# Affective, Behavioral, and Cognitive Aspects of Teen Perspectives on Personal Data in Social Media: A Model of Youth Data Literacy

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**Abstract.** In this study, we explored the interplay between teens' *A*ffective states (A), *B*ehavioral states (B), and *C*ognitive states (C) in relation to the personal data they generate in social media, applying the "ABC model" from the social psychology domain. The data was collected from semi-structured interviews with 22 US teens in three library branches of the Carnegie Library of Pittsburgh, USA. Results from content analysis suggest that: 1) Young people are positive about their data skills, while feeling negative or insecure about data privacy issues; 2) young people with negative affective states related to data privacy are more likely to make an effort to secure their social media accounts and profiles. Given the results, we suggest librarians, educators and software developers apply a range of strategies in reaction to teens' different ABC states to the design of data literacy programs, services, and software applications.

**Keywords:** Data literacy, affect, behavior, cognition, teens.

## 1 Introduction

Today's young people have grown up in a world of digital technology, including both software (e.g., social networking and video games) and hardware (e.g., smartphones and wearable devices), coupled with an increase in the generation of personal data about users. These so-called "digital natives", however, are not natural born experts in navigating the digital world, as some assume. In Plowman & McPake (2013)'s observation, children need guided interactions from parents and educators before they are fully competent users. Related work also shows that teens are unaware of the privacy and security issues around personal data (Madden et al., 2013).

To help with this situation, we need knowledge about how teens think, feel, and behave around data. What is their attitude towards data and the associated issues, such as data privacy, data rights, data subjectivity, etc.? The answer to these questions might help predict and explain teens' behavior vis à vis technology.

This study adopts Ostrom's *ABC model* (1969) of attitudes from the domain of social psychology, which defines the three components of attitudes as: *A* (affect), *B* (behavior), and *C* (cognition). We employ the *ABC model* because it serves as a theoretical perspective that help explain the relationship between teens and their personal data, meanwhile allowing an exploration of possible interplay between affect, cognition, and behavior. Specifically, the research questions are the following:

RQ1: What are teens' "ABC" – their affective (how they feel), behavioral (how they act or react), and cognitive (how they think) states about digital data in their daily lives?

RQ2: How are teens' affective and cognitive states associated with their behaviors toward data?

Having presented young people's attitudes towards data, this study discusses the ABC model with regard to youth data literacy services in public libraries, i.e., the role that libraries can be expected to play in supporting young people in the digital age.

To answer the questions above, we use qualitative data from semi-structured interviews with 22 teens. This study is part of the research project *Exploring Data Worlds at the Public Library*, whose broader goal is to examine young people's data awareness, knowledge, and practices in order to propose ways that the public library can support the development of youth data literacy. In earlier work, the project focused on young people's data awareness (Bowler et al., 2017), e.g., their understandings about the rhetoric of data, and their basic knowledge of data flows and infrastructures. As a contrast, this study focuses on teens' affective, behavioral, and cognitive states.

## 2 Related Work

### 2.1 Young People and Their Data Worlds

Growing up in the networked digital world, young people today are more than passive users; they are also active creators, adding content to the growing collections of data that are aggregated through digital platforms, services, and applications. Teens' data footprints are unobtrusively tracked and added to their "digital dossier" (Montgomery, 2015) that could be used to track, profile, and shape young people throughout their lives. Young people, however, are generally unaware of the data they generate and how the ubiquitous collection of data collection takes place (Deahl, 2014), thus making them particularly vulnerable to the potential risks. According to the Pew Research (Madden et al., 2013), young people are sharing more personal data than before: 92% of teen social media users post their real names and 91% post a photo of themselves. The personal data they share also includes real address, birthdate, etc.

Though there exists a wide body of research on information literacy, research that has helped libraries design services to better support information interaction, there is as yet, little research in the emerging field of data literacy, especially research related to teens. Deahl (2014) proposed the definition of "data literacy" and also established design principles that would guide the data literacy initiatives. In this paper, we argue that it is critical to know how the teens themselves talk and think about data and how it associates with their behavior. Knowing the answers might help researchers, educators and practitioners understand how best to serve teens in our data driven world.

### 2.2 Affect, Behavior and Cognition studies in LIS

As a central topic in the domain of social psychology, the concept of "attitude" is seen as a result of the interaction between three components: affect, behavior, and cognition (hereafter referred to as ABC, a concept based on the work of Ostrom, 1969). The adoption of the ABC model of attitude allows researchers to investigate how people feel, think and interact with the attitude object, which in this case is digital data (Mizokawa & Hansen-Krening, 2000).

