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Investigating the Impact of After-School Programs on Children's Inquiry Skills in Japan

Fuyuko Kanefuji*

Abstract: This study examines the relationship between Japanese children's inquiry skills and their participation in various after-school programs. Inquiry skills—encompassing the ability to explore, analyze, and synthesize information—are essential competencies in 21st-century education. However, limited research has explored how different types of after-school programs contribute to their development.

Using data from a large-scale survey conducted by the National Institution for Youth Education (NIYE) in 2021, this study analyzes the associations between four types of after-school programs and children's inquiry skills, while also considering the influence of socioeconomic status (SES). The findings indicate that participation in nature activities, arts and cultural activities, and private tuition outside of cram schools is positively associated with children's inquiry skills, with nature activities showing the strongest correlation.

These results provide valuable insights for policymakers and practitioners designing after-school programs. The study highlights the potential role of after-school activities in fostering children's inquiry skills and addressing disparities related to SES, thereby complementing formal education.

Keywords: After-school programs, program characteristics, children's inquiry skills, program types.

Introduction

After-school programs are widely recognized as an essential component of children's educational experiences. These programs are defined in this study as those that operate outside the formal school curriculum and provide opportunities for children and youth to develop various cognitive and non-cognitive skills. Afterschool programs can take place in both school-based and out-of-school settings, and are provided by both the public and private sectors. The timing of these programs varies, taking place before or after school, on weekends or during long holidays.

While numerous studies have examined the impact of after-school programs on children's development, two significant gaps remain in the existing literature. First, previous research

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has primarily focused on the frequency and duration of participation, overlooking the relationship between program content, instructional methods, and children's abilities. Second, although some studies have investigated the effects of after-school programs on children from low socio-economic backgrounds, the relationship between different program types and non-cognitive abilities remains underexplored. Few have explicitly examined its relationship with non-cognitive skills such as inquiry skills—a key competency emphasized in 21st-century education reforms.

Inquiry skills represent an important non-cognitive ability that has gained increasing attention in the context of 21st-century education reforms. These skills involve the ability to explore, analyze, and synthesize information to solve problems and are considered essential for lifelong learning and adaptation to complex, rapidly changing environments (Griffin, McGaw, & Care, 2012). Inquiry-based learning, which emphasizes active student engagement in questioning, investigation, and problem-solving, is widely recognized as a key pedagogical approach in 21st-century competency-based education (OECD, 2018; MEXT, 2021). In Japan, educational reforms have increasingly incorporated inquiry-based learning as a means of fostering students' critical thinking, problem-solving abilities, and interdisciplinary learning (MEXT, 2021).

Despite the recognized importance of inquiry skills in contemporary education, there has been limited empirical research on how after-school programs contribute to fostering these skills. Furthermore, although international frameworks for 21st-century skills development highlight the significance of inquiry-based learning (Griffin, McGaw, & Care, 2012), there has been no standardized measurement scale for assessing children's inquiry skills in Japan.

To address this gap, the National Institution for Youth Education (NIYE) in Japan developed a new scale for measuring children's inquiry skills as part of a national survey in 2021 (NIYE, 2021). This study employs this newly developed scale to examine the relationship between participation in different types of after-school programs and children's inquiry skills. The NIYE scale was designed in response to curriculum reforms emphasizing inquiry-based learning in Japanese school education and defines inquiry skills as "the qualities and abilities to better discover and solve problems while considering one's way of being and living through interdisciplinary and comprehensive learning" (MEXT, 2021). In other words, inquiry skills encompass not only individual-level knowledge acquisition but also the ability to collaborate with others and apply acquired knowledge and skills to solve local and global challenges (NIYE, 2021).

Beyond assessing children's non-cognitive skills, this study considers the potential of this scale as a tool for evaluating the quality of after-school programs. By investigating how different types of after-school programs contribute to the development of inquiry skills, this study aims to contribute to the ongoing discussion on effective educational strategies and provides evidence-based recommendations for designing more inclusive after-school programs.

