

Direction and Misdirection in Peer Response

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College Composition and Communication

The late sixties and early seventies saw a concerted attack on the teacher-as-audience. James Moffett claimed that the teacher's authority as evaluator disrupted any natural relationship that a writer might have with an audience.¹ Peter Elbow argued for a "teacherless writing class" where responses came solely from peers.² In response to these and other attacks, many freshman English textbooks began to identify the audience for writing as someone other than the teacher. Some urged students to consider their peers to be the primary audience; others advised students to define an appropriate audience (peers being one possibility) and to write for that audience. The writing would then be judged by its effectiveness and appropriateness for the intended audience.³ Despite the heavy emphasis on peer evaluation, there has been no systematic investigation of the responses of the peer audience. If students are asked to write for their peers, one must assume that the evaluation criteria used by these peers are consistent with the goals of the writing course. But is this the case? If students approach peers' writing with values, interests, and emphases different from those of writing instructors, the status of the peer response becomes problematical.

In order to examine possible differences between instructor and peer evaluations, I conducted a study which posed three questions:

- (1) Do instructors in Freshman English give four selected papers evaluations that differ significantly from evaluations given by students in Freshman English?
- (2) Are instructors in Freshman English able to predict the differences between their evaluations and the students' evaluations?
- (3) What are the reasons for the different evaluations?

For this study I selected one group of ten instructors in Freshman English at the University of New Hampshire and another group of ten students currently taking the course. The ten students were selected from a group of twenty student volunteers. In order to ensure a range of writing abilities in this group, I asked the instructors of these twenty students to rate them in the top, middle, or bottom third of their class based on the four or five papers they had seen to date. From the twenty, I then selected three students rated in the top third, four rated in the middle third, and three rated in the bottom third.

I met with each of the twenty subjects individually for about one and a half hours. Subjects were asked to read four papers and were given as much time as they needed to read, reread, and review. After each paper was completed, I interviewed the student to explore his or her evaluation. This interview was taped and later transcribed. After all of the papers were read, each subject made two ratings:

- (1) They gave each paper a general impression rating of 1-10.
- (2) They ranked each paper 1-4.

In addition, instructors were asked to predict the students' rankings of the papers. Finally, subjects were asked to explain the reasons for their rankings.

The four papers chosen for evaluation were all written by students in introductory writing courses at the University of New Hampshire. All four are essays in which the writer uses personal experience to support generalizations. The spelling and punctuation of all the papers were corrected so that errors of this type would not figure into the evaluations.

To give a sense of the task for each subject, I will present excerpts and brief summaries of each paper.

a. "Mailaholic." In this paper the writer attempts to show her addiction to receiving mail. Near the beginning of the paper, she writes

I am a mailaholic.

I am addicted to letters, receiving, sending, reading, writing, and addressing them. I revel in stationery stores; picking and choosing the "right" paper for me. Should I get the Muppets, Snoopy, or something sophisticated with flowers on it?

Stationery is nothing without stamps. Flag stamps, wild animal stamps, stamps with morals, purple stamps with B's on them. One-cent stamps, thirteen, fifteen, and now eighteen-cent stamps. Post offices drive me wild!

b. "Friendships." This paper is built on an extended metaphor comparing the author's friends to the various positions on a baseball team. She begins the comparison with her own position:

I am on the mound. I am a pitcher. No one plays the game unless I throw the ball. Everything is determined by how I pitch the ball. The catcher would be my best friend, giving me advice, keeping my spirit up and my concentration on the game. If I threw a wild pitch, she would sacrifice her body to save the ball. She would dig bad pitches out of the

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dirt and throw the ball back to me so I can get back on the mound and pitch again. When I am doing poorly she would call "time out" and walk to the mound to build up my confidence and when I strike a batter out, we rejoice together.

c. "Problems of Eminent Domain." This paper attempts to show the injustice of the law of eminent domain as it was used to purchase part of a farm owned by the writer's parents. Midway through the paper, she describes her parents' financial status:

At the present time, my parents' financial status is questionable. The amount they received this summer for the land is \$56,000. This payment was made for 64 acres of some of the most valuable land in New York State. The amazing fact that my parents received the same amount of money that a couple can earn in three years, for a section of land that took my parents a lifetime of work to obtain, reveals that something must be unfair. The state offered my parents \$56,000 for putting them out of business. To pay a couple \$56,000 for putting out of business a 36 dairy cow operation is outrageous. The amount wouldn't even be able to purchase a hot dog business from a local vendor.

d. "Grossmans . . . Love It or Leave It." This paper describes the writer's disillusionment with this summer employer and his sympathy for workers who don't consider alternative employment. In the paragraph below, he describes one of his co-workers:

I had heard stories about a salesman named Truman before I met him. When I started to work, Truman happened to be on vacation. If you worked full-time for a year you were entitled to a two-week vacation. Truman had worked for Grossman's for ten years. "Great to be back," he said as he came through the door. I remember how strange it sounded at the time; I guess it sounded funny because he really meant it. Truman, who never bothered to take his cigarette out of his mouth when he was talking, is the type of person who have many conversations with but you have difficulty remembering what any one of them is about; but you can always remember what brand of cigarette he smokes.⁴

The results of the ratings and ranking are shown in Tables I, II, and III. Table I compares the holistic (1-10) ratings given by the two groups. Table II compares the rankings (1-4) given by both groups, and Table III compares teachers' predictions of student rankings with the actual rankings. From these data, two conclusions seem justified:⁵

- (1) Students and instructors differed in their evaluations of "Grossmans . . . Love It or Leave It" and "Friendships."
- (2) Instructors were able to predict correctly some differences in the ranking of "Grossman's . . . Love It or Leave It" and "Friendships." But for "Friendships" particularly, they were unable to anticipate the magnitude of the difference.

