Technological tools as a facilitator for parental/guardian participation in early childhood education

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ABSTRACT
There is a significant need for an intervention to improve student performance in the Brazilian public school system, especially in the State of Rio de Janeiro. A viable option would be enhancing the interactions between home and school. Technology can be used to facilitate the communication between teachers and parents/guardians. Subsequently, further promoting parental/guardian participation in a student's education. This paper intends to study technological tools used to promote teacher and parent/guardian communication. The general purpose of this study is to map out existing technologies to serve as a road map for future technological aids used in schools within the Rio de Janeiro public school system.

Author Keywords
Teacher and Parent/Guardian Communication, Technological Tools.

ACM Classification Keywords
H.5.m. Information interfaces and presentation; J.m.- Miscellaneous; K.3. - Computers and Education; K.4. - Computers and Society.

INTRODUCTION

By law, parents or guardians residing in the State of Rio de Janeiro are guaranteed the right to receive a report card regarding their child's performance in school. However, these progress evaluations are only released on predetermined dates. What if teachers could communicate with parents and guardians between these set periods of time? What if a student's progress could always be measured by their parents or guardians? Epstein's model for parental involvement, used to facilitate partnership programs between educators and parents, states six different types of parent involvement [12]. One of the categories is communication, creating a two-way communication channel between school and home (school-to-home and home-to-school communications) regarding school programs and student progress. The support given to children by their parents impacts their achievement in school, where a child's attitudes towards school and learning can be directly influenced by parental attitudes [9]. Studies show that parental involvement during a child's first year of school can enhance the probability of a student's ability to adapt more efficiently and obtain good grades [24]. Children in elementary school who receive positive reinforcement from their families regarding good work and study habits while at home and whose value of education is prioritized have the tendency to do well; they accomplish even more when parents are informed of their progress and collaborate with their respective teachers [17]. The student grade levels considered for this literature review were those that encompass early childhood education, given that in this age group "the impact caused by different levels of parental involvement is much bigger than differences associated with variations in the quality of schools" [10].

A scholastic census performed in 2016 showed that there was a total of 145,647 schools located in the State of Rio de Janeiro [28]. Of the 39,377,536 students regularly enrolled in school, 12,619,218 fell into the category "early childhood education" [28]. The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines early childhood as "the period from birth to eight years old" [32]. For the purpose of this study, children in daycare and preschool were excluded from the calculation of those regularly enrolled. Early childhood in the data includes students from grades 1 to 5. Of the students enrolled in 2016, 11,619,054 (92,1%) were approved to go onto the next grade while 860,299 (6,8%) were held back (or retained) in their current grade for the following school year and 139,866 (1,1%) abandoned school completely [29]. The Brazilian index for educational development (IDEB - Índice de Desenvolvimento da Educação Básica) for 2017 showed that

the score achieved for primary education reached the desired goal and increased in comparison to the previous year. However, in a scale from 0 to 10, the score achieved was 5.5 [26]. According to the Brazilian Institute of Educational Studies and Research (INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira), this scale is used to measure the quality of education in Brazil.

PROBLEM STATEMENT AND RESEARCH QUESTION

This paper intends to study and establish how technological tools can be used to improve communication between educators and parents/guardians, facilitating the participation in early childhood education.

Research question: What are some current technologies used to accommodate the communication between parents or legal guardians and teachers?

The general purpose of this paper is to map out existing technologies to serve as a road map for future technological aids used in schools within the Rio de Janeiro public school system.

RELEVANCE

Technological Literacy

Overview

Technological literacy pertains to the knowledge of and capacity to correctly use any given technology [16]. According to the International Technology Education Association (ITEA), a person who is technologically literate understands the essence of technology, what it is and how it works [18]. Currently, there are no comprehensive global statistical indicators being used to measure technological literacy for today's reality. The Global Framework for Digital Skills was presented at the 2018 World Summit on the Information Society in Geneva [2]. This framework was designed to allow countries to analyze digital literacy within their own borders, possibly supporting the development of curricula and assessments [34].

Technological Literacy in Brazil

According to the Human Development Reports for Brazil conducted by the United Nations Development Programme, the percentage of the total population that can be categorized as internet users is 60.9% [33]. Additionally, according to the International Telecommunication Union (ITU), in 2017, there were a total of 236,488,548 mobile telephone subscriptions in Brazil [19]. The Brazilian Geographic and Statistical Institute (IBGE) estimated the Brazilian population in 2017 to be around 207.7 million [1]. The number of mobile telephone subscriptions surpassed that of the population. Both internet access and mobile phones are necessary precursors for the implementation of technology to facilitate the communication between teachers and parents/guardians.

Current Initiatives in Brazil

There have been a variety of bills passed within Brazil to promote electronic report cards. In 2018, laws were passed in Goiânia (a city in the State of Goiás) [6], in Rio Branco (municipality in the State of Acre) [8], and in São Luís (a city in the State of Maranhão) [7]. In all, these laws seek to make available electronically grades, reports and attendance for parents and guardians of students within the public school system.

