Volume 10, Number 3, Winter 2011
ISSN: 1541-4914

# The Social Promise of the Time To Know Program

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*The earlier draft of this paper was presented at the American Educational Research Association Annual Meeting, New Orleans, April 2011*

## Abstract

This article explores the effects of the Time To Know program, a comprehensive technology-rich learning environment, on low socio-economic status (SES) students' learning achievements in Mathematics, Hebrew, and English as a Foreign Language (EFL) in Israel. The study is based on the assumption that one of the possible solutions for bridging the social gap can be achieved through narrowing the digital divide, particularly by bringing a 1:1 computing social-constructivist learning environment to the low-SES students. The subjects were 49 fifth-grade students from low-SES who joined a Time To Know program in Israel and 42 fifth-grade students who learned in a traditional setting. Findings indicated that learning with the Time To Know program significantly enhanced students' Mathematics, Hebrew, and EFL achievements. In addition, the findings showed that, as a result of learning in the Time To Know environment, the knowledge and skills gap between the low SES students was significantly narrowed. This article is based on data collected in an evaluation study conducted by Manny-Ikan, and Berger-Tikochonski, (2010).

The integration of technology-rich learning environments into educational systems is one of the greatest challenges faced by educators and policymakers. Despite high-profile efforts, and significant investments of resources, educational technology programs have revealed relatively low effects (Bernard et al., 2009; Cuban, 2001; Donovan, Green, & Hartley, 2010; Greaves & Hayes, 2006). Based on the assumption that qualitatively different learning environments offer different kinds of learning experiences, they then serve different learning goals. However, past research has shown that technology-rich learning environments can more effectively promote social-constructivist educational goals, such as learning motivation, teamwork, and higher-order thinking skills in comparison to traditional settings (Rosen & Salomon, 2007).

Recognizing the limitations of the digital divide, attributed most commonly to socioeconomic factors, it is possible that educational technology can play a social role in bridging the achievement gap between students (e.g., Jackson et al., 2006; Warschauer, 2003; Warschauer & Matuchniak, 2010). Information and communication technologies (ICT) are perceived by educators, sociologists, and economists as a new mode of information with a profound effect on modern life. Access to new technologies, whether at home or at school, is critical to the development of new abilities and skills, such as collaboration, critical thinking, creativity, and information literacy, needed in the information age. The growing role of information and communication technologies in the economy and society serves to highlight their important role in education, especially in promoting educational equity. It is widely

believed that effective deployment and use of technology in schools can help balance the unequal access to technologies in the home environment and thus help narrow educational and social gaps.

A comparative study of technology use at schools in high– and low–socio-economic status (SES) communities found that the low-SES neighborhood schools tended to have a less stable teaching staff, administrative staff, and IT support staff, which made planning for technology use more difficult (Warschauer, Knobel, & Stone, 2004). A family's SES is based on family income, parental education level, parental occupation, and social status in the community. High-SES schools tend to invest more in professional development, hiring full-time technical support staff, and developing communication among teachers and administration that promoted robust digital networks. This encourages more widespread use of new technologies by teachers. In comparison, the low-SES schools had achieved less success in creating the types of support networks that made technology effective.

Another study (Becker, 2000), found that computer use in low-SES schools often involved conventional learning practices, whereas computer use in high-SES schools often reflected more constructivist and innovative teaching and learning strategies. Studies have found that both within and across nations, the level of family income is a strong predictor of student performance and engagement in learning (Baker, Goesling, & LeTendre, 2002; Baye, Monseur, & Lafontaine, 2009). Findings from the Israeli standardized test (Meitzav), show a consistent significant gap in learning achievements among students from different SES backgrounds (RAMA, 2010). Lower SES students are associated with lower learning achievements in Mathematics, Hebrew, and EFL.

One possible way to achieve this social effect of SES as a significant predictor of learning achievements is by narrowing the digital divide and increasing learning motivation, particularly by bringing an appropriately implemented 1:1 computing social-constructivist learning environment to low-SES students.

Over the past decade, there has been a growing interest in 1:1 laptop technology initiatives, whereby the teachers and the students have full access to a technology-rich learning environment (Jaillet, 2004; O'Dwyer, Russel, Bebell, & Seesley, 2008; Lei & Zhao, 2008; Weston & Bain, 2010; Zucker & Light, 2009). Most results emerging from 1:1 technological initiatives have been largely positive. However, the emphasis on using technology in education should not imply that the technology is the goal of the educational process. Rather, the goal should be to have a technological learning environment as a mechanism for paradigmatic change of learning, teaching, and promoting new abilities and skills needed in the information age (Cuban, 2003, 2006; Salomon & Perkins, 2005).