Table I

Average Point Rating (10 = high, 0 = low)

		Mailaholic	Friendships	Eminent Domain Grossmans
Students (N = 10)	6.5	6.7	7.0	
Teachers (N = 10)	6.0	3.9	6.5	
		Average Point Rating (10 = high, 0 = low)		

Table II

Average Ranking (1 = high, 4 = low)

		Mailaholic	Friendships	Eminent Domain Grossmans
Students	2.5	2.7	2.3	
Teachers	2.3	3.9	2.2	
		Average Ranking (1 = high, 4 = low)		

Table III

Accuracy of Predictions (1 = high, 4 = low)

		Mailaholic	Friendships	Eminent Domain Grossmans
Students' Rank	2.5	2.7	2.3	
Teachers' Prediction			2.7	
		of Student Rank	2.1	3.6
			2.3	2.1

The transcripts suggest three major reasons for the differences in the evaluations. The first reason is that the students' responses were more accurate than the teachers' predictions.

The Role of Identification of Peer with Writer

In three of the four papers, the writers are dealing with experiences common to the experiences of students reading the papers. For that reason, many students claimed they could "relate to" the paper. The sheer frequency of statements of this type suggest that this willingness to identify with the author is a powerful determiner of student response. Some examples:

Response to Mailaholic
I thought it was a good paper. It was interesting to read. I feel the same way she does about mail, like when she says she feels depressed when she doesn't get mail in her mailbox, and somebody else had like 10 letters in their mailbox, it kind of makes you unhappy.

Response to Friendships

I could understand her analogy. When she started talking about her mother being the umpire and how her beer drinking friends her mother would always say are illegal, I could see a mother doing that because that's what my mother always does.

Response to Eminent Domain

Having lived in New England I've heard of people having their land taken. In fact, I knew a family who had their land taken for a highway to be put in and it's especially bitter after you've worked the farm for so many years.

Response to Grotmans

I worked at a company and there were people there that worked there full-time, and I just look at them an laugh like he (the writer) did and just say "Are you going to do this for the rest of your lives?" Don't they want to get out of that rut? Then they'll say, "I'm making a lot of money now," or "I have this and I bought a new car with this." He doesn't know about the interest and stuff, but at least he has a car.

One student defined the general principle upon which these responses are built as follows:

I suppose when a reader reads a paper, it's a lot easier if the person can relate to it, has some background and says, 'I can relate to this because it seems the same kind of thing happened to me.' And it's a lot easier if the reader knows something about what the writer is talking about.

This kind of personal identification, however, was virtually absent in the teacher protocols.

This discrepancy could account for some of the disagreement in the evaluation of "Friendships." For instructors the extended metaphor was unsuccessful; one even claimed that the paper would make for a good Abbott and Costello comedy routine. But the general criticism was that the metaphor ends up keeping the writer from exploring friendships. A typical response:

... it's a fairly simple paper. The author takes one metaphor and extends it for three pages. It doesn't work well because the author stayed too long in the realm of images. It doesn't really say very much about friendships.

A number of students agreed with this assessment, but many found the analogy far more informative than the instructors did.

Contrast this instructor's evaluation with that of a student who chose "Friendships" to be the best of the four papers.

I really liked the idea because you can really tell that they're complex relationships she has with each friend. You can tell that she has different

relationships with every friend she has. And she wants to convey that to us and I think this idea (the baseball metaphor) gets that point across in the paper, that she has a really complex relationship with her friends.

What to most instructors was "simple" is to this and several other students "really complex." A possible reason for this discrepancy is that the instructors expect elaboration to be done by the writer; for example, they claimed the connection between the spectators and the pitcher in the metaphor needed to be specifically drawn out. Students are more willing to do some of this elaboration as *readers*. If readers have had a similar experience, they are ready to use that background to extend what has been written. Because they "read in" details, they see a complexity that the teacher does not. Because the very limited comparison of mother to baseball umpire reminds them of their own mothers' rule-making authority, those few sentences are invested with a richness nor granted to them by instructors. This contrasting willingness to "read in" elaboration is one of the distinguishing differences in the strategies of the two groups.

