations to facilitate the supply of diverse educational resources (e.g., different education tracks, curricula, teaching modalities, etc.) to students with differential abilities and aptitudes, showing respect to their interests, preferences, individuality, and freedom of choice (Chu, 2006; Chu & Yang, 2008; Shi, 2008). (iii) Weighted resource distribution for disadvantaged groups helps us get closer to realizing the ideal of educational equity (Shi, 2008). In other words, SES disparities between students should be a central consideration in the allocation of educational resources, and compensatory services should be ensured for those with underprivileged family backgrounds (Chu, 2006).

China's Endeavors to Promote Educational Equity through Technology Applications

With the said understandings of educational equity, Chinese educational authorities, educators, and education researchers have conducted an array of experiments in exploiting modern technologies to advance the realization of the shared ideal. The education world has been persistently pursuing digital transformation of education to tackle inequity in education caused by regional differences in economic and cultural development, the large-scale migration of population, and disparities in home capital (Wei, 2024) to make high-quality education resources and experiences generally accessible.

Priorities

Leveraging Technology to Redistribute High-Quality Educational Resources

Due to unbalanced economic development across China, education is less developed in its rural and western remote areas in comparison to its urban and eastern areas. The past several decades has witnessed much effort by the Chinese government and educational institutions to utilize modern technologies to bridge the gaps in education between rural and urban areas and between western and eastern regions. A salient practice in this regard has been the adoption of information and communication technology (ICT) to introduce quality educational resources from developed into underdeveloped regions. The 2016 "Cross-Regional Simultaneous Teaching Application Pilot Project," for instance, was developed to enable schools in remote areas in China to have access to high-quality primary education resources via satellite-based broadband connection and online learning platforms (Kou, 2020). With this project, students at these schools can receive online instruction and tutoring from teachers in developed regions. It

also assists teachers in underserved areas in enhancing their instructional quality by collecting teaching and learning data and creating learning analytics systems for them. Additionally, the project's implementation has resulted in the improvement of infrastructure and facilities of these remote schools, enabling them to access internet connection, which had been denied ground-based internet because of their special geographical locations. Yang et al. (2018) dubbed technology application models like this the "Remote Synchronous Classroom (RSC)" and noted that the RSC model had been effective in connecting urban and rural classrooms through ICT, successfully combining the remote instruction of urban teachers and on-site tutoring of rural teachers, while also compensating for the missing subjects in rural schools' curricula due to their difficulties with teacher staffing.

Yet, the RSC model has the limitation of being susceptible to network connection disruptions, which can cause delayed transmission. To address this issue, the education departments and schools engaged in developing the asynchronous online teaching model. With this model, schools in developed regions are responsible for producing digital courses and uploading them to specified online platforms; teachers and students in less-developed regions can then download these courses or use them online. For example, at the primary and secondary levels, prestigious schools in developed regions create teaching materials, such as instruction videos, for the national public platform of "Smart Education of China," which are accessible for all teachers, including those working in rural and hard-to-reach areas (Yang et al., 2018).

To guarantee the quality of online educational resources and the compliance of online learning platforms, the China E-Learning Technology Standardization Committee (CELTSC) was established and held responsible for developing a framework for standardizing online learning technology systems. It has published six clusters of standards (Overall, Management, Resource, Learner, Environment, and Localization) and 16 specifications (Zhu et al., 2011). In the sphere of higher education, the East-West University Course Sharing Alliance was formed as a result of the joint efforts of universities and colleges across China. This alliance advocates that higher education institutions develop and share high-quality online teaching resources, leveraging expertise in their respective outstanding disciplines. As of 2022, over 140 courses were rated as state-level first-class online courses. The number of courses developed, participating universities, and student users of the platform has been growing year by year. The initiative has benefited more than 2,300 universities nationwide, reaching over 30 million college students (Gao et al., 2022).

Providing Differential Support Contingent on Specific Circumstances of Schools and Districts

While schools in underdeveloped regions are working towards the same goal of improving educational standards, the specific assistance they need varies significantly due to factors such as the geographical location, educational level, and cultural environment. Hence, it is essential to adopt targeted strategies and provide differentiated support in leveraging technology to drive educational equity.

