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Use of ICT and Effect on Secondary Students' Achievements in Mathematics

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Abstract*—Nowadays, ICT has developed rapidly, the diversity of available applications has expanded dramatically as well, from simple early tools such as word processing, spread-sheet, drawing, painting, and processing tools to more advanced tools such as programming software and education related software for learning. In this survey, we can understand the influences of ICT on students' mathematics achievements. This study aims to investigate the impacts of information and communication technology (ICT) use on students' mathematics achievements. Data were collected from the Secondary School Students of West Bengal. The study revealed that school level ICT related work had positive influences on learning outcomes. However, the findings indicated that the relationships between different types of ICT use with Mathematics achievement were positive. In addition, self confidence in Internet tasks was discovered to be beneficial to mathematics and thus, suggestions were made to develop students' confidence in conducting ICT related activities*.

***Keywords*—** *ICT, Mathematics, Secondary School Student, Student achievement*.

I. INTRODUCTION

Information and communication technology (ICT) is a specific term that refers to technologies designed for collecting, processing, preserving and delivering information. It has been widely recognized that the rapid development of ICT dramatically affects every aspect of contemporary life by changing the ways people live, work, and study in today's knowledge society. These changes have brought innovative and diverse options, but they have also required us to be information and communication technology (ICT) literate. In general, ICT literacy is defined as the ability to use technology tools appropriately in processing, managing, and evaluating information and communicating with others. Students get more opportunities by the help of ICT to explore the world by themselves. Relationships between use of ICT and student academic achievement were found changeable. In the area of education, a growing body of evidence demonstrates that ICT is an effective means for addressing education goals and requirements. Therefore, the effects of integrating ICT into teaching and learning on students' development have gained more and more attention from both education policy makers and researchers. ICT develops rapidly and support students' learning environments. As a result, students' engagement in ICT activities gives them the opportunity to learn more on ICT knowledge, tools and skills and positively influence their lives. However, given that students have more access to computers and the Internet at school, students' personal ICT use is beneficial for outcomes, especially academic achievement has also been explored. The development of ICT use in education settings has not only become a policy priority in most countries but also an important research studies that focus on the relationship between ICT and academic achievement.

The main focus of the study is to establish how often and how well students use different ICTs, such as for word processing, spread sheets, and editing, for processing or transmitting digital information, or for email or other communication tools. In addition to these basic operational skills, students' attitudes and confidence regarding ICT are also measured.

II. LITERATURE REVIEW

As information technologies developed rapidly, students' actual ICT use became more diversified over time. The dramatic development of the Internet provided more opportunities for students to participate in social communities, access information, and communicate with people around the world (Young 2008).

Now students have their own computers and other devices at home, ICT use is gradually becoming part of their lives. This is quite different from early ICT use, which mostly took place at school. Some researchers found that using computers at home was associated with better performance (Wittwer and Senkbeil 2008).

ICTs can be used for many different purposes, such as entertainment and education. Regarding its entertainment aspects, students actively participate in diverse computer and Internet activities, such as chatting online, playing games, and watching movies. However, students also actively engage with computers and appropriate technologies for school and education related tasks, for example, searching the Internet for information, downloading class materials from school websites, and improving their learning efficacy and methods using certain software. ICT use could also be categorized by locations, that is, whether ICT activities take place, at home or at school, or elsewhere (OECD 2011; Delen and Bulut 2011). In recent decades, school level ICT investments in equipment and infrastructure has advanced from providing computer, Internet access for online teaching and learning (Blackwell, Lauricella, and Wartella 2014). Meanwhile, families are playing greater roles in transmitting ICT influences now that so many students have their own computers and can easily access the Internet at home. ICT use can also be classified into other categories; some researchers group ICT activities into gaming, collaboration and communication, information and

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technical operations, knowledge and content creation and problem solving (Biagi and Loi 2012).

Earlier ICT skill assessments primarily related to students' use of computers and the Internet for learning and entertainment purposes and now ICTs became media tools for students to interact with other people. School related tasks focused more on using the Internet to email and communicate with classmates and teachers, download and upload school material, and conduct simulations. According to Young (2005), learning occurs during Internet mediated activities because of the interwoven relationships between users, the Internet and society. From this view, the Internet could be regarded as a mediating tool between individuals and society (Young 2005) through its promoting interaction and collaboration.

