Constructs of L.S. Vygotsky: Studies in Cognitive Development: Implications for Computer Gaming

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This brief paper will attempt to present some of the more important contributions of Vygotsky to understand cognitive development and implications for computer gaming summarized through five relevant studies that have investigated various aspects of Vygoskyan concepts in child and adolescent cognitive development. Each of these selected scoping reviewed, and historical studies contributes to the understanding of social transmission of cognitive and reasoning skills in and out of family context. These may be extended to computer gaming and role play experiences at various stages of development. The selected studies offer some confirmation of Vygotsky’s theorized concepts of the social and interactional aspects of cognitive development in a variety of contexts. Although there are some methodological considerations for each study with respect to generalizability and replication, each offers some support for the social and interactional model of development and as these would apply to implications for computerized gaming as an aspect of development.

Keywords: computer gaming, cognitive development, Lev Vygotsky, psychology, scoping review

Introduction

Western social scientists concerned with child and cognitive development issues have recently begun to renew interest in the theoretical observations of a Soviet cognitive psychologist, Lev S. Vygotsky. Although Vygotsky died in 1934, his work influenced theorists such as, Piaget and Luria, at the time of his writings (Luria, 1979). Numerous other theorists have been influenced since that time. However, the recent English translation of his work along with increased dialog between eastern and western researchers has seen his concepts applied in several of novel and important cognitive studies.

His work and theoretical precepts also relate to the concepts of computer gaming as an asset for utilization in child and adolescent cognitive development. There is ample evidence that gaming technologies may be used to facilitate missing experiential events to promote development toward adulthood, or in overcoming trauma. Additionally, a number of digital divide studies have demonstrated that access to computers and gaming can enhance essential academic cognitive development skills.

Vygotsky’s collected works were released in full English translation in 1993. The works stimulated a variety of studies on cognitive development from a socio-cultural perspective. Empirical studies reported in English journals are few in number. However, theoretical commentary on his works from key developmental theorists may be found to have occurred since his early works were available in the Soviet Union prior to his
death.

This brief paper will attempt to present some of the more important contributions of Vygotsky to understand cognitive development and to summarize five relevant studies that have investigated various aspects of Vygoskyan concepts.

**Vygotskyan Perspectives in Social Science Research**

Vygotsky reconceptualized cognition as a relationship, which included language and thought. Language served as a bridge between traditional models of individual cognitive development and the inclusion of socio-cultural contributions to collective cognitive competence.

A later theorist, Minick divided Vygotsky’s constructs into three specific phases. The first phase was referred to as the “instrumental act” which is defined as a unit of activity that is mediated by signs which are used as tools or instruments to control behavior. This phase recognizes the role of speech in cognition, as had also been recognized by early theorists. Pavlov had suggested the use of a second signal system in behavior such as speech, or language which could invalidate conditioned responses. The second phase included a psychological system, which focused on relationships between specific mental functions such as between memory and speech. The third phase then was concerned with social systems and psychological development. This final phase included the concept of zones of proximal development, or the concept that children’s cognitive abilities develop through interactions between teacher and learner (Minick, 1987).

The following represent empirical inquiry with respect to validating portions of Vygotsky’s work as it relates to other prominent theorists. Five relevant research studies have been selected for brief review.

**Study 1: Jamieson, 1994, Deafness and Mother Child Interaction**

**Purpose of the Study**

A study reported by Janet Jamieson in 1994 examined the processes by which mothers communicate with their hearing and deaf preschool children during a problem-solving task. The study sought to investigate Vygotsky’s dialectical notion of cognitive development. That is that the teaching and learning of cognitive skills depends in part on the exposure to and effective use of the transmission strategy of the culture of both teacher and learner (Jamieson, 1994).

**Methods Utilized**

Mothers were asked to teach their children to assemble a wooden pyramid constructed of 21 interlocking pieces. Mother and child dyads were placed into three matched groups. The three dyad groups, with three dyads in each set were, hearing mother-hearing child, hearing mother-deaf child, and deaf mother-deaf child. Children were matched on other demographic variables. Dyad interactions were videotaped. Previous research relevant to deaf child learning and maternal interactions were reviewed, and indices of interactional behaviors were developed to compare instructional patterns. Frequencies of these behaviors occurring were tabulated from the videotapes. Interactions were coded at a microbehavioral level. The study employed an embedded multiple case replication design. Measures included degree of exhibition of specified behaviors, interactional sequences, and regulation of activity in each dyad.

**Results of the Study**

Deaf mothers tended to consistently obtain their children’s visual attention before delivering instructions in a sequential visual approach, and to maintain visual attention during instruction of the task. Hearing mothers
with deaf children in dyads had more difficulty in transmission or teaching of competency in completing the puzzle.

**Discussion of the Study**

Findings tended to support Vygotsky’s dialectical notion of cognitive development. However limitations of generalization of findings in this study are due to the possible differences between the way mothers interact with their own children as compared to other interactions, small sample size, and a tendency to describe rather than manipulate independent variables (Jamieson, 1994). This process can be simulated with a number of currently available online and computing gaming and puzzle applications.

