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Information Overload and Children: A Survey of Texas Elementary School Students

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Information overload is a frequently mentioned negative consequence of the Information Age. Research on information overload focuses on adults and little exists on even whether children suffer from overload. Two hundred sixty-five Texas fourth and eighth graders responded to a survey asking them whether they had experienced information overload, what strategies did they use to reduce the overload condition, and what words would describe their feelings while overloaded. Suggestions to the school library media specialist include altering bibliographic instruction, identifying library behaviors, and considering information-fatigue-syndrome. Results are analyzed by grade level, gender, and content. This study is limited by the small number of subjects, extensive complexity of issues, and brief self-reports from young people of their perception of their own thoughts and feelings.

Information overload is increasingly a topic in the news (Jones 1996), in specialized periodicals such as the *American Journal of Roentgenology* (Hendee 1991), and of research (Machung 1995; Jacoby and others 1994). Simply defined, overload is "that moment when the amount of available information exceeds the user's ability to process it" (Klapp 1982, 63). Such overload is a concomitant cost of the vast amounts of information made available by the information storage and retrieval technologies. Usually researchers examine information overload from an adult point of view and with adult subjects.

But children also enjoy the same benefits and suffer the same frustrations of the Information Age. Even in elementary school, seeking information becomes a worldwide act. How do children handle these new processing responsibilities? This research examines whether children experience information overload, how they describe the feeling of overload, and what actions they take to relieve this condition.

Related Literature

Library research on information overload often targets a particular service such as reference librarians (Hopkins 1995). Or it may concern libraries in general (Biggs 1989). The overload research often takes the form of essays, book chapters, or point-of-view articles.

Educational or psychological materials suggest that information overload could be an underlying cause of adolescent suicides (Allen 1987), retarded reading skills (Harker 1979; Saunders 1983), or the inability to complete tasks (Bergstrom 1995). Guidance to teachers on avoiding

information overload in the classroom concerns the number of topics to cover in one lesson (Achterberg 1988), how to structure integrated units (Eisenberg and Small 1993), and how to write a better syllabus (Smith and Razook 1993).

Overload research rarely focuses on gender or age differences. A 1996 Reuters study of corporate executives worldwide found that women were one-fifth more likely than men to suffer overload stress. British women in the same study were more likely than their male counterparts to suffer resulting illness. Generally, younger subjects process information more effectively than older subjects (Schacter and others 1994; Geffen and others 1990) but the notion of effectiveness often has more to do with speed of retrieval than mastery of concept.

Medical research on information overload finds a physical component. Monitoring of adult subjects revealed increased heart rates (Boyce 1974), increased respiration (Ettema and Zielhuis 1971; Zwaga 1973), increased blood cholesterol (Sales 1969), increased muscle tension (Wilkinson, El-Beheri, and Giseking 1972), migraines (Crisp and others 1989), release of stress hormones (Gutfeld 1993), gaze aversion (Field 1981), and reduced visual scanning (Peavler 1974).

When asked to describe information overload, adults used words such as overwhelmed, stressed, doubtful, unsure, vulnerable, and anxious (Akin 1994; Laabs 1995; Labor, Schommer, and Pathak 1995) and report symptoms of dysfunction, unease, frustration, and reduced tolerance.

Coping strategies help the individual reduce the amount of information to a manageable amount and relieve the stress of overload. In 1960, James Miller identified overload coping strategies through laboratory experiments. He found seven strategies regularly used: omission, error, queuing, filtering, lessening categories of discrimination (generalizing), employing multiple channels (delegation is a special subset), and escape. Table 1 lists the coping strategies and their associated reduction behaviors. Miller discovered that omission and filtering were used the most frequently by his overloaded subjects. These subjects, all adults, worked on video terminals identifying lights, or colors, or patterns. Certain strategies were simply not viable in this situation. Queuing, for example, is not possible with a fast moving video display.

