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Educators' Perception on the Use of Robots in the Early Childhood Environment

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Abstract

Understanding teachers in the early childhood education is crucial as it can not only affect the quality of children's education but also cause many critical problems such as child abuse. A significant amount of research work has been made on the use of robots in childcare classrooms. The finding from the research has shown many advantages such as the improvement of learning performance, social/emotional skills, creativity, concentration period, physical and cognitive development. However, most of the study has been implemented at the K-12 classrooms but not much has been focused on the education at the early childhood classrooms. Importantly, it is very crucial to understand teachers' perception, demands and technical competence about the new teaching tool, in order to maximize its educational effect. This paper investigates some critical issues existing in both teaching and managing in the early childhood education. It will also explore teachers' perceptions and expectations on the use of robots to identify some dilemmas that exist in their working and teaching environment. A survey study was conducted with 119 early childhood educators in South Korea. It analyzed the educators' perception of using robots to improve their teaching performance and to make better outcomes for children, investigated job satisfaction and difficulties that they have in the current work environment. This paper concludes with several guidelines for integrating and setting robotics in the early childhood environment, in order to engender productive outcomes for the future early childhood education.

Keywords: *Early Childhood Education, Robots, Teachers' Perception, IT in Education.*

1. Introduction

The early years of transitioning through childhood are considered the most crucial years with regards to developmental growth and learning. These early childhood experiences will also influence future cognitive, social, physical, emotional and linguistic development. However, the childcare industry is currently facing many difficulties due to diversified working environments which also cause problems for staff to work in their full potential to taking care of children and making greater outcomes for the children's future life.

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Today's world is changing at an alarming rate with regards to technological advancements. A future, which was predicted to occur within a century, has almost emerged in the span of ten years. Automated self-driven cars, smart homes and aviation projects aimed at taking travelers into space are examples of the rapid speed of technological transitions. As a result, the social perception of technology has also changed especially as without technology, the modern world could not operate.

Much research has been conducted on the use of robots in the education setting. Most of the research has attempted to prove how robots could improve children's learning performance and social interaction skills. Han et. al. [1] used robot to aid a foreign language lesson and found that the use of robots as a teaching tool enhanced children's learning skill as well as the concentration capability of children. Others addressed a potential to develop various learning skills including understanding science processes, mathematical concepts and improving achievement scores [2]. Conti et. al. [3] addressed some positive attitudes from the use of robots for children with disabilities. Hicks conducted research on the effect of robots for children with autism [4]. Overall, most of the research papers indicated various positive outcomes and potentials that robots could provide in the early childhood settings. Unfortunately, most of the research has been implemented in K-12 classrooms but very rare in the early childhood education. Also, even though the role of teacher is very crucial compare to that of the K-12 teachers, not much research was conducted on the perception of the teachers on the use of new technology for teaching, Bers et. al. [5] indicates that early childhood educators do not have enough knowledge or understanding about IT and robot technologies not appropriate pedagogical strategies to utilize the technologies for teaching.

This paper investigates some ciritical issues existing in the early childhood education, and teachers' perception and expectations about the use of robots to solve the problems. A survey study was conducted with 119 early childhood educators. Data was collected and analyzed about the difficulties that the early childhood educators currently have and how robots would improve the job environment as well as children's learning. It will also propose several guidelines for better use of robots in the early childhood education.

2. Robots in early childhood education

The application of robots in education is becoming more popular. A teacher robot, for example, was developed, tested and analyzed in a classroom in Tokyo [6]. Some attempted to solve a staff shortage problem by monitoring children's sleeping or playing with them in a nursery [7]. Various robots have been developed and applied for education, such as Qrio, PaPeRo, iRobi, Tiro to name a few. A research team at the University of California San Diego has deployed Sony Qrio in local schools and observed that the children had improved at holding attention [8]. Other examples include robots assisting teachers in early childhood environment [9], for language-teaching at primary schools [10] and for health environment education [11].

Despite many innovative and useful IT products, such as robots, are developed every day, it does not always work well if teachers do not have interest or enough knowledge how to use it. Khanlari studied the perception of teachers about robots in education and found that 82% of the teachers are unfamiliar with the robot-related technologies [12]. Most of the teachers were curious about the use of robot for teaching but were anxious about the prospect of the use of robots. Some teachers indicated that robots might be useful for high school students, but they were unsure about the effectiveness for young children.