**Study 2: Goncu1993, Intersubjectivity in Dyadic Play of Preschoolers**

**Purpose of the Study**

The study was designed to examine the hypothesis that children’s play becomes increasingly intersubjective during preschool years. Intersubjectivity is defined as the joint understanding established between players. This hypothesis is common to developmental theories forwarded by Vygotsky, as well as Piaget and Parten. Vygotsky had further theorized that children jointly develop rules that guide social play and other activities (Goncu, 1993).

**Methods Utilized**

This study was designed to establish quantitative differences in intersubjectivity between 3- and 41/2-year-olds in terms of the structure and negotiations of dyadic play. Twelve children from the younger group (M=38 months) and twelve children from the older group (M=54 months) were included in the study. Half of each age level were of each gender and recruited from a university-based laboratory preschool and had familiarity with each other over an academic year. Children were familiarized with researchers over three days in 20-minute sessions prior to the study. Indices of intersubjectivity included structural features and negotiations of social play. Play sessions were videotaped for 20-minute periods for each age group and gender.

**Results of the Study**

Results provided support for the hypothesis that social play of preschoolers becomes increasingly shared from 3 to 41/2 years of age. Significant increases with age in the interactional length of play were noted. For example, the frequency of turns taken and specific acts increased for older children without an increase in frequency of social episodes, which indicated that older children can sustain activity longer than younger children. Further shared understanding with age in play dialogue was also evidenced. Children were also noted to express their individual desires less frequently with age and relate their ideas to their partners with increasing frequency.

**Discussion of the Study**

Findings can be explained by Piaget’s notion that children become decreasingly de-centered in relationships. An alternate view would be that cognitive development depends on transaction in relationships as preferred by Vygotsky (Goncu, 1993).

The study also does not differentiate how play negotiations may take different forms for different themes, or whether shared understandings can be observed in activities other than play. Computing gaming can enhance intersubjectivity in play relationship improving attention focus and sharing capacity.
Study 3: Pratt, 1992, The Mathematical Parent: Parental Scaffolding, Style and Outcomes

**Purpose of the Study**

This study attempts to analyze parental tutoring patterns based on the scaffolding perspectives theorized by Vygotsky and others. Scaffolding refers to the process that enables children as part of an adult-child dyad, to solve problems that they could not solve unassisted. Parental support is given to reduce the complexity of task components not yet within the child’s grasp. This also entails removing support when it is no longer needed, so the child comes to carry out the task independently. Prior research cited had demonstrated that authoritative parenting was linked to better school achievement (Pratt, Green, & MacVicar, 1992).

**Methods Utilized**

Initially a pilot study was conducted to develop a system for analyzing levels of parental support, which was validated. The pilot study consisted of 14 mothers and their children who volunteered for participation. As one of the mothers was unable to solve the division problems for the child, the sample was reduced to 13 dyads. Sessions were audio taped. Interventions and responses were categorized into one of eight different levels of support. Episodes were scored separately.

Afterward a second study attempted to replicate the pilot study findings with a larger sample of 24 dyads. A posttest was used to collect a measure of the children’s actual learning within tutoring sessions. A separate index of parental authority was maintained. Additional data on parental educational level, math ability, and children’s math performance were obtained for analysis.

These two observational studies of parent tutoring of fifth graders’ long-division mathematics homework assessed the hypothesis that this relation may be at least partly mediated by differences in the quality of parental teaching strategies.

**Results of the Study**

Notably results of the pilot study indicated that parents gave more support to difficult task components and to children with poorer initial skills as measured by a pretest. The second study replicated pilot study findings and showed that individual differences in parental scaffolding were associated predictably with variations in the quality of children’s learning from a tutoring session. Additionally, authoritative parenting styles, measured independently, were positively related to more effective scaffolding styles and to better mathematics achievement by children (Pratt et al., 1992).

**Discussion of the Study**

Findings of this study overall may not be generalizable to various populations due to volunteer samples of parents and children being utilized. Further, in some family homework situations, scaffolding may not be a viable or effective option. Some parents may not be competent in the homework skill required by the child. Some problems may be more appropriate for scaffolding support whereas others may require independent creativity, which would be less likely to be well structured. Computing and gaming in the classroom, or at home has the capacity to provide scaffolding as tutoring experience, through augmented reality, or gaming.

Findings in Study 3 indicated that more effective parents tutoring a child in long division were more likely to be rated as authoritative. Authoritative parent scores were more likely to be positively associated with children’s achievement scores in mathematics, as demonstrated in other cited research included within this article.
**Study 4: Pratt et al., 1999, Predicting Adolescent Moral Reasoning From Family Climate**

**Purpose of the Study**

The purpose of the study was to investigate the role that family climate plays in the development of moral reasoning of the adolescent. The socio-cultural perspective of Vygotsky which views the role of the adult-child dyad in cognitive development is utilized to provide a context for investigating the family’s role in moral development (Pratt, Arnold, Pratt, & Diessner, 1999).