Current Initiatives in Rio de Janeiro

Online report cards, known as *Boletim Online*, have been available in the state of Rio de Janeiro since November of 2009 [31]. Parents and students can assess grades and truancy for each academic quarter by accessing a website [30]. The system works as a digital representation of the conventional report card, that is printed by the school and sent out to parents and guardians. As such, the system only serves as a visual aid for student performance and not a direct communication facilitator between teachers and parents/guardians.

RELATED STUDIES

There have been several studies conducted to analyze parental involvement in childhood education. Researchers in Ghana sought out to "examine the extent to which the involvement of parents" affects the academic performance of students [25]. Two separate master's theses also examine this phenomenon, [23] and [4]. Both theses were approved in 1998 and 2004, respectively. Additionally, studies that analyze student performance also exist. A study conducted in 2006 examined multiple aspects of student readiness in an educational environment [15]. However, no study analyzed the use of technological tools as a facilitator for educator and parent/guardian communication in a Brazilian context. This phenomenon is still relatively unresearched.

METHODOLOGY

Systematic Literature Review Protocol

Research Strategy

Digital libraries established by journals predominantly contain articles published by the journal maintaining it, while indexed databases index articles from various digital libraries [13]. Combining digital libraries and indexed databases is a valid method to conduct a systematic literature review [11]. The research databases chosen for this study were: Web of Science, Scopus and IEEE.

Search Strings

The search strings used for each research database are shown in Table 1.

	Tools currently used to facilitate the communication/interaction between teachers and parents/guardians in early childhood education
Web of Science	TS = ((teacher OR school) AND (parent OR guardian) AND (communication OR interaction) AND (tool OR app OR site OR system) AND (childhood OR elementary))
Scopus	(teacher OR school) AND (parent OR guardian) AND (communication OR interaction) AND (tool OR app OR site OR system) AND (childhood OR elementary)
IEEE	(teacher OR school) AND (parent OR guardian) AND (communication OR interaction) AND (tool OR app OR site OR system) AND (childhood OR elementary)

Table 1 – Search Strings

Study Selection Criteria

There was a total of 4 study selection criteria for the inclusion and exclusion of articles. The first criteria chosen to narrow down studies was language. Only articles written in English were considered for this study. The second inclusion/exclusion criteria was the type of research. As a result, research articles (from journals and magazines) and conference papers were exclusively considered. The year of publication was also considered as a factor. Research published and presented between 2004 and 2017 were included in the study. Additionally, articles pertaining to the medical field were excluded, except for those pertaining to psychology and psychiatry.

Systematic Literature Review Results

The initial search, application of the search string, generated a total of 268 results amongst the 3 chosen research databases (Web of Science, Scopus, IEEE). The selection criteria (language, type of research and year of publication) and research area filters (exclusion of articles regarding the various medical fields of study, except psychology and psychiatry) were applied to this search. The results generated from this inquiry included duplicates between the different databases. Three forms of analysis were used on the initial results in order to narrow down the number of articles that could possibly be considered for this review. The first analysis was the examination of titles and abstracts, evaluating whether the subject matter of a given article was pertinent to the present study. This inquiry helped reduce the collection of articles down to 39. The second analysis included removing duplicate articles amongst the previous analysis' results, which in turn, decreased the total number to 26. The third and final analysis applied was content evaluation. Upon reading each article, a decision was made of whether it was relevant and enhanced the discussion. From the results remaining after the first two analyses, 4 articles were chosen using the third analysis; which are further elaborated upon in the following section.

TOOLS USED TO FACILITATE COMMUNICATION AND INTERACTION

A major component of the integration between teachers and parents/guardians is school counselors. According to the Council for Accreditation of Counseling & Related Educational Programs, "counseling is a professional relationship that empowers diverse individuals, families, and groups to accomplish mental health, wellness, education, and career goals" [5]. They can serve as a human bridge for the interactions between teachers and parents/guardians. A study conducted at a school in Surabaya (Indonesia) provided a technological tool to facilitate the communication for School Counseling Services (SCS) and evaluated the proposed system by surveying its target audience (teacher, counselors and parents). An SCS information system was designed with the intent of creating a network of adults, providing them with complete access to a thorough composite of a student's information. It was made available via two versions: mobile (for parents and accessible anywhere) and web (school officials) [22]. Upon completing the analysis and system design phases, tests were conducted to measure the features' efficacy and performance. Three testing methods were used to analyze the system: unit testing (conducted individually for each feature/process), integration testing (verified the accuracy of each feature) and User Acceptance Testing — UAT [22]. The UAT testing method was executed by administering questionnaires to teachers, counselors and parents. Surveys were distributed to all teachers and counselors, and simple random sampling was used to select parents for participation in the questionnaire process. The surveys were administered to evaluate the system's efficacy and identify potential improvements. Two surveys were distributed, the first inquired about general functionalities and problems encountered by school personnel (teachers and counselors), and the second investigated the same aspects as the first survey but from a parental point of view. In all, most parents, teachers and counselors agreed that the system (or any system of the same caliber) would be beneficial to the communication between school (teachers) and home (parents/guardians), which in turn, would benefit the students' overall development. After analyzing all test results, the researchers intended to further implement the system in a wider range of school grade levels and evaluate functionality a year after its implementation. The collaboration and coordination between school and family is necessary to address and manage learning barriers, thus ensuring that student knowledge is achieved in a constructive manner. [14] The system created proposed to foster this partnership.