On two occasions students commented on this difference. One student noted that "Mailaholic" has "the tone of an English paper." Curious, I asked what he meant by that:

It's more declaratory than inspired. It's very much plotted; it's not pulling along by its own weight. When you write a magazine or newspaper article what you put and how much you put is controlled by whether or not you're going to be exciting or interesting. *Whereas in an English paper you know you can develop as far as you want, as long as you do it well. I think she's taken a little advantage of the reader.* She'll ask a question at the beginning of the paper and then elaborate on it. Make a blanket statement, elaborate on it. (emphasis added)

Another student when asked to predict which paper teachers would select as the best, chose "Mailaholic":

She's taking something that seems mental to people and she's making it a big deal. And I think they like to see stuff like that. I think they like to see students write about something like a tree and make it flowery, make it come alive. So I think they would like [Mailaholic] because it's no big deal to get mail and she made it sound like it was really something. She talks about different characteristics and stuff. (emphasis added)

Both students seem to suggest that elaboration pays off when writing an "English paper" but for themselves and for real world writing, it can be a bad habit.

The Role of Originality

One reason for the relative popularity of "Friendships" was the fact that the writer tried a method of exposition that students found original. Note the similarity in the following three responses, written by three different students:

I thought it (Friendships) was very creative and imaginative and I think it was well put together. And the writer wasn't just telling a story. I think that teachers would feel the same way about that; they like to see a creative mind instead of just reading about certain events.

I never thought of friendships like this. I wrote a friendship paper for English and I never thought of it. I thought it was really neat in a way. I would have never thought of my friends as a baseball team like this is doing. . . . It's like a different way of writing a paper on friendships. I've never seen one done this way.

I like the Friendships one because I liked the way she applied the baseball diamond comparison. I would have never thought of that. . . . I think teachers [would prefer "friendships"] because they'll like the unique approach to the friendships whereas "Grossmans" [the first choice of this student] was just a straightforward kind of paper.

A similar scale of values underlies all of these responses. All three students compare the approaches taken in "Friendships" to another possible approach to the topic. In the first, the students claim that the writer "wasn't just telling a story"; one suspects that the second writer, in comparing her own paper on friendships to this paper, realized that she had taken a more conventional approach (written a "story"), and she was humbled by the comparison to this new approach; and in the third the student predicts that teachers will prefer an original to a "straightforward kind of paper." All of these responses suggest that there is a genre of English paper which they call a "story" that they feel comfortable with. A "story" is not necessarily a narrative, but is more a presentation of facts and experiences in which the shaping hand of the writer is not explicitly evident. In "Friendships" the shaping hand is clearly evident; the metaphor precludes a "straightforward" presentation of facts or experiences. Even one student who found problems with the metaphor predicted the attempted use of the [comparison] would probably impress teachers."

They were wrong. While instructors occasionally acknowledged the originality of the approach, their major complaint was that the metaphor ended up limiting the student:

. . . it seems that the author while writing this paper had that metaphor and thought, "Gee, this is really neat" and just filled it out completely. I haven't found out much about this person's friendships. The metaphor is so all-encompassing that it sort of sucks up the whole idea.

This discrepancy in responses may be due to different reading backgrounds in the respondents. Students reading "Friendships" probably have had few previous reading encounters that dealt with extended metaphors. Consequently, they are not familiar with the conventional criteria for the use of extended metaphors, specifically with the usual requirement that they must be used to clarify the subject. Instructors who, as graduate students in English, are immediately familiar with the use of figures of speech, could easily see that this student's use of the figure violated a basic convention for its use. One still might question, however, whether the student should have been given more

credit for "the attempted use" and whether a uniformly critical reaction might convince a student to return to writing "stories."

The Role of Stance

The question of stance goes beyond differences in specific criteria used by the two groups; it deals more with the role the reader takes in reading a student paper. The issue of stance can be illustrated by the example of a teaching assistant in a writing course. On the first day of class he informed his students that since he would be the audience for their papers, he would put on the board a list of subjects that he was interested in and encourage students to write on them. The director of the Freshman English program was horrified to hear of this; he felt that it was highly inappropriate to force students to write to the instructor's *individual* interests.

But the instructor was doing nothing more than any reader does; we generally choose to read in areas of interest and avoid styles of writing or subjects that do not appeal to us. We indulge our idiosyncracies—and call it "taste." This private stance is counterproductive in the classroom, though, because the instructor must acknowledge a wider range of interests and stylistic possibilities. In a sense, the instructor represents the standards and range of interests of an evaluative community. Take as an example a paper I received a couple of years ago, "Why Cheerleading is a Sport." Now, as a jaded product of the late 60's, I would not choose to read this piece unless the approach was satirical (which it definitely was not). As an instructor, though, I took it seriously and worked with the writer to develop arguments that might persuade an intelligent reader unaffected with my biases. I suspect that much of the criticism of the "teacher-as-audience" is actually criticism of teachers who allow their idiosyncracies to become the source of evaluation.

Not only is the instructor's range of interest wider, the focus is different. To evaluate writing the instructor must direct considerable attention to ways in which the text meets or fails to meet criteria implicit in the genre in which the student is writing, for at some point the teacher must give a critical response. In order to give a response, an instructor must view the text as opaque; it is a tangible, seeable representation of a set of decisions made by the writer.