A number of studies found that computer availability and use had positive effects on students' achievement and it develop students' skills in order to improve their learning outcomes.

The most widely used method of categorizing ICT use is by purpose, specifically for entertainment or education. In some research, using ICT for entertainment was found to positively influence achievement because entertainment can help students release stress and passive emotions so that they can concentrate on learning and enable students to think effectively and critically, which is necessary for their learning (Witter and Senkbeil 2008; Ziya, Dogan, and Kelecioglu 2010).

Meanwhile, a significant amount of research has found that students' demographic variables such as gender and socio-economic status greatly impact their computer use (Javier et al. 2012, Aypay 2010), as well as their academic performance (Witter and Senkbeil 2008; Luu and Freeman 2011).

According to Bandura's theory, self-confidence is a significant predictor for specific tasks. Self-confidence in ICT indicates a personal belief in the capacity to accomplish certain ICT tasks. Guzeller and Akin (2014) found that students' confidence in performing high-level and Internet related tasks was associated with higher math scores. Other researchers found that students who reported higher confidence with high level ICT tasks had significantly higher levels of scientific literacy (Luu and Freeman 2011; Wittwer and Senkbeil 2008; Sedat, Atalmis, and Erkan 2011).

A large number of studies have focused on gender differences in learning and ICT use; it was found that girls behaved better during ICT activities than did boys (Ong and Lai 2006). However, in terms of the relationship between ICT use and student achievement, there is no statistically significant difference between male and female students (Gumus and Atalmis 2011; Luu and Freeman 2011).

III. Methodology

Implementation of the descriptive method research design resulted in this study. The study is qualitative in nature and was conducted on a sample of Secondary School Students of West Bengal. The Study was designed to obtain the influence of ICT practice on Students' Achievements in Mathematics in Secondary School of West Bengal.

Samples

For collection of data, attitudes towards ICT use as well as their academic achievement was administered to the 100 male and female Secondary School Students of West Bengal.

Tools

Questionnaires have been used to evaluate the students' attitudes towards ICT use as well as their academic achievement.

Technique

The main technique used for the data analysis was qualitative in nature.

IV. Results and Discussion

The most important contribution of this research is investigating the trends in the influence of ICT use on individual student performance. The current research shed light on the complex influences of diverse ICT uses on student achievement in mathematics. It was found that program and software use had less attention, whereas Internet use had more attention.

At the school level, both school type and school average social economic status were found to show consistently and significantly positive relationships with student math achievement. The family social economic status was found to be a consistently and significantly positive influence on student achievement. Students who have higher economic status tend to show higher achievement indicators. Male students on average achieved higher levels of performance in math. According to the analysis, the extent to which students used the Internet for entertainment had significant impacts on their achievement in math. The intensity of students' engagement in Internet entertainment activities had negative relationships with their academic performance. In this research we found that the Internet use for education purposes had a significantly positive or negative influence on achievement no matter whether it took place at school or at home. However, the use at school had a significant positive influence on student performance, but for use at home, significant negative relationships, respectively, were found for student achievement in math. It was also found that students with more confidence tended to have higher scores. So higher confidence was found to be a significant positive factor.

The analyses stated that the relationships between the ICT use and student learning outcomes were generally positive. At this point, we can argue that students' more frequent ICT use does not necessarily relate to higher scores. However, given the dramatic changes that are occurring in modern society, this trend could change.

One possible interpretation for the lower achievement with the increased use of programs and software is that basic computer operation skill levels, including word processing, making spread-sheets, are more likely to assist students in completing relevant tasks (Li and Ma 2010). In addition, although ICTs have been widely accepted and integrated into school environments. This could have been because educational software was more often used to assist students

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who were behind, so that it did not show beneficial effects for all students (Karpati 2004). In conclusion, although more specific and diverse program and software use items were included across the different testing rounds, consistently negative associations between this type of use and student achievement were found.