Table 1 Overload Coping Strategies and Associated Reduction Behaviors*

STRATEGY	REDUCTION BEHAVIOR
Omission**	temporary non-processing of information
Error	processing incorrect information
Queuing	a temporary delay in processing
Filtering**	neglecting to process certain categories while continuing to process others
Multiple Channels (Delegation)	processing information via two or more channels (getting someone else to do the work)
Lessening Categories of Discrimination (Generalizing)	processing in a more general way
Escape	ceasing processing responsibilities
Twigging***	processing in a more specific way
Chunking	group processing, bundling information

* Miller 1960

** According to Miller's 1960 research results, adults employed omission and filtering more than any other strategy as the amount of incoming information increased.

*** Weick 1970

Twigging (Weick 1970) is the opposite of generalizing. However, both attempt to either narrow a large amount of general information down to a workable specific subsection, or take a large amount of extremely specific information and widen it to be a broad-brush approach.

Finally, chunking, widely discussed across literatures, groups related information into discrete bundles. A chunk can be easily retained in memory, provides a ready-made holding structure for new information. It also aids in retrieval. Mnemonic devices (Robertson-Tchabo, Hausman, and Arenberg 1976) and outlines (Dudczak 1983) are excellent chunking tools.

Subjects in Miller's research selected omission and filtering as their overload reduction strategies of choice. Thus, when adults are overloaded, they prefer to either temporarily not process some information uniformly (omission), or pay attention to some categories of information and not others (filtering). In filtering, the categories can change. Children have less experience with information. They may try to reduce overly large amounts of data by the exact same strategies as preferred by older people or they may prefer or they may use different techniques. Girls and boys may differ on how they reduce information and younger children may select different strategies from older students.

Research Questions

The research questions ask whether fourth and eighth graders will report experiencing information overload, what reduction strategies they employ to relieve the stress of overload, and how will they describe their feelings when overloaded.

Method

Two hundred sixty-five fourth and eighth graders in two different Texas public elementary schools participated in a written survey involving information overload. The 177 fourth graders and eighty-eight eighth graders took part after receiving parental permission. A gender distribution shows an almost equal representation: 130 boys and 135 girls (see figure 1).



Data Collection

Each grade level received an age-appropriate survey, differing primarily by vocabulary. The only significant difference between the two questionnaires involved twigging and generalizing. The eighth graders were given the option to select *narrowing the original topic* (twigging) or *widening the focus* (generalizing) as possible strategies. The fourth graders could only select *changing* the report *topic*.

Homeroom teachers distributed the surveys (appendix A and B) and instructed the students to mark whether they were a boy or a girl. The first of the survey's three major sections asked whether the child had ever experienced information overload. A small paragraph prompted the students to imagine they were preparing a report or researching a hobby and had already gathered materials. At that point they might experience overload and the student was asked whether that had ever happened to them. Respondents were given the opportunity to indicate either yes or no. Instructions to the teachers made it clear that children who marked "no" did not need to continue answering the questions. Children who felt that they had experienced information overload completed the rest of the survey.

The second section listed common overload strategies and asked the student to mark with a 1, 2, or 3, which of three strategies they felt they used most often. Some of the strategies were slightly reworded to accommodate fourth grade reading and vocabulary skills but essentially still

mirrored Miller's seven strategies of omission, error, queuing, filtering, delegation, lessening categories of discrimination (generalizing and inversely, twigging), and escape (table 1). For example, Miller identified delegation as attempting to persuade another individual to perform the work. The reworded strategy asked the students if they had ever "tried to get someone else to do the work for them, like Mom or Dad."

In the final survey section, the students provided their own descriptions of how information overload felt to them. Teachers collected the surveys when the students finished, thereby guaranteeing a 100 percent return rate. The completed surveys were returned and tabulated.

Data Analysis

The survey results were analyzed by grade level, gender, and content. The experiential information overload question calculated to an overall percentage. Rankings determined the relative popularity of any one strategy. A strategy mentioned either in first, second, or third place earned one vote. Tallied votes indicated which strategies were employed the most. In the affective element, words and phrases were coded and then frequency marked. In some cases, several words essentially meaning the same thing were grouped to give a contextual basis to the student responses.

Limitations of the Study

This study looks at a small number of young people and asks them to self-report on the complex issues of information overload and stress. These responses reflect only the thoughts and perceptions of the students surveyed and cannot be generalized to a wider population base.