The student responses suggest that students have only partially been able to adopt this stance; many still read like private readers. In some cases this was evident when students said they could "relate to the paper"; in others it appeared when they claimed that they liked a paper because they liked the topic. But in some cases the students' responses suggested that they were reading to learn, to be persuaded, to be amused. They were granting the text transparency. They were not looking at the window but the view the window allows them. For example, one student reacted as follows to the description of Truman in Grossman's:

It was especially effective for me when he started talking about Truman in the three-room apartment with his wife and five kids. I can't even think about that. It just makes you think that these people are so much poorer than most people I know.

An instructor commenting on this section of the paper would more likely have referred to the writer's effective characterization of Truman or to the effective choice of details that describe the situation. But this student talks, not about the strategy of the writer, but about the reality being described, not the window but the view.

Implications

The results of this study are consistent with those of an earlier study I conducted⁶ and suggest strongly that students and instructors in Freshman English at the University of New Hampshire frequently use different criteria and stances in judging student work. For this reason, the two groups might profitably be viewed as distinct evaluative communities. This position has powerful implications for instruction.

The study raises serious questions about the advice given to students encouraging them to "write for their peers." Such advice embodies two critical assumptions: that the teacher is fully aware of the criteria that the peer audience applies to students' writing, and that those criteria are consistent with the aims of an introductory writing course at the college level. In the case of "Friendships," instructors were unable to anticipate its appeal to students, and one might argue that even if they had been able to anticipate its appeal, they would have been reluctant to accept the students' judgment. They would have been reluctant to reward a paper that fell so short of their expectations about explicitness and about the use of the extended metaphor.

If teachers have this difficulty in anticipating—and accepting—the standards of the student audience which the teachers meet regularly, how much more difficult is it for the teacher to anticipate responses of less familiar audiences. If students are encouraged to write for any audience with the assurance that the paper will be assessed on its effectiveness with the intended audience, one must assume that the instructor possesses a virtually complete knowledge of how various audiences respond to prose. I suggest that few teachers have this complete knowledge; we fall back on using the criteria of the community to which we belong.

The danger, then, is to say one thing and do another: to claim to take one position (assessing writing on its probable affect with any intended audience) and to actually take another (assessing on the basis of the norms of the academic community). This discrepancy will only heighten the cynicism that many students have about evaluation.

This study also suggests the limitations of peer groups for providing a fully

adequate response to a student paper. My own experience working with beginning teaching assistants suggests that many begin with unrealistic expectations about the peer audience; when peers respond in a way that "misdirects," the instructor is caught in a dilemma—either to allow the "misdirection" to occur or to enter a dissenting opinion and thereby seem to veto a class decision. Even when the instructor has been careful to go over criteria with the students, he or she will often find these criteria applied with different results by students and teacher. The teacher's "étail" may differ from the student's "detail."

Nothing I have said should be construed as arguing for the elimination of the peer workshop; students need practice applying the criteria that they are now learning. But rather than being viewed as the "natural" audience for fellow-students' writing, they might more profitably be viewed as apprentices, attempting to learn and apply criteria appropriate to an academic audience. It follows that the teacher's role in the workshop should not be passive. If students are to enter into the evaluative community of the instructor, they need to see the norms of their new community applied to student work. To use Frank Smith's term, they need access to demonstrations; terms like "detail," "transitions," "order," have meaning only as they are applied; the instructor needs to make his or her application of these criteria as accessible as possible.

This study also raises questions about the shorthand comments that teachers frequently use to mark papers. Many of these comments are informative only if one can assume a common critical vocabulary.

For example, James Macmillan in his much-used text *Writing with a Purpose* suggests the use of abbreviations like "det" for "detail inadequate."⁷ But the use of this correction symbol will be successful only if instructor and student agree on what constitutes a detail and on what constitutes adequacy. The results of this study suggest that students are more willing to identify with a text and "read in" details that the writer has not included; their view of adequacy may differ from that of their instructors, who expect greater explicitness.

As the student masters the norms of this academic community, comments like "detail inadequate" can take on meaning. It is not uncommon for an abbreviated comment to be fully informative to an experienced student. But for the student about to enter a new community, "det" is not enough.

The instructor stands as the representative of a larger community and has the responsibility of making the norms of that community clear and plausible—even appealing. Correction symbols, checklists, grades, rating scales or even peer workshops do not offer beginning students a full enough picture of how these norms work. Most presume that the major work of teaching has been done, that teacher and student are working on the same wavelength—when in many, if not most, cases they are not. These norms will be made clearer if we as teachers expose what goes on when we read—if we illustrate, if we demonstrate how they work.

In addition to the need for clarity and fullness of response, the study sug-

gests, I hope, the value of paying serious attention to students' own comments about writing. When I began collecting student responses, I tended to view those that differed from my own as "misreadings." Like one of Plato's targeted souls, I assumed that I soared higher and had a clearer view of The Good than my lower-altitude students. My job was to help them ascend. But as I reread the student comments, I began to see their plausibility, their coherence. They no longer appeared erratic; rather they seemed to arise from reasonable assumptions about writing. I was no longer confronted with misreadings, but with different, equally logical readings.