Based on the previous research, the relationship between the frequency of using the Internet for entertainment and student learning performance has been inconclusive, resulting in a great deal of debate. According to the results found in the current study, it appeared that over time, more time spent using the Internet for entertainment did not benefit students' learning outcomes. However, the interesting finding is that the relationship showed a positive sign: students who used the Internet more often for fun performed better than those who did not. Obtain practical information from the Internet were included as entertainment related indicators, are more representative of advanced Internet use for information exploration and investigation. Lee and Wu (2013) divided online activities into social entertainment and information seeking, and they suggested when students engage in more online information seeking, they gain a better understanding of how to use metacognitive strategies. Specifically, this type of activity is more goal oriented and entails more conscious monitoring and evaluation and better selfregulation. Consistent with previous research (Biagi and Loi 2013), Internet use for education purposes at school was found to be a positive influence on student academic performance. And Internet use for education purposes at home, the current study found that education-related Internet use at home was significantly positively correlated with high academic achievement (Ravitz et al. 2002). Other researchers, meanwhile, for example Fuchs and Woessmann (2004, cited by Luu and Freeman 2011), had already observed that the relationship between the two variables might not be direct linear, just as with the relationship between time spent on homework and student learning outcomes (Song and Kang 2012; Wittwer and Senkbeil 2008).

In alignment with previous findings, the current study found a consistently positive relationship between ICT confidence and student achievement in math. Therefore, an important implication of this study is that within the ICT related education context, confidence in using ICT has more of an effect than frequency of ICT use.

School level variables encompassed school economic status, expenditures and income and included average student socio economic status, school type, quality of school educational resources, and the ratio of web based instructional computers; individual student socioeconomic status was also included. Overall, it was found that both school and student socioeconomic levels significantly influenced students' learning outcomes. To conclude, school level ICT variables had strong positive impacts on student achievement. Consistent with previous findings (Notten and Kraaykamp 2009), individual student socioeconomic status had a positive correlation with academic performance.

Males were consistently found to have better learning outcomes than females in math, which was consistent with previous studies (Gumus and Atalmis 2011). This gender gap might be because female students had higher levels of anxiety, less interest in the subjects and less confidence, which all lead to lower achievement (OECD 2007). Additional support should be provided for females in order to develop their confidence and interest in math, such as introducing interactive teaching strategies or improving classroom environments (Liu and Wilson 2009).

V. Conclusion

A number of implications related to the current analysis have been provided for future studies. First, given the nature of the measurement used in this research, we only intended to explore the association between frequency of ICT use and student academic performance. Although it is suggested that ICT use might indicate ICT skill levels, we suggest that further research should rely on well-designed instruments that directly assess the range of ICT competencies.

References

[1] D. Anil and Y. Ozer, "The effect of the aim and frequency of computer usage on student achievement according to PISA 2006," *Procedia-Social and Behavioral Sciences*, vol. 46, pp. 5484-5488, 2012.

[2] A. Aypay, "Information and communication technology (ICT) usage and achievement of Turkish students in PISA 2006," *The Turkish Online Journal of Educational Technology*, vol. 9, pp. 116-124, 2010.

[3] F. Biagi and M. Loi, "Measuring ICT use and learning outcomes: Evidence from recent econometric studies," *European Journal of Education*, vol. 48, issue 1, pp. 28-42, 2013.

[4] C. Blackwell, A. Lauricella, and E. Wartella, "Factors influencing digital technology use in early education," *Computers and Education*, vol. 77, pp. 82-90, 2014.

[5] J. R. Cheema and B. Zhang, "Quantity and quality of computer use and academic achievement: Evidence from a large-scale international test program," *International Journal of Education and Development using ICT*, vol. 9, issue 2, pp. 95-106, 2013.

[6] D. Zhang and L. Liu, "How does ICT use influence students' achievements in math and science over time? Evidence from PISA 2000 to 2012," *Eurasia Journal of Mathematics, Science & Technology Education*, vol. 12, issue 9, pp. 2431-2449, 2016.

[7] E. Delen and O. Bulut, "The relationship between students' exposure to technology and their achievement in science and math," *The Turkish Online Journal of Educational Technology*, vol. 10, issue 3, pp. 311-317, 2011.

[8] I. Demir and S. Kiliç, "Effects of computer use on students' mathematics achievement in Turkey," *Procedia - Social and Behavioral Sciences*, vol. 1, issue 1, pp. 1802-1804, 2009.

[9] R. Flores, F. Inan, and Z. Lin, "How do the different types of computer use affect math achievement?," *Journal of Computers in Math and Science Teaching*, vol. 32, issue 1, pp. 67-87, 2013.