In the Library and Information Science domain (LIS), scholars consider affect and cognition as important factors in the study of human information behavior (Kuhlthau, 1991, Julien et al, 2005, Nahl & Bilal, 2007). For example, Martzoukou (2005) critiqued the literature on web information seeking research arguing that this body of work should be more holistic, concentrating on not just on behaviors, but also the interplay of behavior with cognition and affect. We suggest that our understanding of teens and their interactions with data needs to be built upon a similar holistic view, rather than being confined to one dimension of the human experience.

## 3 Methodology

### 3.1 Data Collection

This study uses a dataset collected in the project of "*Exploring Data Worlds at the Public Library*," in which we interview 22 young people (age range 11-18) in three urban library branches in Pittsburgh Area, USA. The interviews were conducted in "The Labs," a technology-enhanced teen space in a public library where teens have access to advanced hardware and software (e.g., 3D printers and music composition toolkits). Teens can also hang out together to work on projects, homework, or just play games and socialize while they are at The Labs. The space is facilitated by library staff trained in the technologies available.

A semi-structured protocol was used to guide the interview process. The participants were allowed to be interviewed individually or in groups. As a result, we conducted 5 individual interviews, 7 groups of two interviews and 1 group of three. In total, we conducted 13 interviews with 22 participants. After the interviews were transcribed, twelve base codes are eventually developed to identify the essential themes or components in interview data. Each code can be link back to quotes from actual conversations. The full coding scheme is reported in (Bowler et al., 2017).

### 3.2 Data Analysis-Coding Process

**Codes identified as Affective-Feelings**

In a second level analysis, the four researchers built out the *Affect* theme, two researchers assigned a qualifier to the data coded for Affect, capturing the nature of affect, e.g., surprised or scared. As well, the "affect" data was coded in terms of positive attitude, negative attitude, or neutral. The extended coding structure for affect was then reviewed and discussed by all authors in multiple meetings.

**Codes identified as Behavioral and Cognitive**

We added two new base codes into the pre-existing coding framework: *cognitive states* and *behavioral states*. Cognitive states capture teens' thoughts and beliefs as

they relate to digital data. Behavior states refers to actions or decisions to act. We thoroughly checked the documents tagged by "affective characteristics," and then we re-examined the transcripts again to tag the incidents that suggest "cognitive states". In total, 53 quotes were yielded with an affective state, a cognitive state, or both. For these 53 quotes, we went through adjacent quotes to find out if the respondent also mentioned how they behave or they decide to behave in the future. Table 1 provides the definitions of the ABC codes and the definition.

**Table 1.** Base codes and the definition

| Base Codes | Definitions |
|---|---|
| Affective States | Respondents' feelings and emotions about data. |
| Cognitive States | Respondents' thoughts and beliefs about data. |
| Behavioral States | Respondents' practices or decisions associated with their affects or cognitions. |

# 4 Results

## 4.1 Teen's affective states about data in their daily life

After extracting all the affective quotes and assigning qualifiers, the data was grouped into the following categories: 1) positive affect, 2) negative affect, and, 3) affect that appeared to be neither positive nor negative. Among the 42 quotes suggesting the interviewees' affective states, we found that nearly half of them are positive (N=20). The second popular states are negative (N=12). Besides, there is a fair amount of affective states suggesting neither positive nor negative feelings (N=10).

**A-1. Positive affective states**

Confidence is one frequently found positive affective state in the interview. There were two contexts where the teens would express their confidence about the data and technology. Firstly, when talking about who controls their data, T3 (age: 15), T5 (age: 14) and T9 (age: 14) all reported that they were sure that the data they created were definitely controlled by themselves, demonstrating a positive sense of agency. As said by T9, *"Mine [data] says nice things" and "seems pretty controlled at the moment"*. Secondly, we found that teens are confident about their skills and aptitudes relate to data (Note, however, that this paper does not assess their actual skill level). Confidence is associated with a general feeling of liking:

*"I like it, but I like technology and stuff. It comes, all the software stuff, especially, comes really easily to me… when I'm doing stuff on the computer, it's really fun. I like coding. Coding is fun, because I get to make the computer do stuff, which is cool." (T19, age: 14)*

Interest and curiosity were commonly expressed as positive affects, and they are also considered as positive cognitions:

*"this [the interview] is making me want to go in deeper into learning more about different types of data." (T17, age: 17)*

This might because, at that moment, after talking about so many issues regarding their digital data, teens got the feeling that data is interesting and they were eager to know more. Other positive affective states include pride, relief and ease.