For instance, schools in remote, mountainous areas may have difficulty in recruiting and retaining highly qualified teachers due to their isolated locations and undesirable living environments. The most pressing need of these schools is to enhance the teaching competence of local teachers. To address this issue, the Ministry of Education of China has formulated criteria for teachers' educational technology competence development as well as providing extensive training programs, aiming to elevate the digital teaching skills of teachers in these schools to ensure that technological tools and distance education resources can be fully and effectively utilized (Zhu et al., 2011).

On the other side, most children in underdeveloped regions enter the labor market at younger ages due to factors like family financial distress and peer influence. As a result, there is a strong demand among them for effective practical skill training that are employment-supportive (Fu & Zeng, 2019). To better serve the needs of these children and propel regional economic growth, it is imperative to enhance the quality of vocational education and its alignment with local industrial development with the assistance of technology. For example, online education platforms and virtual reality and augmented reality technologies can be adopted to facilitate the introduction of high-quality vocational education resources to underdeveloped areas as well as students' access to advanced practical skill training, and in the meantime, to significantly lower instruction and placement costs (Peng et al., 2024). Additionally, big data technology can be used to analyze the match between local industrial demands and students' interests, enabling the customization of training schemes and improving the relevance and effectiveness of vocational education (Tian & Jin, 2024).

Offering Technology-Assisted Services to Educationally Disadvantaged Student Groups

The economic transformation of Chinese society has fueled the massive flow of rural labor forces to urban areas. A portion of migrant workers manage to have their children live and receive education in cities, and this group of

children is known as "migrant children." Although migrant children are entitled to the same educational opportunities as their urban counterparts, they often fail to acquire comparable educational experiences and outcomes. This is primarily because they have less ideal home support in education because of their low SES background and attendant lower education levels of their parents. Furthermore, their "outsider" status and distinct growth environment often lead to their reluctance to engage with the teachers. The fear of adding burdens to the teacher or receiving negative comments dampens their willingness to approach him or her for help when encountering academic challenges (Xu, 2009). These issues render migrant children a special group in the education system.

To tackle educational disadvantage in this group, Chinese educators and education researchers tap into the smart teaching systems to improve their quality of education. These smart systems can help migrant children acquire more desirable educational experiences and outcomes in many ways (Jia et al., 2022). For instance, a smart platform assigns legitimate after-school exercises to them in accordance with their learning progress and academic levels as compensatory learning resources. In doing these exercises, they can turn to an online teacher for help when encountering difficulties, who offers one-on-one tutoring mostly through text-based communication. This approach not only ensures that migrant children receive precise academic support but also is effective in encouraging active communication with teachers in them thanks to the anonymity of the online environment. To prompt their sustainable use of the platforms, some smart teaching systems even devise rewarding mechanisms with which the user will receive virtual rewards for their efforts to complete online learning tasks and get physical rewards after they have accumulated a certain number of virtual ones.

Effects and Appraisals

There are many studies of the effects of technology use on educational equity in Chinese academia. A portion of them address the relationship between educational equity and technology use in its broad sense. Hu et al. (2021), for example, investigate the effects of technology use on the equity of educational outcomes in different areas, using data from the China Education Panel Survey (CEPS). According to the research findings of the study, educational technology, generally, has a positive effect on equity in educational outcomes, particularly in terms of student cognitive ability and academic performance, and this effect is, however, subject to the influence of various factors. The scientific application of technology to teaching is the central factor in promoting equity in educational outcomes; the roles of digital facilities and digital educational resources are pending further enhancement. Furthermore, Wen et al.'s (2023) study reveals that the

relationship between the efficiency of technology applications and educational equity is a U-shaped nonlinear one with a distinctive single threshold effect, which means that technology use can promote educational equity only after its efficiency reaches a certain threshold. Tang et al. (2024) focus on examining different views on the said relationship in the literature: while some researchers argue that the integration of technology with education can significantly narrow educational disparities by increasing learning opportunities and resources, as well as elevating educational efficiency and outcomes by providing differential instruction based on students' different learning styles and needs, others express their concerns over the possible challenges of educational technology, such as technology use-induced education costs, which may bring schools and student families disproportionate financial burdens.

