Learning with Social Media: Measurement Tools for Understanding Information Behavior in Technology Pervasive Environments of the 21st Century

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Abstract

This research reports findings from a study on information behavior for technology pervasive information environments in the 21st century. Social media users (*n*=147) completed an online Learning Preference survey battery that included 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. Findings revealed that 23% of the variance in information seeking behavior, as measured by the Information and Communications Technology Learning survey, can be explained by a linear regression model including the SML scale, creativity and school attitude scales (CAQ), and TAS. Participants with higher ICTL scores for Information Seeking had greater preference for learning with social media, more positive attitudes toward school, higher self-reported creative tendencies, and lower preferences for immersive/always-on attachments to, or affinity for, modern information and communication technologies. Implications of these findings and future research directions are discussed.

Keywords: social media tools, guided inquiry, information seeking, information sharing, technology affinity

Introduction

Information and communications technology (ICT) tools play a central, commonplace role in formal and informal inquiry for information seeking, content sharing, and self-expression in technology pervasive information environments of the 21st century. While Web 2.0 technologies provide a wide array of ICT tools (including social media) that may be applied to information seeking for knowledge construction, educators and learning technologists are aware that simply having access to an array of content and contacts within a few clicks and keystrokes will not necessarily result in the use of ICT and social media tools for educationally relevant activities. The popularity of social media tools and the great interest in their potential for use in education prompted the research team to examine higher education students' dispositions toward learning with social media tools, perceptions of creative tendency, attitudes Toward school, and self-reported daily technology use in order to better understand information behavior. Survey data were gathered from an online learning preference 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, in order to determine the extent to which we can understand how ICT/social media tools may be used by individual students for information seeking. Such activities are considered educationally relevant and supportive of knowledge construction.

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Conceptual Rationale

Cognition

Cognition, social development, and technology. 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) described related foundation concepts from the work of social scientists in the neo-Vygotskian contexutalist and interactionist school of thought. Scholars aligned with this school of thought 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). Bruner (1964) connected the development of cognition and the evolution of specialized human capabilities with technology tools. He theorized that, over time, humanity "has changed by linking himself with new, external implementation systems rather than by any conspicuous change in morphology" (Bruner, 1964, p.68). We see today many examples of ICT tools such as social media being used to augment information seeking and sharing capabilities.

Seeking Information

The information search process. Kuhlthau (1991, 2007) conducted research on student activities for affective, cognitive, and physical dimensions of information behavior 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 assist to explain student information behavior 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 behavior continues to be useful in explaining the search process in the digital, technology pervasive information environment of the Web 2.0 world (Kuhlthau, 2007; Kuhlthau, Heinström, & Todd, 2008).

Guided inquiry. Kuhlthau's (1991) ISP model supports guided inquiry (Kuhlthau, Maniotes, & Caspari, 2007). 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 establishing a connection to each individual student's learning environment. Maniotes (2005) conceptualized three *spaces* that are important for teaching and learning. The first space, she saw as the students' current experience and knowledge, the second space as the curriculum, and the third space as the unique learning environment of a student. Maniotes' model is based on the premise that educational social interaction (intellectual discourse) in the students' third space can interconnect a student's experience and knowledge (first space) with curriculum (second space) (Kuhlthau, Maniotes, & Caspari, 2007). Beyond supporting information behavior in a digital information setting, social media tools provide unique communication features that can support social dimensions of teaching and learning such as third space intellectual discourse.

METHODOLOGY

Research Questions

1. How do preferences for use of ICT social media tools and other technologies relate to student information behavior?
2. To what extent can we explain a tendency towards educationally relevant use of ICT from ICT social media tool and technology preference data?

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 the survey. The online, Learning Preference Survey Battery 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. This survey battery was selected and posted by graduate students enrolled in a North Texas (USA) learning technologies program to measure participants' dispositions toward learning with ICT social media tools, perceptions of Creative Tendency, Attitudes Toward School, and self-reported daily technology use. 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).

Table 1
Descriptive statistics: study subjects by gender.

