UNDERSTANDING INFORMATION SEEKING BEHAVIOR IN TECHNOLOGY PERVASIVE LEARNING ENVIRONMENTS OF THE 21ST CENTURY

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ABSTRACT
This research reports findings from a study on information behavior to indicate educationally relevant activity, such as information seeking and sharing, in technology pervasive information environments of the 21st century. Adult learners who are social media users (n = 147) completed an online learning preference survey battery that included the Social Media Learning scale, the Technology Affinity Survey, the Computer Attitude Questionnaire, and the Information and Communications Technology Learning survey. Findings revealed that 23% of the variance in information seeking behavior for this sample was explained by a multiple linear regression model, based on reported perceptions of creative tendencies, attitude towards school, learning with social media, and degree of daily technology use/immersion. Participants with higher preference for information seeking were found to have more positive attitudes toward school, a stronger sense of having creative tendencies, and a higher preference for learning with social media while they also had a lower preferences for continuous immersion in digital communications. Implications of these findings and future research directions are discussed.
Keywords: social media tools, guided inquiry, information seeking, instruments

INTRODUCTION

Information and communications technology (ICT) are coming of age to play a central, commonplace role in formal and informal learning. Educators and learning technologists are interested in understanding how new ICT tools, such as social media will be used by students. Of particular interest is the role of ICT in the information inquiry process used by students to seek information, collaborate, and also to communicate thoughts and content. While Web 2.0 technologies provide a wide array of ICT tools that can be applied to information seeking for knowledge construction, immediate access to a wide array of digital content will not necessarily result in the use of ICT and social media tools for educationally relevant learning activities. The popularity of social media tools and the great interest in their potential for use in education prompted this research, which examines the attitudes and preferences of students in higher education towards learning ICT. Survey data were gathered from using an online survey battery that included four instruments: the *Social Media Learning* (SML) scale, the *Technology Affinity Survey* (TAS), the *Computer Attitude Questionnaire* (CAQ), and the *Information and Communications Technology Learning* (ICTL) survey, for a research study designed to examine learner preferences for technology in order to better understand how ICT/social media tools are used by individual students. This article reports findings regarding student preferences that may align with information behavior supporting learning activities, such as information seeking and sharing, that are associated with educationally relevant activities that can support knowledge construction.

CONCEPTUAL RATIONAL

LEARNIING WITH TECHNOLOGY

Technology tools are recognized for their ability to provide unique opportunities for cognitive development and to enhance the capabilities of those who wield the tools (Bruner, 1964). Bruner theorized that, over time, humanity has developed specialized capabilities more by connecting to new, external implementation systems (Bruner, 1964), than by any physical changes in being. We see evidence for Bruner's theories today as ICT tools and technology-pervasive Internet environments elevate individual information seeking and sharing capabilities to new heights. Renowned technology expert, computer scientist, and educator Seymour Papert also envisioned computer technology in a transformative role that would augment student capabilities. Papert and Harel (1991) predicted that a new kind of system for education, one comprised of a student and a computer, would allow a leaner to utilize computer technology to create a powerful force for change that would result in improvement of student learning (Papert & Harel, 1991).

THE INFORMATION SEARCH PROCESS

Kuhlthau (1991, 2007) conducted research on student activities for affective, cognitive, and physical dimensions of information behaviour in the traditional library setting and also in technology-rich online environments. The Information Search Process (ISP) Model, devised by Kuhlthau, depicts six stages of student information

activity: initiation, selection, exploration, formulation, collection, and presentation. Together these six stages can help explain student information behaviour and also allow educators to guide students in search activities (Kuhlthau, 1991). Kuhltau's (2007) research, an updated review of the literature and extensive inquiry project among n = 574 students, indicated that the ISP model for dimensions of information behaviour continues to be useful in explaining the search process in the digital and technology-pervasive information environment of the Web 2.0 world (Kuhlthau, 2007; Kuhlthau, Heinström, & Todd, 2008). Validation of Kuhlthau's (1991) ISP model for student information behaviour in technology-rich environments provides direction for instruction designed to guide student inquiry (Kuhlthau, Maniotes, & Caspari, 2007) beyond the traditional library to the Internet realm of digital information. Viewed as an instructional model, guided inquiry can direct students' information behavior to educationally meaningful activities that will support knowledge construction. One approach to guided inquiry focuses on a teacher and curriculum connection to each individual student's learning environment. Maniotes (2005) conceptualized three spaces that are important for teaching and learning—the first space, the students' current experience and knowledge; the second space, the curriculum; and the third space, the students' learning environment. Maniotes' model is based on the premise that educational social interaction and intellectual discourse in the students' third space can interconnect a student's experience and knowledge with curriculum (Kuhlthau, Maniotes, & Caspari, 2007). ICT, especially social media communications tools, offer new options to support student learning interaction and guide student information behavior in digital information settings of the 21st century. The third space for curriculum-driven intellectual communication employs ICT to advance learning interactions via social dimensions of student-teacher systems of communications.