One of the most recent studies on learning with laptops (Warschauer, 2006) revealed positive results regarding the potential of these programs for alleviating inequity. In these programs, well-trained and highly committed teachers were able to use laptops to help raise low-SES students' test scores while simultaneously engaging students in more opportunities for critical inquiry and in-depth learning.

The present study examines the possible effects of a 1:1 computing constructivist learning environment, focusing on low-SES students. More specifically, the study explores the effects of learning in the Time To Know program on Mathematics, Hebrew, and EFL achievements of low-SES students, compared to learning in a traditional setting.

Time To Know's teaching and learning environment is designed with a social-constructivist approach to learning and teaching (Fosnot, 2005; Prawat & Folden, 1994; Roschelle, Pea, Hoadley, Gordin, & Means, 2000; Von Glasersfeld, 1995) and it consists of five main components (Walters, Dede, & Richard, 2009; Weiss & Bordelon, 2010):

- Infrastructure: 1:1 laptop environment with a workstation for the teacher.
- Interactive year-long core curriculum: Recommended sequences of interactive learning activities that are aligned with state standards. Teachers can modify these sequences by uploading their own "best practice" materials directly into the lesson flow.
- Digital Teaching Platform (DTP): A platform that enables the teacher to plan and conduct a lesson, receive formative and summative assessment reports during and after the lessons (see Figures 1-4).
- Pedagogical support: Every teacher who joins the program takes part in a professional development course and receives ongoing guidance from a Time To Know coach who has specialized in the field of knowledge in which the teacher is working.
- Technical support: There is technical support during all classroom hours in every school where the program is in operation.

The Time To Know program contains a structured Mathematics, Hebrew, and English Language Arts curriculum of guided learning sequences for elementary schools that includes open-ended applets and discovery environments, multimedia presentations, practice exercises, and games. For example, in mathematics, the teacher opens the lesson with an animation which is used as a trigger for a specific learning topic, such as fractions. Next, a class discussion on the topic increases the curiosity of the students who then explore the topic and perform guided experiments individually using the fraction applet. The students then submit their work to the class digital gallery where the teacher projects the work and engages the students in a discussion. Another example is the use of the Live Text applet to explore written text in Language Arts context. The student can highlight and emphasize different parts of the text, such as words and paragraphs. The student can also use the textual navigator which automatically emphasizes different units, such as verbs, pronouns, and emotions. The student can then review pre-defined “hot words” in order to view additional explanations or information about those words.

The Time To Know DTP was designed to present differentiated materials to different groups simultaneously and support diverse learning levels for the same topic. The class may be divided into homogenous groups of students with similar mastery levels on a given topic. In this way, every student works according to his own ability.


*Figure 1.* Planning a Lesson in Time To Know Digital Teaching Platform (DTP)