Reading Aloud as a Recreational Educational Measure: A Case Study on the Implementation of a Picture Book App in institutionalized extended education

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Abstract: This case study examines the integration of a picture book app in an after-school program in Switzerland, focusing on challenges, benefits and chances of promoting reading as part of the after-school program through the perspectives of caregivers. The study explores the potential of digital media, particularly picture book apps, to enhance children's language skills within institutionalized extended education settings. Through semi-structured interviews with the caregivers, key themes emerged regarding the challenges, strategies, and benefits of using digital tools in educational environments. The findings suggest that while picture book apps can support autonomy and language development, effective implementation requires careful consideration of timing, environment, and the specific needs of children. Additionally, the study highlights the importance of media literacy among caregivers and parents to maximize the educational benefits of digital tools.

Keywords: Digital media, Picture book app, Language development, After-school programs, Media literacy, Extended education

Introduction

An increasing number of children are spending more time in institutionalized forms of extended education (i.e. after-school programs) which are continually expanding in Switzerland and are expected to play an even more significant role in the future (Baader, 2016). An increase in full-day education and care offerings is also being observed internationally (Bae et al., 2019; Klerfelt & Stecher, 2018; Kunze & Reh, 2020). A question that must be asked is whether and to what extent children can be supported in developing their language skills in extended education and how digital media can be used for achieving this goal. Based on existing research, it can be assumed that reading books enhances children's vocabulary and can have positive effects on their development. This case-study examines the extent to which a picture book app can support reading aloud in extended education to promote children's vocabulary and what perceived challenges and benefits are identified by the caregivers in the particular institution of the after-school program in integrating a picture book app in extended education.

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Theoretical Framework

Language competence is considered a crucial factor for educational success in educational research (Barrett et al., 2012; Kempert et al., 2016; Prevoo et al., 2016) — and thereby indirectly also for later economic success (Becker & Hadjar, 2009; Koopmans, 2017). A key finding of international school performance studies has shown that academic success and the acquisition of competencies, even in mathematical and scientific subjects, are significantly related to mastery of the language of education (Czepl, 2019; Schlager, 2019). Linguistic deficits frequently occur in children with a migration background, but they can also appear in children who have no migration experience themselves. This affects both children from second and third-generation migrant families as well as indigenous children from educationally disadvantaged and socioeconomically deprived families (Kreuzer, 2004). An effective tool to support children's language development is reading books. Preschool children who cannot yet read themselves benefit when a caregiver reads to them (Raikes et al., 2006); (Bus et al., 1995; Mol et al., 2009; Sénéchal & LeFevre, 2002; Whitehurst & Lonigan, 1998). Early reading abilities contribute significantly to children's overall development, including language, cognitive, emotional, and imaginative growth (Dickinson & Porche, 2011). Proficiency in reading picture books is particularly important for children's future learning and development (Cunningham & Stanovich, 1997; Dodici et al., 2003). A picture book format aligns with the multimedia learning principle that people learn better from words and pictures than words alone (Mayer & Pilegard, 2005). When eBooks are designed well, preschool-aged children can learn just as effectively, if not more so, than from print books. Reich et al.'s (2016) findings support this, showing that children are equally emotionally engaged with a story whether it is presented in print or digital format, and they comprehend similar amounts of the story regardless of whether it is read by an adult or a voice-over. However, it is important to note that enhanced eBooks, which include features like sounds, animations, and games, can distract children and reduce their learning by drawing attention away from the narrative itself. The studies by Caserta-Henry (1996), Flint (2010), Mathes et al. (1998), Sáenz et al. (2005), Vaughn et al. (2001) and Shamir (2009) collectively highlight the educational benefits of children reading picture books together. These studies generally conclude that shared reading activities, especially when involving peers or a more knowledgeable partner, can significantly enhance children's language development, comprehension, and overall reading strategies. In particular, the interactions during shared reading—such as discussing the content, asking questions, and jointly negotiating meaning—are critical for promoting deeper understanding and engagement with the text. This leads to the conclusion, that children in extended education can benefit from reading together with other children there.

Current State of Research

The importance of extracurricular activities, including the use of libraries and reading promotion programs during extended education, has been highlighted in previous studies, which have demonstrated a significant correlation between these activities and the development of children's vocabulary (Pedro et al., 2021). The impact of extended education offerings on

Process Quality of Extended Education Offerings from an International Perspective.

How can Primary School Children from Disadvantaged Backgrounds be Supported?