**A-2. Negative affective states**

Young people in the interviews showed strong negative feelings related to the fact that their data is being tracked and recorded. If data they created or the data about them was published online, they couldn't control who would get access to it and how long this data would exist. Teens expressed a sense of a loss of empowerment and this made them feel angry, sad, and scared. T11 (age: 17) shared a real experience to us:

*T11: If you Google "[school name]," this horrible picture of me comes up…And so that picture comes up because it was on my profile on the [website name]. And it's such a bad picture.*

*Interviewer: And it follows you?*

*T11: Every time… We had to do a [school name] iMovie so people looked up [school name] to find pictures, and people would come up to me in the hallway and be like, "I saw a picture of you on Google!" Oh, it's so bad.*

T11 is not the only teen in this study who was bothered by the digital identity projected through data. The situation seemed worse when teens were feeling confusion and uncertainty at the same time: They are not sure exactly how the data they post online will affect them in the future.

*T22 (age: 14): "I think it starts a lot of drama sometimes, or it starts a lot of rumor in a lot of ways, just because of too much that you put out there. Teens, if they try to avoid it, or if they just wish that it wasn't there, you can't do anything about it. "*

**A-3. Neither positive nor negative affective states**

While we identified both positive and negative affect, representing both the pleasant and the negative aspects of teens' feelings, we also found that, along the spectrum of feelings, some of the participants reported neither positive nor negative feelings (i.e. seemingly neutral) – a paradox that we feel should be further explored because there could be many reasons behind this observation.

Though many teens strongly conveyed negative feelings about the notion of being tracked, T13 (age: 13) held an indifferent and unmindful attitude, and replied: *"I just don't feel like it's such a big deal if privacy's being invaded."* And T13 further explained: *"As long as they don't take any severe action towards me, who cares what they see? That's how I feel."*

When being asked about their feelings about data, T4 (age:15) was neutral: *"I don't know, it's kind of both. Positive and negative."* T6 (age:15) and T9 (age:14) simply answered that they didn't know, which might have implied evasive, indifferent, or just unaware attitude.

### 4.2 Teen's cognitive states about data in their daily life

Teens' cognitive states were discovered in the interview transcripts, with at least 19 quotes from the transcripts speaking to the teens' knowledge, beliefs, and thought processes with regard to data. As with the analysis of affective states, cognitive states were grouped into three categories: 1) self-awareness of data and its consequences (related to metacognitive states), 2) belief that there is no absolute right or wrong and 3) belief that there are no consequences with regard to the use of their data by others (the latter two categories related to moral judgement and decision making).

**C-1. Self-awareness of data and its consequences**

Half of the cognitive states suggest that teens *believe* they are aware of what happens with their data (Note that we did not assess the validity of this belief in this paper). Some of these quotes also contain positive feelings of confidence.

*"Aware. It makes me feel aware of what's going on and how it affects our society in different ways." (T20, age: 16)*

Some teens expressed an awareness that their digital data traces were being watched and associated that knowledge with feelings of constraint and suspicion. For example, T2 (age: 14) believed that *"Somebody keeps a record of everything that you do and…Feels like you're tied down to something."* Similarly, T19 (age: 14) said *"just makes me feel like I'm always being watched."*

**C-2. Sophisticated but complicated: no absolute right or wrong about data**

Online data such as one's social media profile promotes communication between teens and their social world. People, including teens, can easily reach friends and family through the data world. Even strangers can easily connect through online identities. Despite the benefits of data, there are disadvantages, according to some teens in this study. In the interview, we found that some teens had an ambiguous notion of right or wrong in terms of their own data, seeming to believe that there is no absolutely right or wrong regarding data creation, gathering, and use.

T15 (age: 18) and T14 (age: 16) admitted the advantages of data but were conscious about the bad sequences at the same time.

*T15: "I see all the good it does, but I also just see how I think it… I think it kind of makes us less human in a way. It's weird to say, but it's how I feel about it."*

*T14: "When someone goes to a concert and they'd rather take a Snapchat about the stuff instead of enjoying the moment."*

*T15: "…You lose the awareness that you have with the things that are actually going on around you. And that really affects you as a human."*

**C-3. Belief that there are no consequences**

For some teens in this study, awareness of *"being tracked"* or *"being watched"* was not accompanied by any concern or worry. Although some teens might believe their data doesn't belong to them (or, that others have access to it), they also view this as inconsequential: Nothing severe will happen and it's simply not worth their concern.