Other studies focus on the effects of specific technologies on educational equity. Much research has been conducted on the impact of internet use in education. Based on provincial-level panel data from 2003 to 2019, Yan and Jin (2022) performed an econometric study, which finds an inverted U-shaped nonlinear relationship between internet use and educational equity: the initial use of internet technology may contribute to educational equity; nevertheless, as the "digital divide" widens with the increased use of the internet, the application of internet-based technologies can intensify educational inequity. Using PISA data from Shanghai, Chen and Gu (2019) conducted an in-depth analysis of the relationship between learners' internet use preference and outcome inequality and discovered that the preference of using the internet for academic purposes exhibited a significantly positive effect on the learner's performance in mathematics, reading, and science literacy, whereas entertainment-focused preference had a significantly negative effect on academic achievements. Notably, the preference is associated with the learner' home economic, social, and cultural status: students from more advantaged families are more likely to use the internet for academic purposes, while those from less advantaged families are more inclined to use it for entertainment. This divergence in internet use preference leads to unequal benefits from internet technology between students of different SES, potentially widening disparities in educational outcomes. Liu and Zhang (2022) draw similar conclusions, noting that rural students and those from disadvantaged families are more likely to use the internet for entertainment activity, a tendency leading to increased inequality of educational outcomes.

Issues with China's Technology-Driven Educational Equity Endeavors

The Chinese education community has encountered multiple challenges in their experiments in promoting educational equity through technology applications. First, the deficits in digital literacy and application skills in teachers and students are a major barrier to the effective application of technology for advancing educational equity. Despite the governmental financial support for digital infrastructure and facility construction of rural and disadvantaged schools and other material support from third-sector organizations, digital equipment available is often underused because of the inadequate digital competence of teachers in underdeveloped regions, which exacerbates educational inequity. At the same time, students in impoverished areas may lack the basic manipulation capacity for information acquisition, resulting in their inability to utilize digital resources for self-directed learning or to adapt to the digital teaching environment replete with technology use. This compromises the role of technology in improving educational equity (Guo & Wang, 2025).

Second, the issue of "digital divide" remains pronounced due to regional disparities in economic development and differences in student SES. Disadvantaged students, without necessary family support, may lag behind their advantaged peers in technology learning and use (Yan & Jin, 2022). Also, the gap, without effective intervention, may continue to widen with the expedited development of technology, further magnifying educational inequality.

Third, the construction of digital teaching resources involves a wide variety of entities, including higher education institutions and businesses in the education sector, which results in the stark variations in the quality of these resources. Also, current digital resources typically lack the capability to adapt to the personalized needs of students of different learning capacities across diverse regions. For instance, students in certain remote, underserved areas may have difficulty making use of and benefiting from these digital teaching resources because of the different cultural contexts as well as their own inadequacies in foundational knowledge (Tang & Carr-Chellman, 2016).

Fourth, ethical issues like data privacy and informed consent have also raised wide concerns in the context of increased penetration of new technologies, such as AI, in educational settings. For example, the use of electronic cameras for real-time monitoring of student on-campus activities can serve purposes such as teaching management or educational data collection. Nevertheless, illegitimate practices in this regard may infringe upon students' privacy and other rights.

Lastly, the sustainability of technology applications is another concern, as the deployment and development of educational technology require enduring financial investment and technical support. Yet, long-term costs of digital education may be a burden beyond the financial capacity of schools and educational authorities in underdeveloped regions. Issues like

outdated equipment and software as a result of the school's inability to keep pace with the ongoing iteration of technology may threaten the continuation of digital education development in impoverished areas.