Critical questions are raised by this inquiry and observations are presented within the context of other professional literatures. Application of the conclusions should be tempered with the understanding that additional research is essential. Further studies with controlled conditions and a larger population are encouraged in order to build generalizable conclusions. Such research will benefit those who manage student behavior and teach modern information skills.

Findings

Overloaded Children?

Simply put, the children experienced information overload. Eighty percent (211 children) indicated that they had experienced the overload condition. Girls were more likely than boys to have felt overloaded at times, 85 percent compared to 75 percent.

Twenty percent of the respondents (54 children) answered "no" when asked if they had experienced information overload. Although requested by teachers to stop filling out the rest of the form, 33 of the 54 students completed the surveys in full, sometimes with augmenting comments. The 33 surveys came equally from the two grades (16 from fourth and 17 from eighth grade), but not from the genders. Boys completed 24 of the 33 "no experience with overload" surveys. While these 33 surveys were included in the total no experience group, the responses regarding strategies and feelings were included with the surveys reporting information overload.

The survey says explicitly (to the fourth graders) "pretend you have to write a school report" and the eighth graders respond to "there are ways to reduce information." The students therefore are given the benefit of the doubt that what they responded to, is exactly what they would do, if overloaded.

The fourth graders had a higher overload percentage than did the eighth graders, 86 percent compared to 67 percent. An intuitive conclusion points to the increasing sophistication of the older children in manipulating masses of information and their growing experience with informational analysis and synthesis.

Which Strategies?

The fourth graders employed filtering, chunking, and twigging with the most frequency (see table 2). In other words, a typical fourth grader faced with a significant amount of information in the school library media center will first try to pick and choose among the material according to some criteria known only to the student or perhaps supplied by the teacher. The student will also try to chunk, or link large amounts of information into some common shape, perhaps using a teacher-supplied outline and/or knowledge the student may already have about the topic. And the student will try to either compress the material into a smaller subsection or enlarge it into a big-picture consistency. The fourth-graders were least likely to employ delegation. Thus, they do *not* actively ask others to do their work when they are overloaded.

Table 2 Fourth Grade Overload Strategies (m=177, student could select more than one term)		
1. Filtering	125	
2. Chunking	111	
3. Twigging/Generalizing	74	
4. Omission	68	
5. Escape	44	
б. Queue	40	
7. Error	23	
8. Delegate	19	

Table 1 provides definitions for these strategies.

Slight gender differences emerge among the fourth graders. The top three strategies for boys are the same as the top three overall. Girls however, differed in the choice of a third place reduction behavior. Girls selected omission, or weeding through the material. For example, a female student may decide to eliminate newspaper or magazine articles, and material in that format will be removed *unread* before proceeding.

Eighth graders differed from fourth graders in their most-preferred strategies. Overall, eighth graders prefer omission, filtering, and then chunking. Fourth graders did not list omission among their top-three strategies. With their increasing sophistication in handling information products and a heightened awareness of how much information can pertain to any topic, the eighth graders engage in actively weeding incoming information (see table 3).

Table 3		
Eighth Grade Overload Strategies		
(n=88, student could sel	ect more than one term)	
STRATEGIES	FREQUENCY	
1. Omission	52	
2. Filtering	49	
3. Chunking	28	
4. Queue	26	
5. Twigging	24	
6. Escape	16	
7. Delegate	15	
	10	
8. Generalize	10	
0 5	0	
9. Error	0	

The difference between filtering and omission is one of time economy. A pile of material may be filtered piece-by-piece (based on individual decisions regarding each piece of information), or by an initial global decision to disregard all material meeting specific criteria (such as all information contained on microfilm). Omission choices are generally based upon the language, year, or format of the material. Search engines for commonly used adult search tools (such as ERIC or First search) usually allow these parameters to be applied to an overly large retrieved set. Children go about this the same way, only their parameters may be more crudely drawn or less flexible.

Error, simply described on the survey as "you make mistakes," received the fewest responses among the eighth graders. The students rejected this as a strategy and selected more cognitively active behaviors in managing information.