THE SOCIAL DIMENSIONS OF LEARNING

John Dewey, father of Deweyan social epistemology and constructivism, recognized nearly 100 years ago that knowledge cannot be passed along from person to person—teacher to learner—in the manner of physical objects (Dewey, 1985). He theorized the social dimensions of sharing knowledge and considered social arrangements and sharing as educative to those who participate in communications, which he considered the central action in education (Dewey, 1985). Sharples (2005) identified a need for a new conceptual framework that recognizes the essential role of communication for learning in the mobile age. Communications and the transformative effect of digital networks for communication provide a new venue for discourse and negotiation of agreements among differing perspectives within the context of established meaning (Sharples, 2005). Vygotsky's Theory of Social Development recognized social interaction as a precursor to development, consciousness, and cognition in a progressive cognitive growth model where each function appeared in two forms: initially on a social level, and subsequently on an individual level (Vygotsky, 1962, 1978). Tharp and Gallimore (1988) developed a foundation for schooling and social interaction based on concepts from the work of social scientists in the neo-Vygotskian contextualist and interactionist schools of thought. Scholars aligned with this framework believe that teaching, learning, and schooling can best be understood in a social context (Tharp & Gallimore, 1988) and that higher order cognitive functions develop from social interactions (Bruner, 1962).

THE STUDY

RESEARCH DESIGN

This quantitative research study is based on a pre-experimental one-shot case study design where the sample is examined for overall preferences as one group and also as two parts of the whole. Whole group trends are analyzed as well as comparison of the group divided by median response ratings as two groups, one high (above the median score) the other being low (below the median score), in attitude towards learning with information communications technology.

RESEARCH QUESTIONS

1. Does a students' attitude towards use of social media tools in educational contexts relate to student information behavior for seeking or sharing digital information?
2. Does daily technology use (affinity for technology and tendency to be immersed in technology) relate to students' information behavior for seeking or sharing digital information?
3. Are student learner dispositions such as attitude towards school, perceptions of being creative, or feeling motivated related to preference for use of ICT information seeking or to daily technology use/affinity?

DATA COLLECTION

Subjects were volunteer, higher education, social media users at least 18 years of age who responded to email and Facebook invitations to complete an online learning preference survey battery. The survey battery included a number of instruments to include the four instruments discussed in this study: the Information and Communications Technology Learning survey, the Social Media Learning scale, the Technology Affinity Survey, and the Computer Attitude Questionnaire. This survey battery circulated by graduate students enrolled

in a north Texas (USA) higher education learning technologies program as part of a study designed to study participants' use of ICT tools, preferences for daily technology, and attitudes towards learning with technology such as social media tools. One hundred forty-seven (n = 147) subjects completed the survey during the spring semester of 2012. Subjects were 76% women (n = 112) and 24% men (n = 35) (Table 1), spanning 18 to 60+ years of age (Table 2). Subjects represent a wide group of adult social media users connected by communications technologies.

Table 1: Descriptive statistics: study subjects by gender.

Gender	Frequency	Percent
Male	35	23.8
Female	112	76.2
Total	147	100.0

Table 2: Descriptive statistics: study subjects by age.

Age in years	Frequency	Percent
18-20	37	25.2
21-30	38	25.9
31-40	16	10.9
41-50	17	11.6
51-60	28	19.0
61+	11	7.5
Total	147	100.0

INSTRUMENTS

Survey data were gathered from participants who completed an online survey battery that included four instruments: the Social Media Learning (SML) scale, the Technology Affinity Survey (TAS), the Computer Attitude Questionnaire (CAQ), and the Information and Communications Technology Learning (ICTL) survey. Responses to the question items from these instruments are Likert-type that range from 1 to 5, where 1 = strongly disagree and 5 = strongly agree. Cronbach's alpha internal consistency reliabilities for instrument scales were analysed and interpreted by DeVellis' (1991) guidelines (Table 3).