Discussion and Conclusion

The study reviews China's recent practices in leveraging technology to drive educational equity, highlighting the roles of technology in redistributing educational resources, narrowing regional disparities in education, and enhancing educational opportunities for the disadvantaged populations. It finds technology applications have significantly advanced equity by making high-quality educational resources accessible to impoverished children and those living in hard-to-reach areas and by meeting the diverse needs of different learners through digital platforms and smart tutoring systems. It also pinpoints the challenges of implementing educational technology, such as the inadequate digital competence of teachers and students in underserved communities, exacerbated digital divide, starkly different quality standards of digital teaching resources, and ethical risks in technology use.

In response to current challenges, we recommend the following moves: (i) Enhance digital technology literacy training programs for teachers and students, particularly those targeting underserved populations and disadvantaged groups, to improve their technology application skills to ensure optimal utilization of technological tools and digital educational resources. (ii) Introduce "minimalist educational technology" as a solution to the issues of digital skill acquisition costs and efficiency of technology applications, considering the limits of time and energy (Yan et al., 2021). Minimalist educational technology refers to easy-to-learn, user-friendly, highly effective technology for teaching and learning processes, with the underlying principle of human-centeredness (Li, 2019). The term was advanced to underscore that technology is not used for its own sake but rather for efficiently and effectively tackling educational issues. (iii) Encourage long-term cooperation in technology application between schools in developed and underdeveloped regions with a mechanism for facilitating the former sharing high-quality teaching resources with the latter, the development of collaborative teacher training programs, and inter-student communication. (iv) Enhance the quality standards and review mechanisms for digital teaching resources to ensure their rigorousness, relevance, and practicality. (v) Establish stringent regulations for ethical issues associated with educational technology to regulate the collection, storage, and use of student data and safeguard their privacy and right to informed consent. (vi) Develop an educational equity index framework for regular evaluation of the effect of technology use on educational equity and for policy adjustment in correspondence to problems identified.

The scope of the literature review and the research method of the study may constrain the generalizability of its research results. Future research efforts should be concentrated on the following areas: (1) Longitudinal research to investigate the long-term impact of educational technology on equity in various dimensions, such as student academic achievement, resource distribution, teaching techniques, and education opportunities; (2) Empirical research that blends quantitative and qualitative studies to examine the role of technology in specific education scenarios and the genuine digital education experiences of teachers and students. In addition, we recommend the interdisciplinary approach that brings together perspectives of education sciences, sociology, psychology, IT, and so forth to generate more comprehensive insights into the relationship between technology and educational equity.

References

Aksu, T., & Canturk, G. (2015). Equality of educational opportunity: the role of using technology in education. International Journal of Academic Research in Progressive Education and Development, 4(4), 79-93. DOI: http://dx.doi.org/10.6007/IJARPED/v4-i4/1933

Chen, C. & Gu, X. (2017). Does the internet contribute to the inequality of educational outcomes: An empirical study based on PISA data from Shanghai. Peking University Education Review, 15(1), 140-153+191-192. DOI: https://doi.org/10.19355/j.cnki.1671-9468.201701009.

Chu, H. (2006). Several philosophical questions on educational equity. Journal of the Chinese Society of Education, 2006(12), 1-4. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuT1UAAlOUUYHctFSG8Ez1vbS8Nx20hokzOY522nN-G3GRs8vFQfyv5WlEY1T7eUVoI7hW8ZuTmpbvt3tcD1Qd07TeiYFKp8rszw8_MihWA4-iryNywXAgRmjfaHlULcF-qyESAb7s2MvVrCRDYKwDU7UEVJcMyqwq31BTjYIaP4gA==&uniplatform=NZKPT&language=CHS

Chu, H. & Yang, H. (2008). The principles underlying educational equity and their policy implications. Educational Research, 2008(1), 10-16. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuTnbnluToBFQMYOj3JzbCwHkdzWAAybXV4BxbKU_5ChiU3bXh46C_tOywrlM6F29YfoMgyviCkeDfydBfwadkk_X7Fcqp__cBn1dLJ71ODs0rYtZAJOUiAhP-ri4eGb8VsGu-Jx4COjTHc9L2ywEA6-OS8XofGmNK9nZ0n727twPQ==&uniplatform=NZKPT&language=CHS