As a result I try to listen longer and better when a student explains a judgment, always assuming it makes sense. Previously I would have rushed in, eager to change what I had not tried to understand.

Notes

1. James Moffett, *Teaching the Universe of Discourse* (Boston: Houghton-Mifflin, 1968), p. 193.
2. Peter Elbow, *Writing without Teachers* (New York: Oxford University Press, 1973).
3. See, for example, Sylvan Barnet and Marcia Stubbs, *Practical Guide to Writing*, Fourth Edition (Boston: Little, Brown and Company, 1983); and Maxine Hairston, *A Contemporary Rhetoric*, Second Edition (Boston: Houghton Mifflin, 1978).
4. Full copies of the papers used in this study are available upon request. Write to Thomas Newkirk, English Department, University of New Hampshire, Durham, NH 03824.
5. A subsequent study with a larger sample, 72 students and 20 teachers, found the same discrepancy for "friendships" and an even greater discrepancy for "Grossman's."
6. Thomas Newkirk, "How Students Read Student Papers: An Exploratory Study," to be published in the new journal, *Written Communication*.
7. James McCrimmon, *Writing with a Purpose*, Seventh Edition (Boston: Houghton Mifflin, 1980), inside cover.

Although various aspects of the writing process have been studied extensively of late, research on revision has been notably absent. The reason for this, I suspect, is that current models of the writing process have directed attention away from revision. With few exceptions, these models are linear; they separate the writing process into discrete stages. Two representative models are Gordon Rohman's suggestion that the composing process moves from prewriting to rewriting and James Britton's model of the writing process as a series of stages described in metaphors of linear growth, conception—incubation—production.¹ What is striking about these theories of writing is that they model themselves on speech: Rohman defines the writer in a way that cannot distinguish him from a speaker ("A writer is a man who . . . puts [his] experience into words in his own mind"—p. 15); and Britton bases his theory of writing on what he calls (following Jakobson) the "expressiveness" of speech.² Moreover, Britton's study itself follows the "linear model" of the relation of thought and language in speech proposed by Vygotsky, a relationship embodied in the linear movement "from the motive which engenders a thought to the shaping of the thought, *first* in inner speech, *then* in meanings of words, and *finally* in words" (quoted in Britton, p. 40). What this movement fails to take into account in its linear structure—"first . . . then . . . finally"—is the recursive shaping of thought by language; what it fails to take into account is *revision*. In these linear conceptions of the writing process revision is understood as a separate stage at the end of the process—a stage that comes after the completion of a first or second draft and one that is temporally distinct from the prewriting and writing stages of the process.³

The linear model bases itself on speech in two specific ways. First of all, it is based on traditional rhetorical models, models that were created to serve the spoken art of oratory. In whatever ways the parts of classical rhetoric are

Journal of Basic Writing Resumes Publication

The *Journal of Basic Writing* has resumed publication. One issue has been published for 1984, and two issues are in place for 1985, edited by Sarah D'Eloia Fortune, whose term has ended. Lynn Quirman Troyka has been appointed editor starting with the 1986 semi-annual issues. Manuscripts of 10-20 pages on any topic related to basic writing will be welcome as of January 1985, in the new MLA style (3rd edition, 1984) and, for the referee process, in quadruplicate with identifying information on cover page only. Prospective authors can send a self-addressed, stamped envelope to request the new *JBW* Editorial Statement and Style Sheet.⁴ Subscriptions are \$8 for individuals and \$12 for institutions for one year (two issues). Address: *Journal of Basic Writing*, Instructional Resource Center, Office of Academic Affairs, The City University of New York, 535 East 80th Street, New York, NY 10021.

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described, they offer "stages" of composition that are repeated in contemporary models of the writing process. Edward Corbett, for instance, describes the "five parts of a discourse"—*inventio, dispositio, elocutio, memoria, pronuntiatio*—and, disregarding the last two parts since "after rhetoric came to be concerned mainly with written discourse, there was no further need to deal with them,"⁴ he produces a model very close to Britton's conception [*inventio*], incubation [*dispositio*], production [*elocutio*]. Other rhetorics also follow this procedure, and they do so not simply because of historical accident. Rather, the process represented in the linear model is based on the irreversibility of speech. Speech, Roland Barthes says, "is irreversible":

"A word cannot be retracted, except precisely by saying that one retracts it. To cross out here is to add: if I want to erase what I have just said, I cannot do it without showing the eraser itself (I must say: 'or rather . . .') I express myself badly . . .); paradoxically, it is ephemeral speech which is indelible, not monumental writing. All that one can do in the case of a spoken utterance is to tack on another utterance."⁵

What is impossible in speech is *revision*: like the example Barthes gives, revision in speech is an afterthought. In the same way, each stage of the linear model must be exclusive (distinct from the other stages) or else it becomes trivial and counterproductive to refer to these junctures as "stages."

By staging revision after enunciation, the linear models reduce revision in writing, as in speech, to no more than an afterthought. In this way such models make the study of revision impossible. Revision, in Rohman's model, is simply the repetition of writing, or to pursue Britton's organic metaphor, revision is simply the further growth of what is already there, the "pre-conceived" product. The absence of research on revision, then, is a function of a theory of writing which makes revision both superfluous and redundant, a theory which does not distinguish between writing and speech.