Table 3:Cronbach's Alpha internal consistency reliabilities for instrument scales.

Scale	Number of items	Item numbers	Alpha	Rating by DeVellis
CAQ: Creative Tendency	13	1-13	.78	Respectable
CAQ: Attitudes toward School	7	1-7 (2r,5r)	.81	Very Good
ICTL Total Scale	15	1-15	.77	Respectable
ICTL: Info Seeking	7	1,4,7,8,10,13,14	.71	Respectable
ICTL: Info Sharing	8	2,3,5,6,9,11,12,15	.83	Very Good
SML Total Scale	7	1-7	.74	Respectable
TAS Total Scale	22	1-22	.74	Respectable
TAS: Immersed	13	7,10,9,8,13,12,3,21,22,11,4,16,19,5	.78	Respectable
TAS: AlwaysOn	4	18r,5r,2r,1r,6	.55	Unacceptable

The Creative Tendencies and Attitude towards School subscales of the CAQ were used to gauge participant perceptions of creativity and attitude towards school. The CAQ measures dimensions of student attitudes towards learning and computers. This questionnaire was developed from another instrument, the Young Children's Computer Inventory (YCCI) and has foundations in research funded by the Fulbright Foundation of Washington, D.C., the Japan Society for the Promotion of Science, and the Texas Center for Educational Technology at the University of North Texas. The CAQ was formalized as a validated measurement tool in 1995 and has been extensively used in research studies (Knezek & Christensen, 1995, 2000) before being released for public use in 2000. The instrument was revalidated for use in secondary grades in 2011 (Mills, Wakefield, Najmi, Surface, Christensen, & Knezek, 2011). Internal consistency reliability for the CAQ Creative Tendency subscale (α = .78) and the Student Attitudes toward School subscale (α = .81) for the 147 subjects in the current study were found to be respectable and very good, respectively (DeVellis, 1991).

The Information and Communications Technology Learning survey was designed and refined in a doctoral level course on psychometric measurement and was expanded and validated in a 2011 study of student ICT tool use (Mills & Knezek, 2012) (Figure 1). The ICTL was developed for research on how students choose to interact with ICT tools in digital information environments. The refinement process, which included higher-order factor analysis, revealed two reliable measurement scales: Information Seeking (α = .71) and Information Sharing (α = .83) with respectable and very good measurement properties, respectively (DeVellis, 1991).

Information and Communications Technology Learning (ICTL)
1. I would like to be a participating member of an online community.
2. I use Internet technology to explore topics of interest.
3. I like to share interests and reflections online.
4. I like to enroll in classes to continue my education.
5. I use Internet communications and other technology tools for self-expression.
6. I learn many things by interacting with other Internet users.
7. I like to take classes from good professors.
8. I use Internet communications technology tools when I want to learn about something new.
9. I learn best in a traditional classroom setting.
10. Internet technology helps me be successful in my college classes.
11. More classroom learning should include interactive communication technology experiences.
12. The things I need to know are taught by instructors in the classroom.
13. I learn more when I regulate my own learning experience and seek information on things that I want to learn about.
14. I use Internet communications technology to keep current on topics related to my field of expertise.
15. I post information that might be of interest to other people.

Figure 1. The Information and Communications Technology (TAS) survey items.
Note: ICTL V1.0 by Mills, L. & G. Knezek, (2011)

The Social Media Learning scale was originally developed to measure student perceptions of Twitter for student reflections and community building in university courses featuring Global Policy and Digital Textuality. Subsequently the SML instrument was analyzed (Knezek, Mills, Wakefield, 2012) and refined by college faculty and learning technologies graduate students as the Social Media Learning (SML) scale (Figure 2). The refinement process revealed that this unidimensional (single factor) instrument has respectable (Devellis, 1991) internal consistency reliability (α= .74).

Social Media Learning (SML). When using social media…..
1. I feel a sense of community learning becomes interactive.
2. Posting questions to my peers helps me understand my readings better.
3. I am able to get faster feedback from my peers.
4. I am able to get faster feedback from my instructor.
5. I am able to communicate effectively.
6. I am able to connect with peers more easily than face-to-face.
7. I increase my participation in classes when I am allowed to contribute through social media.

Figure 2. Social Media Learning (SML) scale items.
Note: SML V.1. By Alsobrook, M., Knezek, G., Wakefield, J., (2011).