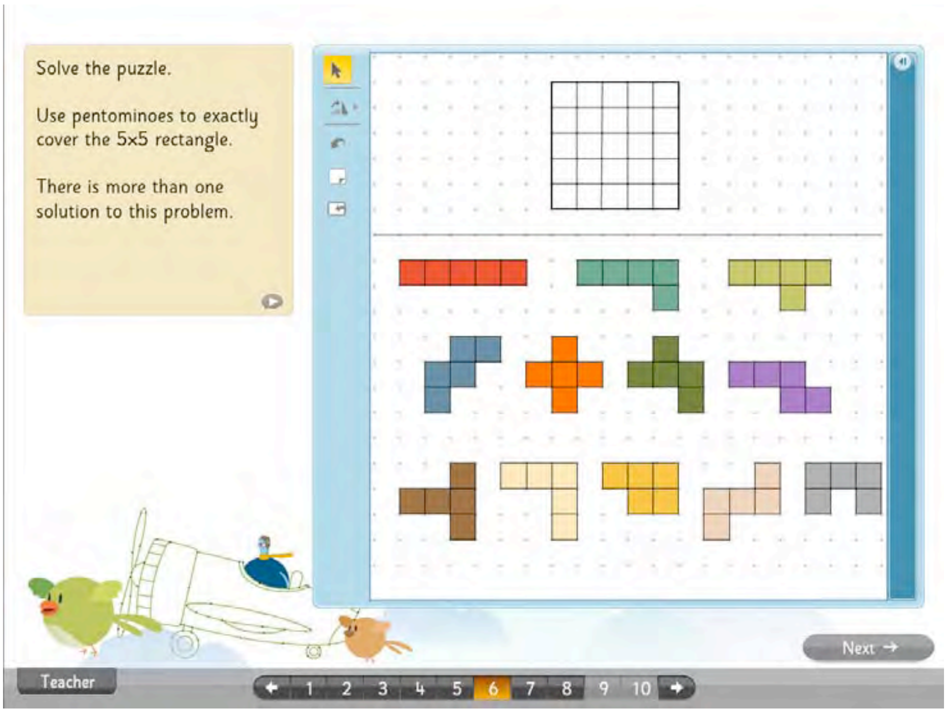


*Figure 2.* Learning Activities in Time To Know DTP

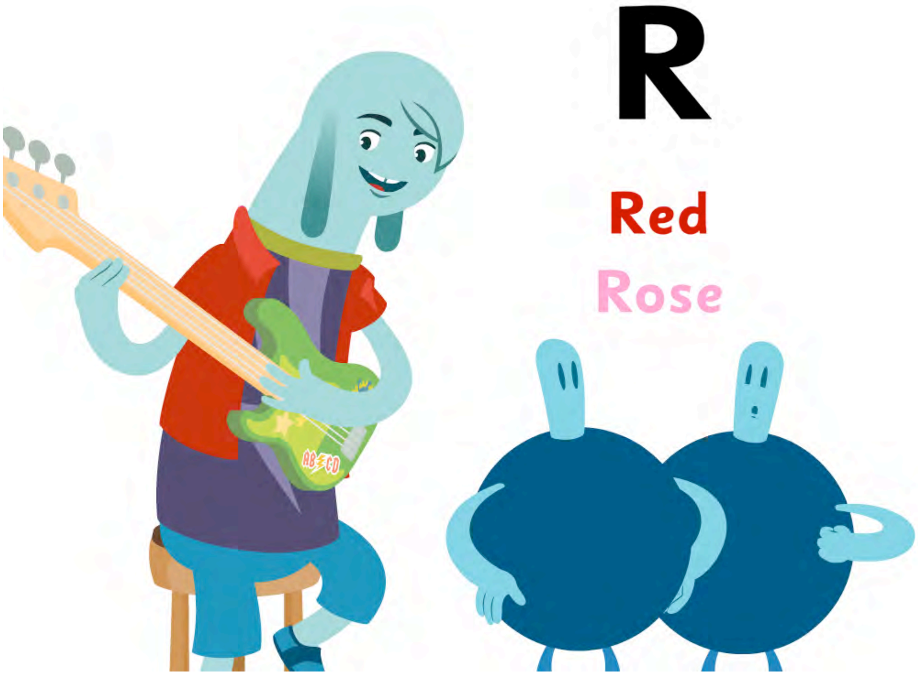


*Figure 3.* Interactive Animations in Time To Know DTP


*Figure 4.* Assessment Reports in Time To Know DTP

T2K DTP suggests a new paradigm in educational technology. Combining a digital teaching platform and interactive core curriculum into a teaching and learning environment, which is lead by the teacher who is empowered but not replaced. According to this paradigm, content is coming back after being left behind in the 90's. The teacher becomes a powerful learning facilitator with help from these teaching tools. According to this paradigm, educational technology in the classroom is no longer a partial project but a holistic system. The main idea is to create a partnership between the teacher and the technology.

Past research on educational effects of the Time To Know teaching and learning environment in the United States showed highly promising results (Scott, Rockman, Kuusinen, & Bass, in press; Rosen, 2011-a, 2011-b, 2011-c, 2011-d; Rosen, & Livshits, 2011). Findings indicated that learning with the Time To Know program significantly enhanced students Mathematics and ELA achievements and contributed to development of mathematics reasoning skills. In addition, the study showed that the Time To Know program narrowed the gap between the low and high achievement students, as well as significantly promoted the academic outcomes of at-risk students, compared to a traditional setting.