3. Survey study

The shortage of workers in the childcare industry is becoming a global issue across the world. The study with 1200 associated educators and qualified teachers working in childcare in Australia revealed that one in

five early childhood educators planned to leave their job in the next 12 months [13]. The main reasons for the leave included overloads of work, feeling undervalued and low payment. Children's services in Australia are under pressure due to the cumulative effect of the increase in both the demand and supply of children's services and the apparent shortage of qualified staff [14]. The staff shortage problem degrades the standard of the licensing systems and it can have direct impact on the children. Child abuse has been a key issue in United Kingdom with the lack of qualified staff underling the poor quality of system [15]. With these critical situations accruing in present this survey study will show what early childhood workers need to stay in their position.

Educators job satisfaction is closely related to the productivity at work. Mein et. al. [16] and Van den Berg et. al. [17] addressed that low job satisfaction was one of the key factors that affects the intention to leave or retire early. Some other research also revealed that staff shifts occurs more frequently in early childcare centers in comparison to other teaching environment [18,19] and this directly affects the low-quality service for young children [19-23]. Since early childhood teachers play such a vital role, understanding teachers' perceptions and job satisfaction is also very important.

4. Teachers' perception on educational robots

For this research, a survey study was conducted with 119 early childhood teachers from 60 childcare centers in South Korea. The data collected from the survey was analyzed to identify the critical issues in the early childhood education and the correlations among job satisfaction, teacher's needs and the perceptions on the use of robots in early childhood education settings.

Every survey study began with giving a brief explanation about the aims and objectives of the research. Teachers were asked to choose one to five multiple choices for quantitative analysis, where five for the most positive and one the most negative. The comment sections were also given for the qualitative analysis, in order to allow individuals to comment their thought and ideas. The survey was conducted anonymously and asked to return the answer sheets sealed in an envelope when completed.

The data analysis showed that most of the educators, 87%, needed teaching assistants, Figure 1.

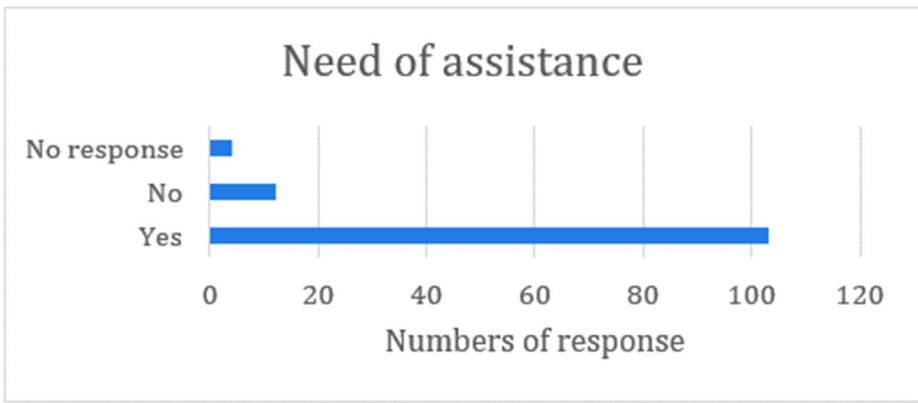

Figure 1. Teachers who need assistants

The teachers believed that the enough assistance would provide more contact time and consequently enhance the quality of education. In fact, majority of the teachers appealed high levels of stress due to the heavy workload and high children per teacher ratio, Figure 2.

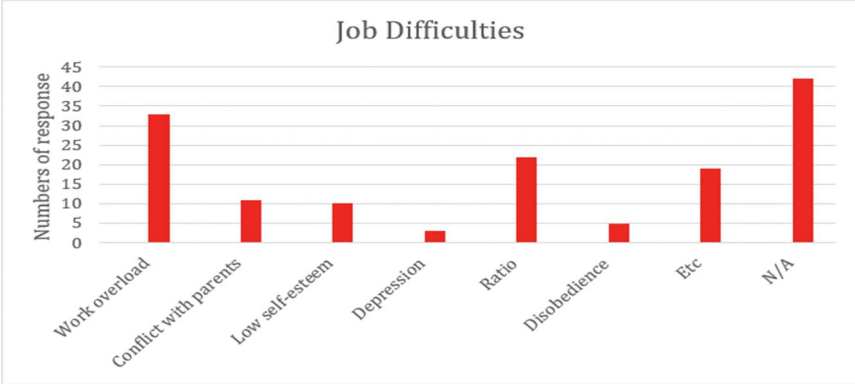

Figure 2. difficulties for the teachers. Heavy workload and high children per teacher ratio were the major issues.

The average level of job satisfaction was 3.9 out of 5. The average ratio for the high job satisfaction group (between 4 and 5 out of 5) was 17.1042 children per teacher, whereas the teachers with a high children-educator ratio (33) answered low job satisfaction, 2 or less.