An e-portfolio is an electronic tool that allows a person to store and collect evidence of learning, "owned and managed

by the student, and meant to be selectively shared according to audience and purpose" [20]. According to Mohammed et al., "e-portfolios have many advantages over printed portfolios, they are easily accessible, with the ability to store multiple media, they are easy to update, and references the work of learners" [26]. A researcher in New Zealand conducted a study to analyze a school's transition from physical portfolios to electronic portfolios (e-portfolios). The study intended to evaluate parent and teacher perspectives regarding collaborative relationships through e-portfolios. Educa and Storypark were the two providers chosen for the study, both of which "provide a range of ways to communicate with families, such as learning story templates, conversations, video and audio, and can be accessed in multiple ways, such as desktops, laptops, tablets and smartphones, with an app available for tablets and smartphones" [3]. Additionally, tools to help better understand how to utilize the programs are made available to the user through the systems. The study aimed to investigate how and whether an e-portfolio can assist teachers in supporting and promoting collaborative relationships with their colleagues, students and their families, in addition to, supporting families in cultivating collaborative relationships with their child's teachers [3]. A series of interviews and questionnaires were conducted to examine the alliance between teachers, students and their parents/guardians, and how e-portfolios improve their communication. One finding derived from the study showed that both teachers and parents agreed that e-portfolios promoted collaborative partnerships and increased effective communication between both parties. As a result, there was an increase in parental involvement since the implementation of the digital system. Research findings also showed that with adequate participation from all members involved, communication improved significantly. Additionally, teachers who participated in the study stated that e-portfolios helped enhance the collaborative relationship between the school and home environments. With the information gathered through the dialogue provided by the system, teachers were able to better prepare lesson plans based on an enhanced understanding of a child's personal needs and home life.

A group of Chinese researchers developed Hero, considered "a suite of learning tools that combine teacher-created extracurricular challenges with in-class motivational tools to help parents become more involved in their child's education, while also engaging students in their own learning" [35]. Given that several technologies aspiring to strengthen parental involvement have been developed in countries within Western society, the study focused on non-western characteristics of educational tools, specifically in the Chinese context. Hero comprises of three different modules, "a website for teachers, a mobile application for parents, and an interactive adventure map that can be used in the classroom by each student" [35]. The three modules interact with one another, imposing direct and indirect communication between the participating individuals. Its design specifications were based on the results from a field study including elementary school students, parents and teachers. The field study, conducted in a school located in Beijing (China), included interviews with all parties involved and usability testing. The main design goals in creating Hero were: "increase parent-child communication by reducing redundant tutoring sessions, improve parents' pedagogy skills to increase their ability to teach their children and involve teachers' guidance in parenting to leverage the trust parents have in them" [35]. Advice and guidance could be given to the parents by the teachers through the website, of which include challenge-based guidance based on different educational problems. According to participant feedback, the system was easily understood and used. The study showed that all participating parents agreed they could acquire pedagogical guidance from teachers through the system. Additionally, all participating teachers stated that through the system they were able to better understand a student's academic environment outside of school. In all, the system helped facilitate the alliance between teachers and parents/guardians.

A study conducted by researchers in Taiwan, created a system for an electronic classroom newsletter for students [21]. The population chosen, students in the fourth grade of an elementary school, would input their work into the platform created specifically for the classroom and parents would receive a classroom newsletter via email. The focus of this study was to design and construct a system that enables the composition of newsletters, and to enhance parental understanding of a child's daily routine and achievements in school. The researchers hypothesized that communication between teachers and parents/guardians could improve through a student collaboration by way of an electronic classroom newsletter; of which includes information updating parents/guardians about their children's daily routines and tasks. Through user feedback, the study was able to show that parents were able to be more aware of their children's accomplishments better through visual depictions as opposed to the oral sharing previously experienced. According to studies, "it takes the cooperation of both parents and teachers to guide a youngster out of academic or behavioral problems; good parent-teacher communication is therefore indispensable when it comes to helping a child break through learning barriers" [21].

CONCLUSION

Multiple studies introduce tools used to promote the communication between teachers and parents/guardians. However, no studies were found pertaining to a Brazilian context. This year, laws at the State level in Brazil were passed to announce and mandate electronic report cards throughout the country. However, this alone may not be a strong enough agent to promote the necessary level of communication between teachers and parent/guardians. As such, perhaps examining tools and systems available in the market and implemented in other school systems but adapting them to the Brazilian reality may accomplish a

significant boost in communication. An in depth analysis of how technology is being used to enhance current communications between teachers and parents/guardians within a Brazilian public school context could be elaborated in future studies.

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