**Research Hypothesis**

Based on the assumption that one of the possible solutions for bridging the social gap can be achieved through engaging low-SES students in 1:1 computing social-constructivist learning environment, the study addressed the following main hypothesis: *Year-long learning experience in Time To Know comprehensive, technology-rich learning environment will promote knowledge and skills in Mathematics, Hebrew, and EFL of low-SES students compared to learning in a traditional environment.*

## Method

**Design and Procedure**

The study was based on the quantitative methodology using the pre-post experimental design (participation or non-participation in the Time To Know program). Pretest data were collected before the onset of a second year in the Time To Know program to provide baseline data, while post-test data were collected right after the completion of the year-long school program.

**Participants**

The study participants were 5th grade male and female students (ages 10-11) from two low-SES Israeli elementary schools. Gender distribution was almost even. Experimental schools were selected on the basis of two criteria: their participation in the Time To Know program and a similar SES background, while the comparison schools used the traditional teaching and learning approach (without intensive use of educational technology). In all, there were 91 students who participated in the pre- and post-test data collection (49 experimental and 42 comparison students).

Both schools that participated in the study are inner-city public schools located in an underprivileged neighborhood in Tel-Aviv. The schools' principals were driven by intense ideology and faith, combined with a strong desire to make a difference in the lives of the students, but the reality they encountered was harsh. The teachers mainly wanted the students to sit in the classroom, even if they did not engage in a meaningful learning experience. In many cases, the teachers did not even ask the children to accomplish learning tasks.

**Measures**

The instruments comprised standardized tests on Mathematics, Hebrew, and EFL in Israel. In the current analysis, findings from the following dimensions will be presented for each subject:

1. Mathematics knowledge and skills test on fractions:
    - Word problems (Cronbach's alpha reliability was .79)
    - Comparison (Cronbach's alpha reliability was .72)
    - Calculations (Cronbach's alpha reliability was .88)

2. Hebrew knowledge and skills test:
    - Reading comprehension, based on informative text (Cronbach's alpha reliability was .82)
3. EFL knowledge and skills test:
    - Listening comprehension (Cronbach's alpha reliability was .61)
    - Writing (Cronbach's alpha reliability was .82)
    - Grammar (Cronbach's alpha reliability was .88)

## Results

In the first stage of the study, potential effects of the Time To Know environment on knowledge and skills was examined. The results indicated that the main hypothesis of the study was supported. Table 1 shows that learning in the Time To Know technology-rich learning environment increased the achievements of low-SES students. Time To Know students out-performed the comparison students in all the measures (Mean Effect Size = .7). Significant impact was found in math fractions, calculations (ES = .8, t = 3.2, p < .01) and EFL listening comprehension, writing and grammar (ES = .6, t = 2.5, p <. 05; ES = .8, t = 2.6, p < .01; ES = 1.2, t = 2.9, p < .01). Over the same time period, the findings showed only a minimal increase in the performance of the comparison group in most of the measures.

Table 1
*Means, Standard Deviations, and Effect Sizes of Mathematics, Hebrew, and EFL Scores*

| | **Experimental Time To Know** | | | **Comparison** | | | **Overall** | |
|---|---|---|---|---|---|---|---|---|
| **Measure** | **Pre-test M(SD)** | **Post-test M(SD)** | **t(df)** | **Pre-test M(SD)** | **Post-test M(SD)** | **t(df)** | **t(df)** | **ES** |
| ***Math*** | | | | | | | | |
| Fractions word problems | 36.1 (26.4) | 64.0 (28.7) | 7.8 (48)** | 42.0 (26.8) | 60.1 (28.9) | 4.1 (37)** | 1.7 (85) | .4 |
| Fractions comparison | 31.7 (24.4) | 58.4 (29.8) | 7.1 (48)** | 39.5 (28.4) | 58.5 (31.5) | 4.3 (37)** | 1.3 (85) | .4 |
| Fractions calculations | 20.3 (21.6) | 58.5 (31.5) | 9.8 (48)** | 38.1 (28.0) | 58.0 (30.9) | 4.8 (37)** | 3.2 (85)** | .8 |
| ***Hebrew*** | | | | | | | | |
| Reading comprehensi on | 44.7 (21.2) | 58.7 (17.2) | 3.8 (46)** | 44.6 (21.1) | 49.1 (25.1) | 1.1 (41) | 1.8 (87) | .5 |
| ***EFL*** | | | | | | | | |
| Listening comprehensi on | 59.3 (20.5) | 80.2 (18.9) | 5.4 (41)** | 79.2 (22.0) | 87.4 (16.7) | 2.6 (36)* | 2.5* (87) | .6 |
| Writing | 6.9 (12.7) | 43.0 (28.7) | 9.3 (41)** | 12.6 (15.3) | 32.2 (28.0) | 4.7 (36)** | 2.6** (87) | .8 |
| Grammar | 6.9 (25.2) | 36.2 (12.7) | 6.9 (41)** | 12.6 (15.3) | 19.6 (25.5) | 1.4 (36) | 2.9** (87) | 1.2 |