[10] J. Gil-Flores, J. J. Torres-Gordillo, and V. H. Perera-Rodriguez, "The role of online reader experience in explaining students' performance in digital reading," *Computers and Education*, vol. 59, issue 2, pp. 653-660, 2012.

[11] S. Gumus and E. H. Atalmis, "Exploring the relationship between purpose of computer usage and reading skills of Turkish students: Evidence from PISA 2006," *The Turkish Online Journal of Educational Technology*, vol. 10, issue 3, pp. 129-140, 2011.

[12] C. O. Guzeller and A. Akin, "Relationship between ICT variables and math achievement based on PISA 2006 database: International evidence," *The Turkish Online Journal of Educational Technology*, vol. 13, issue 1, pp. 184-192, 2014.

[13] M. Kubiatko and K. Vlckova, "The relationship between ICT use and science knowledge for CZECH students: A secondary analysis of PISA 2006," *International Journal of Science and Math Education*, vol. 8, issue 3, pp. 523-543, 2010.

[14] Y. H. Lee and J. Y. Wu, "The effect of individual differences in the inner and outer states of ICT on engagement in online reading activities and PISA 2009 reading literacy: Exploring the relationship between the old and new reading literacy," *Learning and Individual Differences*, vol. 22, issue 3, pp. 336-342, 2012.
[15] Q. Li and X. Ma, "A meta-analysis of the effects of computer technology on school students' math learning," *Educational Psychology Review*, vol. 22, issue 3, pp. 215-243, 2010.
[16] O. L. Liu and M. Wilson, "Gender differences in large-scale math assessments: PISA trend 2000 and 2003," *Applied Measurement in Education*, vol. 22, issue 2, pp. 164-184, 2009.
[17] K. Luu and J. G. Freeman, "An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada and Australia," *Computers and Education*, vol. 56, issue 4, pp. 1072-1082, 2010.
[18] S. Martinez and S. Guzman, "Gender and Racial/ethnic differences in self-reported levels of engagement in high school math and science courses," *Hispanic Journal of Behavioral Science*, vol. 35, issue 3, pp. 407-427, 2013.
[19] G. McMahon, S. Yeo, and M. Williams, "Making a difference: student perceptions of E-learning blended with traditional teaching methods," *In World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, vol. 1, pp. 759-764, 2011.
[20] C. Mido and K. Sunha, "Computer access and computer use for science performance or racial and linguistic minority students," *Journal of Education Computing and Research*, vol. 40, issue 4, pp. 469–501, 2009.
[21] S. Mondal, "Attitudes of pre-service teachers towards the use of digital technology in teaching-learning process in India," Desh Vikash, vol. 4, issue 4, pp. 247-256, 2018.
[22] N. Notten and G. Kraaykamp, "Home media and science performance: A cross-national study," *Educational Research and Evaluation*, vol. 15, issue 4, pp. 367-384, 2009.
[23] H. D. Song and T. Kang, "Evaluating the impacts of ICT use: a multi-level analysis with hierarchical linear modeling," *The Turkish Online Journal of Educational Technology*, vol. 11, issue 4, pp. 132-140, 2012.
[24] R. Vanderlinde, K. Aesaert, and J. Braak, "Institutionalised ICT use in primary education: A multilevel analysis," *Computers and Education*, vol. 72, pp. 1-10, 2014.
[25] A. Woods-McConney, M. C. Oliver, A. McConney, R. Schibeci, and D. Maor, "Science engagement and literacy: A retrospective analysis for students in Canada and Australia," *International Journal of Science Education*, vol. 36, issue 10, pp. 1588-1608, 2014.
[26] K. A. Young, "Toward a model for the study of children's informal Internet use," *Computers in Human Behavior*, vol. 24, issue 2, pp. 173-184, 2008.
[27] Z. H. Zhong, "From access to usage: the divide of self-reported digital skills among adolescents," *Computers and Education*, vol. 56, issue 3, pp. 736-746, 2010.
[28] L. Zhou, N. Griffin-Shirley, P. Kelley, D. R. Banda, W. Y. Lan, A. T. Parker, and D. W. Smith, "The relationship between computer and internet use and performance on standardized tests by secondary school students with visual impairments," *Journal of Visual Impairment and Blindness*, vol. 106, issue 10, pp. 609-621, 2012.