**Methods Utilized**

Parental interactions with 14-year-old adolescents and its longitudinal prediction to adolescent moral reasoning at 16 years of age were studied in 40 Canadian families. Three measures of family climate were obtained. These included an authoritative parenting style construct, a transactive dialog measure, and a novel index of responsiveness to the “child’s voice” in stories told by parents about moral socialization.

Families were volunteers recruited through a newspaper. One parent and an adolescent were interviewed by one interviewer, while another interviewer interviewed the other parent separately. Parents were asked to tell a story about moral socialization in the family. At a second visit the roles were reversed allowing the other parent to tell a story. Families were visited two years later regarding family values and socialization. Honorariums were given for visits.

**Results of the Study**

The three climate measures demonstrated some coherence and provided support that constructs measured contained some core similarities. Further, findings demonstrated that narratives were an effective way to gain information on the family with respect to moral domain. Greater authoritativeness of parenting was linked to a more effective use of the “zone of proximal development” as had also been reported in other studies. Authoritative parent styles over the two-year period, from age 14 to 16, were predictive of moral reasoning development. A greater tendency for mothers to articulate and respect the child’s voice was a positive predictor of gains in moral reasoning.

**Discussion of the Study**

The role of the narrative index of socio-cultural voice as derived in part from the work of Vygotsky was linked to parenting style and moral indices. This index for fathers however highlighted potential gender-related variations for adolescent girls, as fathers attended less well to daughter’s voices in the family (Pratt et al., 1999). Moral reasoning is in part dependent upon role modeling, including simulated role models. Computing gaming and narrative learning experiences can be designed to improve moral reasoning outcomes.

**Study 5: Kavathatzopoulos1994, Professional Managers and Ethical Decision Making**

**Purpose of the Study**

Citing the psychological theories of Piaget, Vygotsky, and Kohlberg, the authors investigated the possibility of the acquisition of autonomous ethical skill by instruction and training. This study trained business managers in the use of autonomous methods in decision making in real-life business ethics problems. The study sought to determine whether participation in a one-day educational program which focused on development of autonomous cognitive ability without focusing on moral content would be sufficient to provide a shift in mode of decision making about business ethics problems. Adoption by the subjects of the autonomous ethics
problem-solving method would imply the acquisition of a new cognitive skill as theorized by Vygotsky (Kavathatzopoulos, 1994).

**Methods Utilized**

Participants were 17 managers employed in different parts of a pharmaceuticals plant in Sweden. Fifteen were men and two were women. Ages ranged from 31 to 58 years. These subjects were divided into two groups consisting of eight and nine persons. Both groups were given the same pretest and posttest and training program. A third unexpected follow up test was mailed to them one month after instruction. Training of all subjects was given by same the instructor. Stories and later real-life situations were used to determine subjects’ responses to ethical dilemmas.

**Results of the Study**

The investigator was primarily concerned with the program’s ability to promote a shift towards autonomous ethical decision making in both groups from pretest to posttest.

Subjects scored significantly higher at posttest than at pretest with scores remaining high at posttest two administered by mail one month after completion of training.

**Discussion of the Study**

Methodological problems included in this study include lack of a control group, or random assignment, as well as, small sample size and lack of pretesting of the measurement instruments to verify internal validity. However, the study implies that the gain in ethical decision-making ability is due to the adoption of a new more functional method of resolving moral problems. The finding is consistent with Vygotsky’s theory that appropriate education may lead to the acquisition of autonomous ethical skill (Kavathatzopoulos, 1994). Training programs can be simulated and provide vignettes and alternate story lines depending upon the ethical choices made. These can also be designed as computer gaming learning modules.

**General Discussion and Conclusions**

These five relevant studies offer some confirmation of Vygotsky’s concepts of the social and interactional aspects of cognitive development in a variety of contexts. Although there are methodological considerations for each study with respect to generalizability and replication, each offers some support for the social and interactional model of development. The first selected study offers general support for the importance of parental teaching styles for children experiencing deficit or disability. Parental experience is a factor in effectiveness of transmission of skills. However, peer interaction also plays an important role in individual cognitive development as is illustrated in the second study dealing with intersubjectivity and the understanding of shared rules of play at various preschool ages. The actual transmission of longer-term problem-solving competence in a non-disabled population is demonstrated in the third selected study of transfer of mathematical competence through the process of scaffolding, or lending structured support for difficult problems. This study in particular also suggests authoritative parenting is associated with higher mathematical competence for some children. Then Study 4 begins to assess the likelihood of transmission of core family values and moral reasoning as a socialization process occurring in adolescence. Simply offering stories of key experiences of moral learning by parents in narrative or story form along with authoritative parental style was predictive of the acquisition of increased moral reasoning. Finally, the last study attempted to evaluate changes in moral decision making among adults within a pharmaceuticals plant based on participation in a peer-training program on
autonomous decision making.

Each of these studies contributes to the understanding of social transmission of cognitive and reasoning skills in and out of family context. These may be extended to computer gaming and role play experiences at various stages of development. They also serve as indicators of the differences possible between actual level of development and possible levels of development based upon socially transmitted and reinforced learning.

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