What the linear models do produce is a parody of writing. Isolating revision and then disregarding it plays havoc with the experiences composition teachers have of the actual writing and rewriting of experienced writers. Why should the linear model be preferred? Why should revision be forgotten, superfluous? Why do teachers offer the linear model and students accept it?

One reason, Barthes suggests, is that "there is a fundamental tie between teaching and speech," while "writing begins at the point where speech becomes *impossible*."⁶ The spoken word cannot be revised. The possibility of revision distinguishes the written text from speech. In fact, according to Barthes, this is the essential difference between writing and speaking. When we must revise, when the very idea is subject to recursive shaping by language, then speech becomes inadequate. This is a matter to which I will return, but first we should examine, theoretically, a detailed exploration of what student writers as distinguished from experienced adult writers *do* when they write and rewrite their work. Dissatisfied with both the linear model of writing and the lack of attention to the process of revision, I conducted a

series of studies over the past three years which examined the revision processes of student writers and experienced writers to see what role revision played in their writing processes. In the course of my work the revision process was redefined as a sequence of changes in a composition—changes which are initiated by cues and occur continually throughout the writing of a work.

Methodology

I used a case study approach. The student writers were twenty freshmen at Boston University and the University of Oklahoma with SAT verbal scores ranging from 450-600 in their first semester of composition. The twenty experienced adult writers from Boston and Oklahoma City included journalists, editors, and academics. To refer to the two groups, I use the terms *student writers* and *experienced writers* because the principal difference between these two groups is the amount of experience they have had in writing.

Each writer wrote three essays, expressive, explanatory, and persuasive, and rewrote each essay twice, producing nine written products in draft and final form. Each writer was interviewed three times after the final revision of each essay. And each writer suggested revisions for a composition written by an anonymous author. Thus extensive written and spoken documents were obtained from each writer.

The essays were analyzed by counting and categorizing the changes made. Four revision operations were identified: deletion, substitution, addition, and reordering. And four levels of changes were identified: word, phrase, sentence, theme (the extended statement of one idea). A coding system was developed for identifying the frequency of revision by level and operation. In addition, transcripts of the interviews in which the writers interpreted their revisions were used to develop what was called a scale of *concerns* for each writer. This scale enabled me to codify what were the writer's primary concerns, secondary concerns, tertiary concerns, and whether the writers used the same scale of concerns when revising the second or third drafts as they used in revising the first draft.

Revision Strategies of Student Writers

Most of the students I studied did not use the terms *revision* or *rewriting*. In fact, they did not seem comfortable using the word *revision* and explained that revision was not a word they used, but the word their teachers used. Instead, most of the students had developed various functional terms to describe the type of changes they made. The following are samples of these definitions:

Scratch Out and Do Over Again: "I say scratch out and do over, and that means what it says. Scratching out and cutting out. I read what I have written and I cross out a word and put another word in; a more decent

word or a better word. Then if there is somewhere to use a sentence that I have crossed out, I will put it there."

Reviewing: "Reviewing means just using better words and eliminating words that are not needed. I go over and change words around."

Rewriting: "I just review every word and make sure that everything is worded right. I see if I am rambling; I see if I can put a better word in or leave one out. Usually when I read what I have written, I say to myself, 'that word is so bland or so trite,' and then I go and get my thesaurus." *Redoing:* "Redoing means cleaning up the paper and crossing out. It is looking at something and saying, no that has to go, or no, that is not right."

Marking Out: "I don't use the word rewriting because I only write one draft and the changes that I make are made on top of the draft. The changes that I make are usually just marking our words and putting different ones in." *Slashing and Throwing Out:* "I throw things out and say they are not good. I like to write like Fitzgerald did by inspiration, and if I feel inspired then I don't need to slash and throw much out."

The predominant concern in these definitions is vocabulary. The students understand the revision process as a rewording activity. They do so because they perceive words as the unit of written discourse. That is, they concentrate on particular words apart from their role in the text. Thus one student quoted above thinks in terms of dictionaries, and, following the eighteenth century theory of words parodied in *Gulliver's Travels*, he imagines a load of things carried about to be exchanged. Lexical changes are the major revision activities of the students because economy is their goal. They are governed, like the linear model itself, by the Law of Occam's razor that prohibits logically needless repetition: redundancy and superfluity. Nothing governs speech more than such superfluities; speech constantly repeats itself precisely because spoken words, as Barthes writes, are expendable in the cause of communication. The aim of revision according to the students' own description is therefore to clean up speech, the redundancy of speech is unnecessary in writing, their logic suggests, because writing, unlike speech, can be reread. Thus one student said, "Redoing means cleaning up the paper and crossing out." The remarkable contradiction of cleaning by marking might, indeed, stand for student revision as I have encountered it.