Gender differences again crop up in the selection of strategies. The eighth grade girls have the same three choices as the grade overall, but boys selected queuing for their third place pick by a narrow margin. Queuing, explained as deciding to do the report later, attracted twelve- and thirteen-year-old boys.

What Feelings?

The survey asked students, "is there a word that describes your feelings when you are overloaded?" The affective responses revealed much about the children experiencing information overload. Overwhelmingly, the fourth graders reported feeling confused and frustrated (see table 4). Ranked second were feelings of being mad, angry, or even furious. These visceral responses speak to the degree of disillusionment or disappointment with the information at hand and the expectations of the child.

Table 4 Terms Frequently Used by Fourth Graders to Describe Feelings of Information Overload (n=177)

FEELINGS	FREQUENCY
1. Confused/Frustrated	65
2. Mad/Angry/Furious	40
3. Depressed/DisTurbed/Upset/ Overwhelmed	13
4. Bulging/Bursting/Exploding/ Blowing Up	12
5. Stress/Pressure	б

The verbs chosen to reflect the overload feelings capture both high action and strong affective elements. "Bulging," "bursting," and "exploding" indicate a container full to the topmost point and threatening to flood over. Words like "depressed," "disturbed," "overwhelmed," and "upset" imply a more internalized, passive response. It is interesting to note that the girls used the more active verbs.

Some children chose to apply a physical component to overload. These students listed symptoms such as headache, tiredness, depression, or sickness to explain how they felt when overloaded.

Eighth-grader responses to the same question differed in several respects (see table 5). Ten eighth graders, all male, responded with vulgarity. This equals approximately ten percent of the total eighth grade results. One interesting quality to the swear words is that all but one were linguistically correct, fairly mundane, and reasonable to the question. It is a tossup whether eighth grade boys were being crude for effect, simply displaying adolescent developmental behavior, or whether the vulgar expressions reflect the frustration of overload.

Table 5 Terms Frequently Used by Eighth Graders to Describe Feelings of Information Overload (n=88)		
FEELINGS	FREQUENCY	
1. Confusion/Frustration	25	
2. Stressed/Tense	15	
3. Vulgar	10	
4. Mad	4	
5. Panic	3	

While the boys respond with anger and cursing, the girls described themselves as tense, stressed, or experiencing panic. One curious element of this survey marks the change in the female affective responses. The fourth grade girls felt as if they were exploding and bursting, and responded to overload with irritability. By eighth grade, fatigue and panic have set in. Either the older girls learned to internalize overload or their active anger had been socialized out.

Physical symptoms mirror those of the fourth graders to a large degree: headache, fatigue, and depression. The eighth graders reported additional feelings of being stuffed and bored.

Role of the School Library Media Specialist

The role of the school library media specialist is one of informed facilitator. It is important for librarians to become aware of information overload and the ways in which students experience it. Knowing how the child *feels* can help the librarian be more empathetic. But knowing what the child *does* allows the school media specialist to respond with instruction.

Knowledge of the strategies students use to combat overload allows the information professional to both expect certain behaviors in the school library and to tailor learning episodes to the appropriate age of the student. In creating library lessons, the media specialist can consider the strategies and apply their purposes in media-related activities.

Based on the research, librarians should expect fourth graders experiencing information overload to respond in the following ways: actively try to decide which information is appropriate, try to create a large picture of the topic, and try to compress or enlarge the information products.

If the media specialist offers varying formats of material, the fourth grader may be adamant about refusing to consider some information. This is an example of the subjective 'picking and choosing' criteria. They may be unable to clearly explain their refusal but they are unwilling to admit new categories to consider. Delegation is the strategy surveyed fourth-graders are least likely to employ. **The librarian should be aware that children may be reticent to ask for help when they most need it, and should be prepared to tactfully intervene.**

Emotionally, the profile of an overloaded fourth grader is an angry-mad student who is confused and may feel like bursting or exploding. This can translate into physical stress-release behaviors. Busy librarians may not notice leg jiggling or pencil tapping but they will notice the more extreme book slamming or paper throwing. The school library media specialist can chart fourth grade research projects and the incidence of library misbehaviors in order to ascertain the relationship between information overload and physical outlets.