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Abstract: In many countries, children with low socio-economic status and with migration backgrounds are particularly disadvantaged in terms of their educational opportunities. Despite different forms, many extended education offerings around the world pursue a common educational focus, namely supporting the development of all students while reducing educational disadvantage related to social status, migration background, or any other diversity dimensions. Research shows that the process quality of extended education offerings is crucial for their effectiveness. This study examines experts' understanding of the process quality of extended education offerings that are particularly beneficial for primary school children from disadvantaged backgrounds. The data comes from problem-centred expert interviews with researchers from 16 countries worldwide. Structuring qualitative content analysis identifies three quality dimensions that are emphasised by the experts: (a) principle of educational processes: interests- and needs-orientation, (b) formats and methods: variation, and (c) interactions between staff and children: appreciation and (learning) support. The identified dimensions highlight the crucial additional value of extended education compared to formal lessons and underline the relevance of embedding social-pedagogical principles in the diversity-sensitive design of extended education offerings to support children from disadvantaged backgrounds.

Keywords: educational disadvantage, migration background, process quality, qualitative content analysis, staff-student-interaction

Introduction

For many primary school children worldwide, their social and cultural background leads to disadvantages regarding their educational opportunities (e. g., Mullis, Martin, Foy, Kelly, & Fishbein, 2020). Although extended education offerings are designed differently across countries (Noam & Triggs, 2018), many pursue the same educational focus, namely supporting the development of all students while reducing educational disadvantage related to social status, migration background, or any other diversity dimensions (Ning, Schmidt, Lilla, Nieuwenboom, & Schüpbach, 2025). In this respect, dealing with diversity is considered one

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of the most topical issues in extended education research, policy, and practice in many countries (e. g., Bae, Cho, & Byun, 2019; Smith, Witherspoon, & Osgood, 2017).

In heterogeneous student groups, diversity-sensitive action of staff has the potential to contribute to reducing origin-related educational disadvantages. This includes appreciating and reflecting on differences as well as providing educational opportunities designed to take any differences into account (Allemann-Ghionda, 2015). There are overarching concepts that deal with diversity-sensitive action in the educational context, such as the concept of "Diversity Education" (Prengel, 2007, p. 49). Furthermore, there is research for the formal part of school, i. e., teaching (e. g., Powell et al., 2021). However, little consideration has so far been given to what constitutes diversity-sensitive action, specifically in the non-formal part of school education. In many countries, classroom teaching and extended education, differ greatly in terms of their level of obligation, educational foci, and forms (Ning et al., 2025; Noam & Triggs, 2018). It can therefore be assumed that teaching concepts cannot be directly transferred to extended education. Thus, the question arises as to how extended education offerings can take appropriate account of the diversity of the student body so that children from disadvantaged backgrounds, in particular, can benefit.

Analysing the effects of different forms of extended education in the US, Vandell et al. (2022) found quality of the offerings to be central to their effectiveness, especially in supporting educationally disadvantaged children. High quality was defined "in terms of children's experience at the programs, including supportive and positive relationships between staff and students, positive relationships among students, high levels of child engagement in program activities, a range of activities that provide support for children's mastery orientation and cognitive growth, and appropriate levels of program structure (i. e. programs are not chaotic and not over-controlled)" (pp. 426–427). Also, apart from extended education, process quality has been shown to be particularly important and to have direct effects on children's development (Tietze, Roßbach, & Grenner, 2005). Which features of process quality in extended education are potentially beneficial, especially in supporting children with diverse social and cultural backgrounds, has not yet been sufficiently investigated (Schmidt, Ning, Nieuwenboom, Schüpbach, & Lilla, 2025). Against this background, this study aims to identify features of process quality in extended education offerings that potentially support primary school children from disadvantaged backgrounds. A special focus is on providing empirical knowledge regarding the design of diversity-sensitive extended education offerings from an international perspective. To this end, problem-centred interviews have been conducted with experts from 16 countries worldwide, whereby the experts' understanding of process quality was analysed.