Gender	Frequency	Percent
Male	35	23.8
Female	112	76.2

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

The Learning Preference survey battery measurement scales from CAQ, ICTL, SML, and TAS are comprised of questions with Likert-type response choices varying from 1 = *strongly disagree* to 5 = *strongly agree*. Cronbach's alpha internal consistency reliabilities for all measurement scales were analyzed 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: Attitude 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	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

Computer Attitude Questionnaire (CAQ). The CAQ was developed to measure attitudes toward learning and computers. The CAQ has foundations in earlier work funded by the Fulbright Foundation of Washington, D.C., the Japan Society for the Promotion of Science, and the Texas Center

for Educational Technology. The CAQ was formalized as a validated measurement tool in 1995 and has been extensively utilized in research studies (Knezek & Christensen, 1995, 2000) before being released for public use in 2000. The instrument was revalidated in 2011 (Mills, Wakefield, Najmi, Surface, Christensen, & Knezek, 2011). Internal consistency reliability for the CAQ Creativity scale (α= .78) and the Student Attitudes toward School scale (α= .81) for the 147 subjects in the current study were found to be respectable and very good.

Information and Communications Technology Learning survey (ICTL). The ICTL was designed and refined in a graduate course on psychometric measurement, and was expanded and validated in a 2011 study of student technology tool use (Mills & Knezek, 2012) (Figure 1). ICTL was developed to allow research on how students choose to interact with ICT tools in relation to educational information seeking and sharing. The refinement process for this instrument revealed two reliable measurement scales resulting from higher-order factor analysis (Dunn-Rankin, Knezek, Wallace, & Zhang, 2004): Information Seeking (α= .71) and Online Information Sharing (α= .83) with respectable and very good measurement properties, respectively.

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. (R)
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).

Social Media Learning scale (SML). The SML 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 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).

Technology Affinity Scale (TAS). TAS development was led by the first author during a doctoral level psychometrics class completed during summer 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 – especially focusing 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 factors. Two measurement scales with established high construct (factor analytic) validity that are of interest in the current study include: preference for ubiquitous (always-on) communications (tas_AlwaysOn, α= .55), and tendency to be preoccupied with or immersed in technology-based interaction (tas_Immersed, α= .77) were found to be unacceptable and respectable.

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.
Note: TAS V2.0 by G. Knezek and L. Mills 12/2011

Data Analysis and Findings

Correlation Analysis. Identifying and understanding how information seeking behavior correlates with technology preferences was of particular interest in this research. A review of the ICTL Information Seeking scale items revealed content of possible usefulness for the measurement of constructivist information acquisition behavior that would be indicative of knowledge construction for learning. Pearson product moment correlation analysis was conducted in order to examine possible relationships between ICTL Information Seeking values and values for social media, technology, and CAQ learner dispositions. Information seeking was found to be significantly (p<. 05), positively correlated with learning through social media, SML (r= .34, p< .0005); CAQ Creative Tendencies (r= .25, p< .002), and CAQ Attitudes Toward School (r= .20, p< .017).

Analysis of variance for high versus low dispositions. An analysis of variance was conducted for low vs. high affinity for learning with ICT (partitioned based on ICTL Total Scale Score), in order to determine if the two groups would have significant mean differences for SML, TAS, and scales of the CAQ (Creative Tendencies, Attitudes Toward School). A low/high ICTL designation was assigned based on the ICTL Total median score, with the median score for *n*=147 found to be 3.69 of possible 1-5. Respondents with mean ratings below the median were designated as low, while those with mean ratings above the median were designated as high. Significant differences (p< .05) for low vs. high ICTL values were found for SML, TAS immersion, and CAQ Creative Tendencies. To summarize (Table 4), students in

the group found to have high ICTL information seeking reported a more positive disposition for learning with social media, tended to be technology immersed, and felt creative as learners. Effect sizes for these significant discriminations were in the large (*ES*= .8) to medium (*ES*= .5) range according to guidelines by Cohen (1988).

Table 4
Analysis of Variance for high versus low means for ICTL Information Sharing groups.

Analysis of variance for high versus low groups: ICTL Information Sharing						
	Scale	N=	Mean *Low* Group 1	N=	Mean *High* Group 2	Sig.	Cohen's D Effect size
	SML	75	3.10	72	3.61	0.000	.86
	TAS: Immersed	75	2.87	72	3.21	0.001	.56
	CAQ: Creative Tendencies	75	3.77	72	4.00	0.002	.51

Low vs. high group analysis of variance was also performed for the ICTL Information Seeking scale. The median value for this scale for *n*=147 subjects, which was used to separate the low group versus the high group, was 4.2 of a possible 5.0. Group mean differences with educationally meaningful effect sizes (Cohen, 1988; Sivin-Kachala, Bialo & Langford, 1997) were found for Social Media Learning (SML), Technology Affinity Immersion (always on) connected communications (TAS_alwaysOn), CAQ Attitudes Toward School, and Creative Tendencies. Participants with higher ICTL scores for Information Seeking had greater preference for learning with social media, more positive attitudes toward school, higher self-reported creative tendencies, and lower preferences for immersive/always-on attachments to or affinity for modern information and communication technologies. Effect sizes for group mean differences were in the small to moderate range according to guidelines by Cohen (1988) (Table 5).