The Technology Affinity Scale was developed during a doctoral-level psychometrics class offered at a university in North Texas during the summer of 2011 (Figure 3). This instrument was inspired by the need for a reliable instrument to measure Internet-related digital technology use—affinity for technology and immersive technology use—with a focus on mobile technology tools. TAS produced high internal consistency reliability values as a total scale score (22 items) for the n= 147 subjects in this study and is currently being further refined to determine eventual retention of measurement subscales. Two emerging subscales from TAS were used in this study: the first gauges tendency to be preoccupied with or immersed in technology-based interaction, and the second indicates a preference for continuous connection to (always-on) communications. These subscales were identified and based on their factor analytic construct validity. They are of interest in the current study because they lend insight into the extent and uses of daily communications technology. Internal

consistency reliabilities for TAS subscales: TAS immersed, α= .77, and TAS always-on, α= .55, would be considered, respectively, respectable and unacceptable by Devellis' (1991) guidelines.

Technology Affinity Scale (TAS)
1. It is impolite to work on a computer in the audience during a presentation.
2. There are certain events during which ALL electronic devices should put away.
3. My attention is often distracted by email or test messages when I am talking to someone.
4. I communicate with my friends mostly by text message.
5. Some people are too absorbed in electronic communications to really listen face to face.
6. It's okay to send text messages while carrying on a face to face conversation.
7. I often type text messages while walking down the street.
8. I sometimes check text messages while driving.
9. I sometimes check email messages during meetings.
10. I feel agitated when I am away from the Internet for more than a day.
11. I feel disturbed if I go out and forget my cell phone.
12. I prefer to socialize on social media rather than face to face.
13. Many relationships are easier to maintain on Facebook-type social media.
14. I would use an online dating service.
15. I would not use the Internet to find a babysitter.
16. My computer is just as important to me as my wallet or purse.
17. For me, a computer is a better companion than a pet.
18. Many people are too attached to their smart phones.
19. Many people have good friends they met via social networks.
20. Getting married via computer connection is taking the Internet a bit too far.
21. Sometimes I feel more available to my electronic devices than to my family.
22. I sometimes I feel I am a slave to the technologies that surround me.

Figure 3. Technology Affinity Scale (TAS) items

FINDINGS

Research Question #1 was examined with Pearson's product moment correlation analysis between participant preferences for use of social media tools, as gauged by the SML scale, and information behavior for seeking and sharing information, as gauged by ICTL seeking and sharing subscales. A significant relationship was identified between attitude towards social media learning and information seeking, $r = .338$, $p < .0005$; and also between social media learning and information sharing, $r = .580$, $p < .0005$. These positive correlations explain 11% and 37%, respectively, of the variance associated with attitude to use of social media for learning and information seeking and sharing.

Research Question #2 was investigated with Pearson's product moment correlation analysis between degree of technology affinity, as gauged by the TAS total score and the TAS_immersed subscale, and tendency toward seeking or sharing digital information, as gauged by ICTL seeking and sharing subscales**.** A significant correlation was identified between overall technology affinity and information sharing, $r = .402$, $p < .0005$. Significant correlation was also found between tendency to be immersed in daily technology and information sharing, $r = .386$, $p < .0005$. These positive correlations explain 16% and 15%, respectively, of the variance associated sharing digital information and technology affinity and immersion.

Research Question #3 was also examined by analysis of Pearson's product moment correlation analysis in order to examine possible relationships between ICTL seeking information and CAQ learner disposition subscales for attitude towards school, creative tendencies, and motivation. Information seeking was found to be significantly and positively correlated with learning with CAQ creative tendencies ($r = .25$, $p < .002$), and CAQ attitude towards school ($r = .20$, $p < .017$). These positive correlations explain 6% and 4%, respectively, of the variance associated with seeking digital information attitude towards school and creative tendencies. Perception of being motivated was found to be positively correlated with perceptions of having creative tendencies ($r = .411$, $p < .0005$), and negatively correlated with being TAS immersed in daily technology use ($r = -.192$, $p = .020$). These correlations explain 17% and 4%, respectively, of the variance associated with perceptions of being motivated, having creative tendencies, and being immersed in use of communications technologies.