Fu, W. & Zeng, X. (2019). The outcomes, problems, and prospects of poverty alleviation through education in China: A study based on a survey of 18 targeted counties (districts) in six provinces in central and western China under the poverty alleviation and development program. Journal of Central China Normal University (Humanities and Social Sciences Edition), 58(5), 45-56. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQdxNDpJgmf--Yp6SGT6j2Dg-84HfY0TxzFqoJsqAne6ITDpjTyTbjcMOqPx_nMQvFZpl_cW86mmL0i2zxmdHJ_

FcfCAddAwh5hNDPhxT5cdow1jhISTIiEwILA66iVmPjjddyTaiy8vUdlybuflmWdEsve-HebqetvObBSg2rg9w==&uniplatform=NZKPT&language=CHS

Gao, S., Li, Z., & Xiang, C. (2022). Digital education fosters high-level equity in higher education: Using the practice of the East-West University Course Sharing Alliance as an example. China University Teaching, 2022(3), 4-10. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuSC5BmEL2SmardXRifyp9_cOH70tBNIFiEYkFd3Fh_Z4ui3qdxz7ORAl8Q4p8L2WsbW7zXex2OYwy9XpOkcnuYjLvT0sZEaLs91LCAKBXQMm3qGq0AxQ78URnxErJ8_ZmumJIwhxIRR_kgfmvX6_m-3o2tBDEXbjzn3sfXNJC7P8Q==&uniplatform=NZKPT&language=CHS

Guo, S. & Wang, J. (2025). Smart education: A new path to achieving equity through technology for rural education. China Educational Technology, 2025(2), 67-74+83. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQ4sgHMZza8wPRgJTZ0baTEbParU45j-rFnW4j2OnLODE0nDDc3gP1i6HvKH8qSKQ-Mk8-nrG1_-uyV0-93iwef49gFYB5P2yLoSf8IvLWE_WGvDPxUyztZn5-EOIWw5MEeQt5dwVMWlGt6TfIHHIQHADpA4ynQdQ9FlE3RQr9qfg==&uniplatform=NZKPT&language=CHS

Han, S. (2021). China's endeavors to promote educational equity through digital education: The evolution of policies, analysis of problems, and suggestions for future development. Chinese Journal of Distance Education, 2021(12),10-20+76. DOI: https://doi.org/10.13541/j.cnki.chinade.2021.12.002.

He, K. (2011). Education informatization: An essential avenue for high-quality and balanced development of compulsory education. Modern Distance Education Research, 2011(4), 16-21. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuTFUczsvStth-1_nrintcZSjdN0exryfEJT83Hj92XivVbth6c-SWTgrUKs6fnsOuxbsks-39xWQRl-L7mCT57wgaMCSwruWsptKe5iyEkpxcQmJZrZw_9a987h6qljjwBwNh5ed8Btwrdhj0lfaD7DaBRYlOGUmKRveUBky1NjqA==&uniplatform=NZKPT&language=CHS

Hu, Q., Lin, X., & Zhang, Y. (2021). The role of information technology in promoting equality in basic education outcomes: An analysis based on data from the China Education Panel Survey. Educational Research, 42(9), 142-153. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQkY6rwEJv3vxDW0rPY98ncR-eMLKJlKiZJ82I3ytVwsyY7em7zXvzG8pwZVo4ncAbVS4Wn864jfmACu5POrDHUoN5GAJyQmrA5aMC2XVQdRKGFmFsg2C5rM409JQ8iBpKU5TSDrUclJbz9_w_Z0rt8-efzo6lHtZlQy91clL3BCQ==&uniplatform=NZKPT&language=CHS

Kou, S. (2020). Application of education informatization promoting educational equity in remote areas of China. International Journal of Information and Education Technology, 10(8), 608-613. DOI: https://doi.org/10.18178/ijiet.2020.10.8.1432