The students place a symbolic importance on their selection and rejection of words as the determiners of success or failure for their compositions. When revising, they primarily ask themselves: can I find a better word or phrase? A more impressive, not so clichéd, or less hum-drum word? Am I repeating the same word or phrase too often? They approach the revision process with what could be labeled as a "thesaurus philosophy of writing"; the students consider the thesaurus a harvest of lexical substitutions and believe that most problems in their essays can be solved by rewording. What is revealed in the students' use of the thesaurus is a governing attitude toward

their writing: that the meaning to be communicated is already there, already finished, already produced, ready to be communicated, and all that is necessary is a better word "rightly worded." One student defined revision as "redoing"; "redoing" meant "just using better words and eliminating words that are not needed." For the students, writing is translating: the thought to the page, the language of speech to the more formal language of prose, the word to its synonym. Whatever is translated, an original text already exists for students, one which need not be discovered or acted upon, but simply communicated.⁷

The students list repetition as one of the elements they most worry about. This cue signals to them that they need to eliminate the repetition either by substituting or deleting words or phrases. Repetition occurs, in large part, because student writing imitates—transcribes—speech: attention to repetitive words is a manner of cleaning speech. Without a sense of the developmental possibilities of revision (and writing in general) students seek, on the authority of many textbooks, simply to clean up their language and prepare to type. What is curious, however, is that students are aware of lexical repetition, but not conceptual repetition. They only notice the repetition if they can "hear" it; they do not diagnose lexical repetition as symptomatic of problems on a deeper level. By rewording their sentences to avoid the lexical repetition, the students solve the immediate problem, but blind themselves to problems on a textual level; although they are using different words, they are sometimes merely restating the same idea with different words. Such blindness, as I discovered with student writers, is the inability to "see" revision as a process: the inability to "re-view" their work again, as it were, with different eyes, and to start over.

The revision strategies described above are consistent with the students' understanding of the revision process as requiring lexical changes but not semantic changes. For the students, the extent to which they revise is a function of their level of inspiration. In fact, they use the word *inspiration* to describe the ease or difficulty with which their essay is written, and the extent to which the essay needs to be revised. If students feel inspired, if the writing comes easily, and if they don't get stuck on individual words or phrases, then they say that they cannot see any reason to revise. Because students do not see revision as an activity in which they modify and develop perspectives and ideas, they feel that if they know what they want to say, then there is little reason for making revisions.

The only modification of ideas in the students' essays occurred when they tried out two or three introductory paragraphs. This results, in part, because the students have been taught in another version of the linear model of composing to use a thesis statement as a controlling device in their introductory paragraphs. Since they write their introductions and their thesis statements even before they have really discovered what they want to say, their early close attention to the thesis statement, and more generally the linear model,

function to restrict and circumscribe not only the development of their ideas, but also their ability to change the direction of these ideas.

Too often as composition teachers we conclude that students do not willingly revise. The evidence from my research suggests that it is not that students are unwilling to revise, but rather that they do what they have been taught to do in a consistently narrow and predictable way. On every occasion when I asked students why they hadn't made any more changes, they essentially replied, "I knew something larger was wrong, but I didn't think it would help to move words around." The students have strategies for handling words and phrases and their strategies helped them on a word or sentence level. What they lack, however, is a set of strategies to help them identify the "something larger" that they sensed was wrong and work from there. The students do not have strategies for handling the whole essay. They lack procedures or heuristics to help them reorder lines of reasoning or ask questions about their purposes and readers. The students view their compositions in a linear way as a series of parts. Even such potentially useful concepts as "unity" or "form" are reduced to the rule that a composition, if it is to have form, must have an introduction, a body, and a conclusion, or the sum total of the necessary parts.

The students decide to stop revising when they decide that they have not violated any of the rules for revising. These rules, such as "Never begin a sentence with a conjunction" or "Never end a sentence with a preposition," are lexically cued and rigidly applied. In general, students will subordinate the demands of the specific problems of their text to the demands of the rules. Changes are made in compliance with abstract rules about the product, rules that quite often do not apply to the specific problems in the text. These revision strategies are teacher-based, directed towards a teacher-reader who expects compliance with rules—with pre-existing "conceptions"—and who will only examine parts of the composition (writing comments about those parts in the margins of their essays) and will cite any violations of rules in those parts. At best the students see their writing altogether passively through the eyes of former teachers or their surrogates, the textbooks, and are bound to the rules which they have been taught.

Revision Strategies of Experienced Writers

One aim of my research has been to contrast how student writers define revision with how a group of experienced writers define their revision processes. Here is a sampling of the definitions from the experienced writers:

Rewriting: "It is a matter of looking at the kernel of what I have written, the content, and then thinking about it, responding to it, making decisions, and actually restructuring it."

Rewriting: "I rewrite as I write. It is hard to tell what is a first draft because it is not determined by time. In one draft, I might cross out three

pages, write two, cross out a fourth, rewrite it, and call it a draft. I am constantly writing and rewriting. I can only conceptualize so much in my first draft—only so much information can be held in my head at one time; my rewriting efforts are a reflection of how much information I can encompass at one time. There are levels and agenda which I have to attend to in each draft."