Additionally, analysis of variance for low versus high preference for ICT learning scale scores was conducted in order to determine if differences would exist between overall attitude towards learning with ICT on the ICTL

and other learning preferences examined in this study via the SML, TAS, and CAQ. Low and high ICTL groups were created by dividing participants into two groups based on the median ICTL total score of 3.69 across the range of 1 to 5 for the n = 147 survey participants. Respondents with mean ratings below the median were designated as the low group on preference for ICT learning, while those with mean ratings above the median were designated as being the high group on the ICT learning preference spectrum. Significant variance between the two groups was found for attitudes toward social media learning (SML), technology affinity (TAS), and creative tendencies (CAQ). Students in the high ICTL group disposition were found to have a more positive disposition for learning with social media, higher technology immersion, and higher perceptions of having creative tendencies. Effect sizes for these significant variances were in the large (r = .8) to medium (r = .5) range according to guidelines by Cohen (1988), Table 4.

Table 4. Significant variance for ICTL total scale score high and low groups.

Analysis of Variance For High/Low Group: ICTL Information Seeking						
	N	Low Group	*N*	High Group	Sig.	Cohen's *D* Effect Size
SML	75	3.10	72	3.46	0.000	.86
TAS: Always-On	75	2.87	72	1.75	0.001	.56
CAQ Creative Tendencies	75	3.77	72	3.95	0.002	.51

Understanding and identifying information seeking behavior for inquiry was of particular interest in this research. The question items that make up the ICTL seeking information subscale align with constructivist information behaviors indicative of interaction with information and content for information seeking and could be considered educationally relevant to knowledge construction. The median value for information seeking (TAS) for n = 147 participants was 4.2 out of a possible 5. Significant variance between low and high disposition for seeking information with ICT was found for learning with social media (SML), technology affinity for always-on digital communications (TAS), CAQ attitudes towards school, and creative tendencies. Participants higher in disposition towards ICTL information seeking were found to have more positive attitudes towards learning with social media. They also had more a positive attitude toward school and felt more creative as learners. Additionally, the group found to be high in information seeking also had a lower preference for continuous (always-on) connection to digital communications technology (TAS). These effect sizes (Table 5) are considered to be in the small (r = .3) range according to guidelines by Cohen (1988), and yet they are also of sufficient magnitude to be considered educationally meaningful (Neuman, Bialo & Sivin-Kachala, 1996).

Table 5. Analysis of Variance for ICTL: Information Seeking high and low groups.

Analysis of Variance For High/Low Group: ICTL Information Seeking						
	N	Low Group	*N*	High Group	Sig.	Cohen's *D* Effect Size
SML	73	3.24	74	3.46	0.022	0.37
TAS: Always-On	73	1.93	74	1.75	0.052	0.33
CAQ Attitudes Toward School	73	3.46	74	3.7	0.046	0.32
CAQ Creative Tendencies	73	3.82	74	3.95	0.066	0.29

Multiple linear regression analysis was conducted to determine the extent to which a model based on significant factors for disposition to information seeking can predict information seeking behavior. As shown in Figure 4, ICTL information seeking behavior as a function of multiple linear regression for factors representing 1) learning with social media, 2) technology affinity for always-on communications connections, 2) learner attitude towards school, and 3) learner perceptions of having creative tendency accounted for 23%, RSQ=.226, of the variance in ICTL information seeking behavior with model significance at $p < .0005$. The standardized

regression coefficients Beta weights from Figure 4 indicate that preference for learning with social media (Beta = .364, $p < .0005$), and CAQ attitudes towards school (Beta = .269, $p = .003$) contribute most significantly to this regression model for prediction of information seeking behavior.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476[a]	.226	.205	.4884

a. Predictors: (Constant), smed_t, TAS_alwaysOn, creat_t, ats_t

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.914	.451		4.243	.000
	TAS_alwaysOn	-.150	.073	-.152	-2.045	.043
	ats_t	.170	.057	.229	3.000	.003
	creat_t	.190	.093	.156	2.044	.043
	smed_t	.335	.070	.364	4.772	.000

a. Dependent Variable: ictl_seeking

Figure 4. Model summary and standardized beta coefficients output for the ICTL information seeking multiple linear regression model.

DISCUSSION

While there is a large body of research to indicate that appropriate application of information technology can enhance student learning (Voogt and Knezek, 2008), the promise of personal computers as tools with power to support new systems of connection between learners, instructors, and digital information for learning interaction and knowledge construction has yet to be fulfilled (Halverson & Smith, 2009). Technology-pervasive information environments offer unique affordances for educational discourse and information-seeking behavior that is associated with social and cognitive development for inquiry and knowledge acquisition. Yet as an increasing number of daily activities and educational offerings are transferred to the online realm, educators have only begun to utilize the potential of systems connecting student, technology, and teacher for direct inquiry and guided instruction for educationally relevant interaction with digital information. Some educators worry that the instruction in schools of today has changed very little in recent decades (Cuban, 2001) and that the ICT-driven change that has taken place is classrooms is not in the direction of innovation in learning and augmentation of learner capabilities as proposed by early visionaries (Halverson & Smith, 2009) but that instead technology in schools is most often being employed for content delivery, assessment, and reporting.