Jia, J., Le, H., Li, Z., & Gui, Y. & Zhang, H. (2022). The role of artificial intelligence in promoting balanced development of education: Using the online teaching system-based, personalized tutoring for migrant children as an example. China Educational Technology, 2022(1), 42-49. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuRvYqqO9e8xd89Bm34BJsvlzL4su8AdHbRKPr7n3wv2D-ZP2wsbdyLrEvOCy8x4H_d5-XCGNvSm31FUUzNnvkESK2Fxjdbh89QF8_E7SfScD6pnNs6LuqXmgOndpOQzXZWQFLaes4GPyQyJAHlIbCdTBgV5oehQiUOnEzm21WWT7Q==&uniplatform=NZKPT&language=CHS

Levinson, M., Geron, T., & Brighouse, H. (2022). Conceptions of educational equity. AERA Open, 8(1), 1-12. Available at: https://files.eric.ed.gov/fulltext/EJ1360521.pdf

Li, J. (2019). The rise of minimalist educational technology in basic education. China Educational Technology, 2019(2), 6-9. Available at: https://link.cnki.net/urlid/11.3792.G4.20190124.0851.004

Li, S. & Fan, L. (2012). Pathways for promoting balanced development of compulsory education through digital transformation. e-Education Research, 33(10), 41-44. DOI: https://doi.org/10.13811/j.cnki.eer.2012.10.013.

Liu, Y. & Zhang, D. (2022). The role of online learning in promoting educational equity: An empirical study of the "digital divide" in online learning among primary and secondary school students during the epidemic. Journal of Schooling Studies, 19(2), 58-68. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuRYBS2GGauoOs4ggFx1YnJQbOFb3oVxMM6uV1mFwS4hHiMXt5AeYDVHME_LqVIcskxtGRjXJyyg5aHiMKee0jHIT3UgNp0Sw_VjgMAbCKsUZr84kOXCCHUByHD_puYkhNv95Onj_oRkyHo3f63pqalQOTKPBfV9P-13I9hP8v0LGg==&uniplatform=NZKPT&language=CHS

Peng, J., Li, J., & Lin, T. (2024). The application of virtual reality technology in vocational education: A case study of Fuzhou Software Technology Vocational College. Journal of Continuing Higher Education, 37(5), 40-46. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQYWGcZpKM7JSlg1h8xVsDTiugp252tvFLurTXNXw0KYliuHHdkv0PLXJFEuuhNvn5wEPQqEKQA5LmwUgBdZGN9X0Ks0bAYf0SJmzP-6OHhI86JiFVyD9-7OEMMp49o-XpAKHNfo8RpawIJNEmQAZ2Rljb0gBvZFhw5_Lv5utl9NA==&uniplatform=NZKPT&language=CHS

Shi, Z. (2008). Connotations and social significance of educational equity. Journal of the Chinese Society of Education, 2008(3), 1-6+27. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuTLVlq_8pChcuN9vYVmUwiONXSQRQi7Nb_wB60DkGuZxb25Ajy_ogBSrCOf5RHV9UsaIUf6hvgfGcKP7V3YLe_dI2svrloQGcziCSH8Y2xkfP8HsAup3VeIrkqvPErNgHFXF5AIWXcmYDAri70hDgFOT6UkViqsZRiqSAn9Z3MSKg==&uniplatform=NZKPT&language=CHS

Tang, M., Ren, P., & Zhao, Z. (2024). Bridging the gap: The role of educational technology in promoting educational equity. The Educational Review, USA, 8(8), 1077-1086. DOI: https://doi.org/10.26855/er.2024.08.012

Tian, X. & Jin, S. (2024). The supportive role and prospects of big data analytics in higher vocational education. Journal of Liaoning Economic Management Cadre College, 2024(4), 186-188. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQLrffPXWNY-CSq4sIVSAEmk6rfhAvrI2jTRydrsXjhJ9HrA_iTI61BSiS9HZ8NM3rEMI36erTwPqpa-bUtPV2X8R107yPb-gKPNpFtGZ9j7uSkQs-8JyxDUpIV6NFY21tlgmtQXdBCMpU37_S3OYa28CmOd9FqnaCKRVZ5nnORbg==&uniplatform=NZKPT&language=CHS