As replied by T11 (age: 17): *"I mean, honestly, nothing's going to happen to me. It's not like the government is going to smash into my house..."*

T12 (age: 16): *"Personally, I feel like if they're trying to collect all this data for safety purposes, as long as you're not doing anything wrong online, I don't see anything wrong with having it."*

T13 (age: 13) thought that data rights are not important and *"People who cry about it are stupid."*

### 4.3 Behaviors Corresponding to Affective and Cognitive States

Table 3 summarizes the young people's behaviors and their corresponding affect and cognition. As shown in the first column, there are five major types of behaviors referred to. The five types of behaviors are divided into active behavior and passive behavior according to the required effort of the subject. Therefore, B-1 and B-2 are active behaviors as the subjects are actively updating their settings or adopting tools, while B-3 to B-5 are passive because no extra effort is put in. An example quote of

each type of behaviors is displayed in the second column. We also report the number of incidents discovered with certain affective states or cognitive states. When the teens talked about how they feel or how they think, they did not necessarily mention how they behaved or how they would behave in the future. But whenever they expressed an action after they answered the question about affective states and cognitive states, the incident is counted as a *behavior corresponding to that affective state*.

**Table 2.** Behaviors Corresponding to Affective and Cognitive States and the Number of Reported Incidents (N.B., darker color indicates more incidents)

| Behaviors | Example Behavior Quotes (ID, Age) | Corresponding Affects and No. of reported incidents | | | Corresponding Cognitions and No. of reported incidents | | |
|---|---|---|---|---|---|---|---|
| | | A-1 | A-2 | A-3 | C-1 | C-2 | C-3 |
| B-1. Active — Hide personal information, e.g., use fake names; hide address, birthday, etc. | *"…Don't use your full name. And you don't give it to strangers." (T9, 14)* | 3 | 3 | 2 | 4 | 0 | 1 |
| B-2. Active — Increase security settings, e.g., use incognito mode, etc. | *"...you can add a password or a fingerprint...I change it [password] once a month" (T4, 15)* | 0 | 4 | 2 | 1 | 1 | 0 |
| B-3. Passive — Anticipate for more knowledge or training, e.g., expect for awareness training, skill training, etc. | *" since we're young, we don't have all that information, all that knowledge about data in particular, and so we don't have the right knowledge to really understand…" (T17, 17)* | 7 | 0 | 1 | 2 | 0 | 0 |
| B-4. Passive — Reduce Usage, e.g., abandon accounts; post less, etc. | *"Maybe when I was young and I just posted little… You know, stupid pictures or stupid posts. I'll just leave the account, don't use it anymore. " (T22, 14)* | 0 | 4 | 2 | 1 | 1 | 0 |
| B-5. Passive — Maintain current settings, e.g., don't use any tricks to protect data; don't anonymize anything, etc. | *"…I've never actually worried about having my data be private, like, ever. So no, not specifically. No tricks." (T1, 11)* | 3 | 0 | 1 | 1 | 0 | 4 |

**B-1. Hide personal information**

Hiding personal information is a popular behavior adopted by some teens who consciously protect their data. It includes use fake information such as fake name, address, birthday on their profiles, and clear personal traces online.

T8 replied that a digital ID is different from the real person. Though believing that there is no need to worry too much about it, T8 still preferred to partially hide the personal information online. T18 believed that if avoiding putting middle initials on the Internet, others would not be able to locate him.

Teens who are *self-aware of data and its consequences (C-1)* are more likely to hide personal information comparing to other cognitive states.

**B-2. Increasing security settings**

Some teens have more skills and knowledge on how to increase the security of their accounts and devices. T6 changed password once a month. T15 used Duck Duck Go instead of Google as the former one claimed to track no user data. T20 was cautious when using public devices: *"But outside of home-wise, I just make sure I log out."*

We were surprised to find that teens who hold negative feelings about data tend to consciously increase security settings. This might because with the negative feeling, these teens are doubtful about the data security and thus are willing to actively improve the security level of their online accounts and profiles.

