Positive Technological Development: A systems approach to understanding youth development and educational technology

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Abstract: Youth development is multifaceted. While educational researchers have paid attention to one or few of these foci, it is imperative to understand how our technologies influence the various facets of youth development. We developed the *Positive Technological Development* research model to detail the overall impact of a technology on youth. We present a study describing how the *PTD* model illustrates the impact of an educational technology, while illuminating design areas that need to be revised.

Introduction

It is well acknowledged that computer technologies can be used to support youth's cognitive, social, and personal developmental concerns. For example, researchers have shown the potential of Lego Logo programming in facilitating young children's development of problem solving, hypothesis testing, and abstract thinking skills (Rogers & Portsmore, 2004). Other researchers have demonstrated successful use of computer technologies in promoting youth's confidence, motivation, and sense of efficacy (Dede & Ketelhut, 2003), in bringing together entertainment and learning to promote motivation and interests (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005), and in encouraging collaboration and meta-cognitive thinking (Bers, New, & Boudreau, 2004). Taken together, these and many other research studies have shown that computer technologies can function as more than just a cognitive manipulative; computer technologies have the potential to affect many facets of youth's development.

Although the field of research in the learning sciences acknowledges the multifaceted nature of learning with technologies, policy makers and practitioners often fail to see these connections. We suggest that this may be partly because research reports in the field of technologies and learning sciences have largely been one-dimensional; that is, individually, researchers have focused on just one of the many youth developmental concerns.

Positive Technological Development

Guided by a research model from applied development sciences termed *Positive Youth Development* (Lerner et al., 2005), which is a systems approach to youth development, we developed the *Positive Technological Development* theoretical model that details the multi-faceted nature of youth development and educational technologies. The *Positive Technological Development* model looks at six variables that have been deemed important development concerns in the youth development literature (Scales et al., 2000). These six variables are Competence, Confidence, Connection, Caring, Character, and Contribution. Given the growing concern for bridging the gap between learning, educational technologies, and youth development, it is imperative that researchers who hope to promote positive development in children and adolescents pay attention to these developmental concerns (see Figure 1).

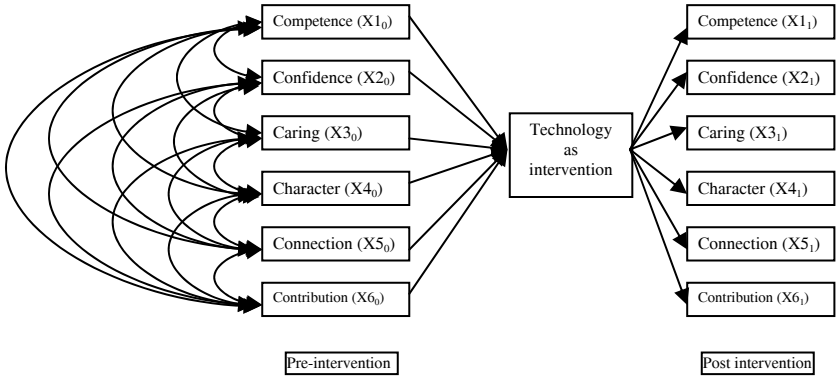

Figure 1. An Illustration of the Relationships between Developmental Variables and Technology.

In order to understand these developmental variables in the context of technology and learning, we have also developed the *Positive Technological Development Questionnaire*, which assesses these six variables in detail. This poster presents our *Positive Technological Development* model and describes a research study as a case study that exemplifies how this model and this questionnaire apply to research in the context of technology and learning sciences.

Case study: Lego robotics workshop

Thirty-seven children in the first and second grades participated in this research study with their parents. The workshop was designed to teach participants basic Lego robotics building and programming skills using the RoboLab© software. Both parent and child participants received instructions on Lego robots building and programming. Each parent-child pair worked on their own project throughout the workshop. Children participants completed the *Positive Technological Development* questionnaire before and after the workshop. Differences in scores related to the six variables were interpreted as changes due to the workshop. Table 1 summarizes the results of the questionnaire with t-tests for significance.

Table 1. Differences in scores in *PTD*'s six C variables before and after the workshop.

Developmental Variable	Difference (std. dev)	*t*	Developmental Variable	Difference (std. dev)	*t*
Competence	1.19 (.69)	10.38**	Connection	-0.35 (1.00)	-2.11*
Confidence	0.43 (.42)	5.01**	Caring	0.11 (1.14)	.58
Character	0.05 (1.64)	.19	Contribution	-0.19 (0.81)	-1.42

Note. *$p < .05$. **$p < .01$.

As table 1 illustrates, participants indeed increased their perceptions of competence and confidence in technological abilities. However, connection, which indexed participants' perception of the extent to which technology influenced their social connections with peers, decreased after the workshop. This could be because participants worked in pairs with their parents and the workshop curriculum did not encourage children to work with other peers. The *PTD* analysis model successfully demonstrated that, although the goal to teach participants skills in working with Lego robotics was reached, the workshop might have resulted in participants feeling less connected to peers when using the technology. Thus, the curriculum may need to be revised to address this important issue.

Conclusions and Implications

Our case study illustrated the importance of looking at the many facets of youth development when we develop technologies as a learning tool for young people. While it is important to set priorities as to which aspect of youth development (cognitive, social, or personal) our technologies may have the greatest impact, it is imperative to also examine how our technologies may influence other aspects of development. The *Positive Technological Development* theoretical model and questionnaire are tools designed to help researchers get a sense of how their technology may influence the various developmental concerns in youth. Using this model and questionnaire can guide researchers in their continuing effort to revise and develop their technologies and curricula.

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