Wei, X. (2024). Balanced development of compulsory education in urban and rural areas: Causes of problems, policy evolution, and pathway improvement. Rural Reviews, 2024(5), 14-20. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuQ5z6zAwMHLBa0NW6a28CfNjGlkoURjjdkJSCvTVH-7UbcFzV45V1FDgUi87aoHkHJZKabq3Kg-_uW0hBOg8IdwBrVeGf7xZq-q92Slj45sFivgBtqP0po9EROkS2QD5Zg3CPtiEq24vcOVvVDJ3AXJpPWY3JxpRq3UuoSexK6g8Q==&uniplatform=NZKPT&language=CHS

Wen, L., Ding, P., & Li, L. (2023). An empirical analysis of the impact of education informatization on educational equity. Teaching and Administration, 2023(36), 21-26. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuTUtGpuQYotV47cYed7Is-e9SyrdljfZL5Wk8nyiGZ7W2CWxalTo2IY9UrAeC1fdPJkCQ25cWfm-3eUkYA1bxNQOlLynHj97JZAo4_Ct-TO5xfD65Y48u_w7ROSGQabJzW7fKmhB3CLAUO4yyhqzJPqdGWTaG9jkZi7cA7_OvoB0Q==&uniplatform=NZKPT&language=CHS

Xu, L. (2009). The Integration of Migrant Workers' Children into Urban Schools: A Developmental Research Framework (Doctoral Dissertation). Nankai University. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuRncuXn2Cqyn7eBhhpYy6Y6cYWVE8ZmUMqiBB3C75F_rfJSSa3slYj_paYTvhsT7wRO-IevhsUZhCb4pzlHSx7BqjS44UHSvpKhZPiOGmDlgTBSTr-__d9XESay7CpTTR19x4K6YB-VC7NV62rWryDapq7OuitJ-hOdKK2kWLZBe1y3Jlx8uCaz&uniplatform=NZKPT&language=CHS

Yan, B. & Jin, Z. (2022). Can popularized internet use advance educational equity: An empirical study based on provincial-level panel data in China. Journal of Party School of the China Nanjing Municipal Committee of CPC, 2022(3), 59-70.

Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuSRwKLWoODNDNZe8aIrvDm8sRhiodt_2XkTK61SCi9-puugEB0XNHpiMxjHPlRbMRZADo-aLL6db-RFAEo-n4n6ru0Wpk5zAw9K8knhpdMcQgtU5na83xGbUIWXVIh7R6OQwtJ43OLB6N8Q83-IjFNrSjd6spcLde-lJ7pDVvS5sA==&uniplatform=NZKPT&language=CHS

Yan, H., Ouyang, H., & Miao, D. (2021). Education informatization promotes high-level equity in basic education: A review of successful programs based on multiple case studies and findings. China Educational Technology, 2021(5), 10-17. Available at: https://kns.cnki.net/kcms2/article/abstract?v=_GofKS1StuS_Mhw0oX0ba0c_2CKrf70qgf33M8QrBnm0Bjc2935dMZUiiDSJLH4sSvL6R7zvSlxevxeYXST0EdYXs5aiIYQeQV25x9eIffB5HH4SUbaP5rSMBwQhFQNTG4zIz9utBde8XsmsKEi0fZT6IpTBN2sHqklgBdkz15nVnDd74CbG4g==&uniplatform=NZKPT&language=CHS

Yang, H. H., Zhu, S., & MacLeod, J. (2018). Promoting education equity in rural and underdeveloped areas: Cases on computer-supported collaborative teaching in China. Eurasia Journal of Mathematics, Science and Technology Education, 14(6), 2393-2405. https://doi.org/10.29333/ejmste/89841

Zhu, Z., Gu, X., Collis, B., & Moonen, J. (2011). Use of ICT in Chinese schools: Striving for educational quality and equality. Educational Technology, 51(3), 32-37. Available at: https://www.jstor.org/stable/44430005

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