Table 5
Analysis of Variance for high versus low means for ICTL Information Seeking groups.

Analysis of variance for high versus low groups: ICTL Information Seeking							
	Scale	N=	Mean *Low* Group 1	N=	Mean *High* Group 2	Sig.	Cohen's D Effect size
	SML	73	3.24	74	3.46	0.022	Toward. 37
	TAS: Always-On	73	1.93	74	1.75	0.052	-.33
	CAQ: Attitudes Toward School	73	3.46	74	3.70	0.046	.32
	CAQ: Creative Tendencies	73	3.82	74	3.95	0.066	.29

Regression Analysis. Regression analysis was used to determine the extent to which information seeking behavior could be explained by other perceptions measured in the study. A linear combination of learning with social media (SML), TAS for always-on connectedness, CAQ Attitudes Toward School and Creative Tendencies accounted for 23 % (RSQ=.23) of the variance in ICTL Information Seeking behavior ($p < .0005$). The standardized regression coefficients (Beta weights) indicate that preference for SML (Beta= .364, $p < .0005$), and CAQ Attitudes Towards School (Beta = .269, p =

.003) best account for the variance in Information Seeking in this multiple linear regression model (Table 6).

Table 6
Linear regression standardized regression coefficients and model summary.

		Unstandarized Coefficients		Standardized Coefficients			
	Model	B	Std. Error	Beta	t	Sig.	
1	(Constant)	1.1914	.451		4.243	.000	
	TAS:Always-On	-.150	.073	-.152	-2.045	.043	
	CAQ: Attitudes Toward School	.170	.057	.229	3.000	.003	
	CAQ Creative Tendencies	.190	.093	.156	2.044	.043	
	SML	.335	.070	.364	4.772	.000	

Model Summary								
	Model	R	RSQ		Adjusted RSQ		Std. Error of Estimate
	1	.476*	.226		.205		.4884

Note: a. Dependent Variable: ICTL_Seeking
Note: a. Predictors: (Constant), SML, TAS_AlwaysOn, Creative Tendencies, Attitudes Toward School

Discussion

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. The interactive Web 2.0 environment provides new communication tools that are easily mastered and maneuvered by most students. Yet as an increasing number of daily activities and educational offerings are transferred to the online realm, educators must be able to guide inquiries and provide interventions to support learning. Reliable measurement tools can assist in gauging the quality and quantity of ICT tool information behaviors and provide insight for directing information behavior in the direction of creative inquiry and discourse that will support construction of knowledge. Further research is needed to firmly establish the reliability and validity of these and additional instruments that can support efforts to create learning opportunities that maximize the affordances of ICT and social media tools for the construction of social-mediated knowledge. This approach is consistent with the theoretical conceptions of Vygotsky (1978) and Bruner (1969) when social media is used in a manner that creates opportunities for cognitive functions to appear on a social level (Vygotsky, 1962, 1978), for teaching and learning in a social context (Tharp & Gallimore, 1988). Social media tools may augment individual cognitive functions (Bruner, 1962), and provide communication options that can connect curriculum and teacher direction to the realm of student experience and knowledge (Kuhlthau, Maniotes, & Caspari, 2007). Additional research is planned to verify the direct application of these theoretical constructs to social media-assisted learning in a social context.

Conclusion

This research reported findings from a study of information behavior in technology pervasive educational environments of the 21st century. Social media users (*n*=147) completed an online learning preference survey battery that included instruments designed to understand student information behavior for seeking and sharing information in technology rich educational environments. Preference for learning with information and communications technology was assessed as a function of the other measures.

Major findings were that students with total ICTL scores for the subscale Information Seeking had greater preference for learning with social media, more positive attitudes toward school, higher self-reported creative tendencies, and lower preferences for immersive/always-on attachments to or affinity for modern information and communication technologies. Additional findings revealed that 23% of the variance in information seeking behavior, as measured by the Information and Communications Technology Learning survey, can be explained by a linear regression model based on instrument scales from SML, TAS, and CAQ. Further research is required to refine knowledge of specific behaviors associated with information seeking preferences in a technology-rich educational environment. Additional studies of information seeking predictive models are planned for the future.

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