Theoretical and Empirical Background

Diversity in the Context of Extended Education

In general, the term diversity refers to the heterogeneity of people, which can manifest itself in various dimensions. People differ in a number of characteristics, such as age, gender, sexual orientation, race and ethnicity, and abilities, as well as their social background (Gardenswartz, Cherbosque, & Rowe, 2010). Within the individual, various diversity dimensions are dy-

Science Teaching in Extended Education: A Systematic Mapping

Lisa Fransson*, Lena Hansson*, Daniel Östlund*

Abstract: This study aims to map the purposes, content and teaching approaches of science teaching aimed at schoolchildren aged 6–12 years outside the regular school setting, as described in previous research. The findings are based on a systematic search in four databases and three journals, resulting in the selection of 51 articles based on specific inclusion criteria. These articles were analyzed thematically through content analysis based on the didactic questions of why, what, and how. The findings indicate that the mapped articles highlight several purposes, contents, and teaching approaches. The purposes involve increasing interest in science, developing students' ability to act in everyday life and society, increasing knowledge and skills, promoting careers in science or academic success, and reaching other aims not directly related to science. The teaching includes contents such as scientific phenomena and concepts, nature of science and scientific processes, and socio-scientific issues. The approaches of teaching vary from being mostly teacher-led, mostly student-led to being both teacher- and student-led.

Keywords: didactics, Extended Education, science, systematic mapping, teaching

Introduction

In this article, we explore the characteristics of science teaching in Extended Education as described in previous research literature. The systematic mapping focuses on answers to the didactic questions *why, what* and *how* and aims to increase knowledge of present Extended Education practices aimed at students aged 6–12 years.

Bae et al. (2019) noted that Extended Education, including afterschool science programs, is expanding globally and concluded that Extended Education worldwide is booming even when it comes to education focused on science. Extended Education is highlighted as an effective way to address the challenges faced by public schools, meet various social needs such as childcare and education for immigrants, and develop a skilled workforce in certain areas (Bae, 2019). In line with this, Ecarius et al. (2013) state that in most countries "not only educational policy arguments but also questions of the employment market and family policy play an essential role in the justification of out-of-school programs and activities" (p 8).

Extended Education has recently garnered increased attention in research. International studies on Extended Education have explored various topics, including the effects of different activities on students' academic performances, social and emotional abilities, equity, health and well-being as well as broader societal impacts have been investigated (Ecarius et al., 2013; Skolforskningsinstitutet, 2021). As reported in a recent research review (Skolforskningsin-

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stitutet, 2021), Extended Education research in the Nordic context has primarily focused on organizational changes within after-school programs, the integration between after-school programs and schools, and the professional role of after-school educators. At the same time, there is growing interest in the content of after-school programs and their significance for students' development and learning.

Research focusing on science teaching within the context of Extended Education remains limited. There are a few research reviews on science teaching in Extended Education focusing for example gifted students (Chowdhury, 2018), equitable participation (Heath et al., 2022) and science education in museums and science centers (Ennes & Lee, 2021). However, to our knowledge, there is no previous mapping of the characteristics of science teaching in Extended Education, focusing on teaching purposes (why), content (what), and teaching approaches (how). Such a mapping has the potential to meet the needs of teachers who struggle with how to teach science in Extending Education settings and to make an important contribution to research by addressing a currently underexplored area.

Providing teachers with a systematic overview of different teaching purposes, content and approaches is a way to support teachers in seeing alternatives for their teaching. Thus, such an overview has the potential to support teachers' didactic analysis (Klafki, 1995) and the didactic positions and choices teachers make. Contributing to this kind of support is a central task of the didactic research tradition (Wickman, 2014). The mapping of the characteristics of science teaching in Extended Education settings presented in this article can be seen as a step toward developing didactic models (Wickman, 2014) for teaching science in Extended Education. Such modelling takes a starting point in extracting knowledge, practices and experiences from teachers and actual teaching settings.

A significant portion of the research on science teaching in Extended Education focuses on Extended Education aimed at secondary students. In this study, descriptions of the characteristics of science teaching aimed at students aged 6–12 in Extended Education contexts are extracted from peer-reviewed, international research literature and systematized. The results are structured as different answers to the didactic questions why, what and how.

Aim and Research Question

The study aims to increase knowledge of the characteristics of science teaching in Extended Education as described in previous research literature.

The following question is the starting point for the systematic empirical mapping:

What characteristics regarding science teaching in Extended Education, concerning purposes, contents and teaching approaches, can be extracted from descriptions in previous peer-reviewed research articles?