CONCLUSION

This research reports findings for a study of information behavior for seeking and sharing information in technology-pervasive 21st century information environments. Social media users ($n = 147$) completed an online learning preference survey battery that was designed to allow exploratory research on student preferences for use of technology for learning in technology-pervasive, Internet environments. The survey battery included three recently validated instruments for evaluation of student attitudes towards learning with information communications technology tools (ICTL), learning with social media (SML), and daily technology use and affinity (TAS), along with a well-established instrument that has been used in many studies related to student learning with computers (CAQ). Research questions examined factors that can be used to identify student information seeking and sharing activities. Information seeking was more closely examined as being indicative of inquiry for knowledge construction. Findings indicate that ICT preference for seeking and sharing digital information is positively associated with a positive attitude towards using social media for learning (SML), with the strongest alignment between ICTL sharing information and social media learning. Technology use and affinity data revealed a positive trend between preference for daily technology use and ICTL information sharing. Being TAS immersed in daily technology use was also positively associated with ICTL information sharing.

Examination of participant preference for seeking information and for possible predictors of ICTL information seeking behavior revealed associations between tendency to seek information with positive student attitude towards school and perceptions of having creative tendencies. Additionally, participants who were above the median for ICTL information seeking were found to have lower mean scores for TAS continuous (always-on) connection to communications technologies, while having higher mean scores for learning with social media.

Additional research is planned to identify instructional design components that will support opportunities for both information seeking and sharing.

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APPENDIX

I Part 1 Computer Attitudes (Comfort, Learning)
1. I enjoy doing things on a computer. (1)
2. I will be able to get a good job if I learn how to use a computer.(3)
3. I would work harder if I could use computers more often.(6)
4. I know that computers give me opportunities to learn many new things.(8)
5. I can learn many things when I use a computer.(9)
6. I enjoy lessons on the computer.(10)
7. I believe that the more often teachers use computers, the more I will enjoy school.(11)
8. I believe that it is very important for me to learn how to use a computer.(12)
9. I get a sinking feeling when I think of trying to use a computer.(16)
10. I think that it takes a long time to finish when I use a computer.(7)
11. Working with a computer makes me nervous.(17)
12. Using a computer is very frustrating.(18)
13. I will do as little work with computers as possible.(19)
14. Computers are difficult to use.(20)
II Part 3 Empathy
15. I feel sad when I see a child crying.(716)
16. I sometimes cry when I see a sad play or movie.(717)
17. I get angry when I see a friend who is treated badly.(718)
18. I feel sad when I see old people alone.(719)
19. I worry when I see a sad friend.(720)
20. I feel very happy when I listen to a song I like.(721)
21. I do not like to see a child play alone, without a friend.(721)
22. I feel sad when I see an animal hurt.(722)
23. I feel happy when I see a friend smiling.(723)
24. I am glad to do work that helps others.(724)
III Part 4 Creative Tendencies
25. I examine unusual things. (726)
26. I find new things to play with or to study, without any help. (727)
27. When I think of a new thing, I apply what I have learned before. (728)
28. I tend to consider various ways of thinking. (729)
29. I create many unique things. (730)
30. I do things by myself without depending upon others.
31. I find different kinds of materials when the ones I have do not work or are not enough. (732)
32. I examine unknown issues to try to understand them. (733)
33. I make a plan before I start to solve a problem. (734)
34. I invent games and play them with friends. (735)
35. I invent new methods when one way does not work. (736)
36. I choose my own way without imitating methods of others. (737)
37. I tend to think about the future. (755)
IV Part 5 Attitude Toward School
38. I really like school. (739)
39. School is boring. (740)
40. I would like to work in a school when I grow up. (741
41. When I grow up I would not like to work in a school. (742)
42. I am learning a lot in school. (743)
43. My friends from other schools would like to go to this school. (744)

Source: Computer Attitude Questionnaire CAQ NSF ITEST v. 7.1 by G. Knezek & R. Christensen (2010)