**Note:** ES = common effect size computed by Cohen's *d*.
*** p < .01, * p < .05.*

## Discussion

Modern education calls for integrating technology in a broad manner by focusing on social-constructivist, technology-rich environments. This study explored the effects of Time To Know, a comprehensive technology-rich learning environment, on low-SES students' learning achievements in Mathematics, Hebrew, and English as a Foreign Language (EFL) in Israel. Findings indicated that learning with the Time To Know program significantly enhanced students' learning achievements in all measures. In addition, the findings showed that as a result of learning in the Time To Know environment, the knowledge and skills gap between the students was significantly narrowed. The principal of the school which implemented the Time To Know program described this effect as follows:

> When the school adopted the Time To Know program, suddenly the academic aspect also became relevant and interesting to the children, and the teachers began to expect academic achievements. Today we want a lot more than children who merely sit in the classroom, and much of it is due to Time To Know. Today we also want students to leave here with academic accomplishments.

This study sheds light on the importance and effectiveness of bridging the social and educational gap via innovative teaching and learning in a constructivist 1:1 computing environment. Providing access to technology is not enough for this transformative change in a social context (e.g., Sever, in press). Achievement gains are more likely to emerge from innovative teaching and learning involving individualized, problem-based instruction, increased motivation, and engagement (Cuban, 2003, 2006). Motivational components play a large role in students' learning achievements as well as enhancing higher order thinking skills (Rosen, 2009; Schunk, 1990, 2000). It is possible that the motivational and engagement component of the Time To Know environment contributed to the significant effect on learning achievements of the students, whereas the students in the traditional environment experienced different affective conditions.

Educational technology programs are more challenging to implement in low-SES schools. Schools recruiting students of lower socio-economic status often tend to create school environments of low aspirations and support for academic learning (Creemers & Kyriakides, 2008). Students in low-SES schools mostly have less home computer experience, and thus took more time to adapt to using technology. Teachers in low-SES schools tend to be less experienced and parents less able to guide their children on effective use of technology (Creemers & Kyriakides, 2008). However, the findings of this study showed high potential of appropriately implemented educational technology programs among low-SES students.

These findings are consistent with the results of previous studies showing the high potential of 1:1 computing learning environments in general, and Time To Know particularly, compared with a traditional learning environment (e.g., O'Dwyer, Russel, Bebell, & Seesley, 2008; Rosen, 2011-a, 2011-b, 2011-c, 2011-d; Rosen, & Livshits, 2011; Scott, Rockman, Kuusinen, & Bass, 2011; Zucker, & Light 2009). However, while the past studies focused on general student population, this study sheds light on just such effective educational practices among low-SES students.

In light of the positive results described in this research, it is recommended that educators be encouraged to integrate year-long constructivist technology-rich programs, especially among low-SES students. Teaching practices can be strengthened and improved leading to higher student cognitive competencies. Ttechnology-based learning and assessment systems will be pivotal in improving student learning and will enhance educators' competencies and expertise over the course of their careers. This study provides empirical evidence for a meaningful and efficient education technology model that can potentially

achieve these objectives in a complex educational context. Empowering learning experiences prepares learners to be active, creative, knowledgeable, and ethical participants in a global networked society.

However, the statistical analysis carried out in this study pertained to research done in the field of Mathematics, Hebrew, and EFL education on a relatively small sample. Would the same findings emerge in a large-scale implementation or when other disciplines are examined?

Does the overall novelty play a role here – moving away from the traditional year-long curriculum, or temporary novelty – the very participation in an experiment in which a new approach to instruction is promoted? It is essential that similar studies be carried out to examine the effectiveness of different constructivist technology-rich environments in large-scale settings involving other disciplines and a variety of pedagogical support models.

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