Figure 3 shows that the teachers who rated a high job satisfaction level were also highly positive on the perception of robots integrating into childcare, scoring average 3.12 out of 5. On the other hand, the low job satisfactions group scored average 2.8. Regardless of their job satisfaction, both groups chose high scores in need of educational assistance in their classroom.

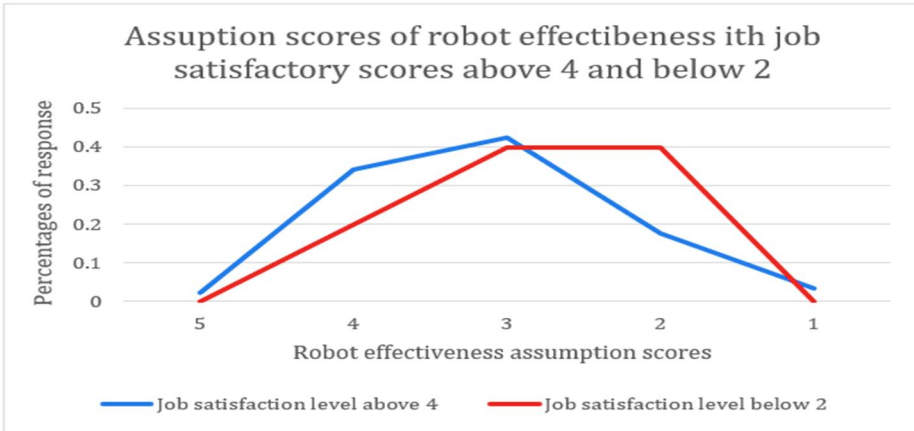

Figure 3. Assumption scores of robot effectiveness with job satisfactory scores above 4 and below 2.

The teachers believed that the use of robots in education will be beneficial to both teachers and children, and children would have more benefits, Figure 4.

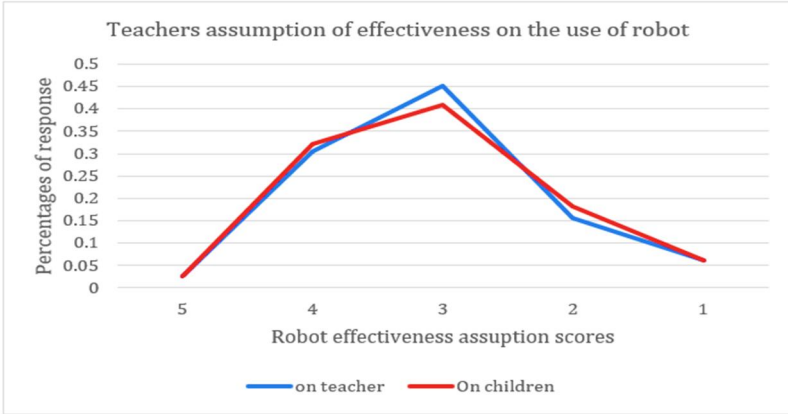

Figure 4. Teachers believed robots will more beneficial to children

When the questions came to the applications of robots in more details, the answer from the teachers were not confident due to the lack of technical knowledge and concept in the use of robots in childcare settings. However, the expectations of the teachers about the impact of robots in education were highly positive. Most of the teachers expected the biggest impact of robots to children would be the increase of creativity (53%) and general learning (30%). The rest was for assisting in cleaning and other management work.

5. Conclusion

Understanding the job environment of teachers in early childhood education is very crucial to improve the educational quality as well as preventing some critical problems, such as child abuse. Researchers proposed the use of robots in education to solve some problems that teachers have and to enhance the educational quality. This study investigated the teachers' perception of integrating robots in to the early childhood education environment. Our survey study revealed that most of the frustration that teachers had come from overloads of work and high children per teacher ratio, and this issue was high related to the job satisfaction.

The perception of the early childhood teachers was positive towards the idea of using IT and robots in childcare system. However, the teachers were not confident nor comfortable with the details of the use of robots in teaching, due to lack of technical knowledge.

The quantitative and qualitative survey showed that the introduction of the technologies into the classroom would highly support children's creativity. Educators believed that robots would be more beneficial to children's education than the work assistance.

In conclusion, the introduction of educational robots to early childhood classrooms will bring great benefits to reduce the stress level that teachers have, enhance creativity of children. however, in order to make full use of its capabilities and productive outcomes for the children and teachers, it is essential for the teachers to gain basic knowledge on the use of technology resources through training to be comfortable and confident in their teaching performance through using new technology.

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