**B-3. Anticipating more knowledge or training**

Young people's expectation for more knowledge or training on data, or, the behavior they *anticipate* - is associated with positive feelings. In other words, some teens reported that they wanted to learn more about data in the future. This might be due to one of the commonly found positive feelings of curiosity. Curiosity drives T17 to expect to *"go in deeper into learning more about different types of data."*

We also found that some teens have ideas about what kind of training or data-related knowledge should be delivered to them. For example, T19 is very interested and confident in coding and technology, thus expected training in coding.

Talking about who should offer the training, T5 believed that a conversation led by the libraries could be helpful: *"They [libraries] could possibly do a meeting or have something that… Young adults or younger kids know what it is and how they could and should use it, and what an impact it has on everybody, each individual's life."* While, T16 thought it should be parent's responsibility to teach their children about the necessary information for using the technologies.

**B-4. Reducing Usage**

When teens have extreme negative feelings about digital data about themselves, they reduce their usage of some online services or even abandon some accounts.

T11, whose picture was captured by Google search results, reported: *"I used to use Instagram and Twitter and stuff. I don't really use those anymore...I just didn't want to anymore. They're just a distraction and I wanted to focus on other things."* Similarly, T22 also said *"I'll just leave the account, don't use it anymore."*

**B-5. Maintaining current privacy settings**

Some participants reported that they prefer to take no actions and they believe there is no need to make data private.

For example, T12 had a positive feeling, believing that nothing dangerous will happen to his data and it should not be individual's responsibility to protect personal

data: *"I feel like if they're trying to collect all this data for safety purposes, as long as you're not doing anything wrong online, I don't see anything wrong with having it. But if you're doing something wrong, then I feel like it's the government's responsibility to be able to…"* T13 has a very similar opinion: *"If it's necessary for people to view what I'm doing, I don't have to hide much."*

## 5 Discussion and Conclusion

**Young people are positive about their data skills while negative about their data privacy.**

In our analysis of teens' affective states associated with their data in their daily life, it is not surprising to find that young people appear to be very confident about their data related skills, such as coding. On the other hand, though several teens believed that they had control over the data they created, most teens expressed negative feelings when the conversation was about data privacy issues. What made the feeling worse was their lack of knowledge about what data was released to other entities or to the Web and how exactly how that data might affect them.

**Teens with negative affective states are more likely to adopt effortful behaviors to protect the data privacy.**

By analyzing the relationships between teens' behavior and their associated affects, we found that affective states may influence the teens' behavioral strategies. To be specific, teens with negative affects tend to adopt active behaviors to deal with the potential problematic situations, such as *B-1 hiding personal information* and *B-2 increasing security settings*. On the contrary, the teens who perceive current situation as a positive environment are more like to passively rely on the existing routines and adopt no actions to protect themselves *(B-5 remaining current settings)*.

This finding aligns with Schwarz (2000)'s argument that negative affective states foster the use of "effortful, detail-oriented, analytical processing strategies." It implies that educators should try their best to evaluate teens' data confidence, because over-confidence may negatively influence the teens' behaviors regarding data security.

**Librarians, educators and software developers can apply different strategies in reaction to different ABC states.**

We suggest librarians, educators and software developers incorporate implications from this study about ABC states of teens with regard to data into the design of data literacy programs, services, and software applications. For example, as implied by the interplay between *A-1. positive affective states* and *B-3. expect for more knowledge or training*, if librarians observe the teens showing increasing interests about the data, it may be a good time to push more knowledge and technical skills. Likewise, for the teens who are *not aware of the consequence of data privacy C-3*, there is a high chance that they adopt no actions to protect their data. In this case, it is recommended that librarians show the teens the potential risk of, for instance, personal data leaks or a compromised password, perhaps through the use of videos or news clips. Libraries can also encourage teens to share their own experiences in peer-to-peer teaching.

## 6 Future Work

While the interview sample size in this study aligns with general practices in qualitative research, the number of incidences regarding teens' *ABC states* is relatively small, making it difficult to draw wide generalizations across the population of all teens. A core contribution of this work is the development of a new analysis framework for investigating how young people interact with digital data in their daily lives. Our analysis focused on three aspects: (A) affect, (B) behavior, and (C) cognitive states. Almost a quarter of teens in this study expressed indifferent opinions with regard to data, a finding worth further investigation. It is difficult to know why, based on the data we had available. Is it because the teens didn't want to expose their feelings to the researchers or, that they simply felt nothing about data? Future research is needed to fill in this gap.

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