While eighth graders are more likely to competently perform their own searches and gather materials, they are not exempt from overload. Their strategies of choice (omission, filtering, and chunking) reflect active engagement with the material.

The affective component of overload for the eighth grader involves confusion, tension, stress, and frustration. A student who curses while searching for information may be experiencing overload. Physical symptoms include headache, fatigue, and depression. A media specialist can chart eighth grade research activities along with requests for passes to the nurse in order to pattern overload-related behaviors. A full-scale research investigation could involve the school nurse in monitoring respiration, temperature, and blood pressure. It would be interesting to know if such symptoms, known to occur in adults experiencing overload, appear in children as well. Cooperation between the school nurse and media specialist during project assignments could identify distinct upswings in certain behaviors and complaints: physical ailments, tiredness, and simple requests to go to the nurse. The newly coined *information fatigue syndrome* (McIntosh and McLean 1997) with its accompanying fatigue, irritability, and frustration may increasingly occur at younger ages as students are exposed to higher processing expectations.

Finally, the school library media specialist should discuss information overload and the common overload strategies in bibliographic sessions. Some students may rely on only one strategy, and knowledge of several may increase a child's coping skills when faced with information overload. A simple lesson tailored for fourth graders could focus on searching for material on an overlarge topic. Prior to the lesson, the librarian should ascertain that the selected research topic is both extensive and available in many formats. When the sample search results in hundreds of sources, student could brainstorm to reduce the number or type of materials. Possible solutions should include format requirements, possible topic change (either smaller or larger), seeking help, making mistakes, delaying the work, or just quitting. In this way, the students would identify the overload reduction strategies on their own, learn more about manipulating information products, and adopt a pro-active response to information overload. And as always, learning you are not alone with a feeling creates a sense of community and sharing.

The Information Age offers a wealth of available information but it also creates an environment for information overload. Children are not exempt from the stresses and advantages modern technology brings. Their voices should be heard and heeded about this important information condition.

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Appendix A

Fourth Grade

Boy _____

Girl _____

Sometimes there can be so much information on a topic that it is very hard to think about it all. When that happens, it is called "Information Overload." It can happen with schoolwork or with anything you want to know more about just because you are interested in it.

Has this ever happened to you? Yes _____ No _____

Pretend you have to write a school report and you are feeling information overload. There are ways to reduce the amount of information so that you are comfortable with it. Please pick out the three (3) ways from those listed below that you use most often. Mark the one you use the most with a 1, the next with a 2, and the third with a 3.

- __look through the material you have gathered for the report and decide what to keep and what to leave out
- _____decide on a different report topic
- _____decide to stop looking after a few pieces of information
- _____try to get someone else to do the work for you, like Mom or Dad
- __decide to do your report later
- _____make mistakes
- _____decide what you do not want to read and take that out first
- ____put the materials into piles, like for the beginning or the ending of your report

When you are feeling overloaded, is there a word that describes your feelings?

Please turn the page over and write your definition of the word "information."

Appendix B

Eighth Grade

Boy _____

Girl _____

Imagine you are doing a report. You have piles of magazine articles, books, encyclopedias, dictionaries, and notes you have already taken. At this moment, you might experience "Information Overload." This sometimes happens when too much information is available for you to think about.

Has this ever happened to you?

Yes _____ No _____

There are ways to reduce the amount of information so that you are comfortable with it. They are listed below. Please pick out the three (3) ways you use most often and mark the one you use the most with a 1, the next with a 2, and the third with a 3.

- __you go through all the material you have gathered and decide what to keep and what to leave out
- __you decide to narrow your report topic to reduce how much information you will need
- ___you decide to enlarge your report topic to do a broad report
- __you decide to stop after you have looked at so many pieces of information (for example, the first 4 articles)
- ___you try to get someone else to do the work for you, like Mom or Dad
- __you decide to do the report later
- __you make mistakes
- ___you put the materials into related piles, like for the beginning or the end section
- __you decide first what you do not want to include in your report and go through all the material and eliminate (throw away)

When you are overloaded, is there a word that describes your feelings?

Please turn the page over and write your definition of the word "information."

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