Rewriting: "Rewriting means on one level, finding the argument, and on another level, language changes to make the argument more effective. Most of the time I feel as if I can go on rewriting forever. There is always one part of a piece that I could keep working on. It is always difficult to know at what point to abandon a piece of writing. I like this idea that a piece of writing is never finished, just abandoned."

Rewriting: "My first draft is usually very scattered. In rewriting, I find the line of argument. After the argument is resolved, I am much more interested in word choice and phrasing."

Rewriting: "My cardinal rule in rewriting is never to fall in love with what I have written in a first or second draft. An idea, sentence, or even a phrase that looks catchy, I don't trust. Part of this idea is to wait a while. I am much more in love with something after I have written it than I am a day or two later. It is much easier to change anything with time."

Rewriting: "It means taking apart what I have written and putting it back together again. I ask major theoretical questions of my ideas, respond to those questions, and think of proportion and structure, and try to find a controlling metaphor. I find out which ideas can be developed and which should be dropped. I am constantly chiseling and changing as I revise."

The experienced writers describe their primary objective when revising as finding the form or shape of their argument. Although the metaphors vary, the experienced writers often use structural expressions such as "finding a framework," "a pattern," or "a design" for their argument. When questioned about this emphasis, the experienced writers responded that since their first drafts are usually scattered attempts to define their territory, their objective in the second draft is to begin observing general patterns of development and deciding what should be included and what excluded. One writer explained, "I have learned from experience that I need to keep writing a first draft until I figure out what I want to say. Then in a second draft, I begin to see the structure of an argument and how all the various subarguments which are buried beneath the surface of all those sentences are related." What is described here is a process in which the writer is both agent and vehicle. "Writing," says Barthes, unlike speech, "develops like a seed, not a line,"⁸ and like a seed it confuses beginning and end, conception and production. Thus, the experienced writers say their drafts are "not determined by time," that rewriting is a "constant process," that they feel as if (they) "can go on forever."

Revising confuses the beginning and end, the agent and vehicle; it confuses, *in order to find*, the line of argument.

After a concern for form, the experienced writers have a second objective: a concern for their readership. In this way, "production" precedes "concept-

tion." The experienced writers imagine a reader (reading their product) whose existence and whose expectations influence their revision process. They have abstracted the standards of a reader and this reader seems to be partially a reflection of themselves and functions as a critical and productive collaborator—a collaborator who has yet to love their work. The anticipation of a reader's judgment causes a feeling of dissonance when the writer recognizes incongruities between intention and execution, and requires these writers to make revisions on all levels. Such a reader gives them just what the students lacked: new eyes to "re-view" their work. The experienced writers believe that they have learned the causes and conditions, the product, which will influence their reader, and their revision strategies are geared towards creating these causes and conditions. They demonstrate a complex understanding of which examples, sentences, or phrases should be included or excluded. For example, one experienced writer decided to delete public examples and add private examples when writing about the energy crisis because "private examples would be less controversial and thus more persuasive." Another writer revised his transitional sentences because "some kinds of transitions are more easily recognized as transitions than others." These examples represent the type of strategic attempts these experienced writers use to manipulate the conventions of discourse in order to communicate to their reader.

But these revision strategies are a process of more than communication; they are part of the process of *discovering meaning* altogether. Here we can see the importance of dissonance; at the heart of revision is the process by which writers recognize and resolve the dissonance they sense in their writing. Ferdinand de Saussure has argued that meaning is differential or "diacritical," based on differences between terms rather than "essential" or inherent qualities of terms. "Phonemes," he said, "are characterized not, as one might think, by their own positive quality but simply by the fact that they are distinct."¹⁹ In fact, Saussure bases his entire *Cours in General Linguistics* on these differences, and such differences are dissonant; like musical dissonances which gain their significance from their relationship to the "key" of the composition which itself is determined by the whole language; specific language (parole) gains its meaning from the system of language (langue) of which it is a manifestation and part. The musical composition—"composition" of parts—creates its "key" as in an over-all structure which determines the value (meaning) of its parts. The analogy with music is readily seen in the compositions of experienced writers: both sorts of composition are based precisely on those structures experienced writers seek in their writing. It is this complicated relationship between the parts and the whole in the work of experienced writers which destroys the linear model; writing cannot develop "like a line" because each addition or deletion is a reordering of the whole. Explicating Saussure, Jonathan Culler asserts that "meaning depends on difference of meaning."²⁰ But student writers constantly struggle to bring their

essays into congruence with a predefined meaning. The experienced writers do the opposite; they seek to discover (to create) meaning in the engagement with their writing, in revision. They seek to emphasize and exploit the lack of clarity, the differences of meaning, the dissonance, that writing as opposed to speech allows in the possibility of revision. Writing has spatial and temporal features not apparent in speech—words are recorded in space and fixed in time—which is why writing is susceptible to reordering and later addition. Such features make possible the dissonance that both provokes revision and promises, from itself, new meaning.

For the experienced writers the heaviest concentration of changes is on the sentence level, and the changes are predominantly by addition and deletion. But, unlike the students, experienced writers make changes on all levels and use all revision operations. Moreover, the operations the students fail to use—reordering and addition—seem to require a theory of the revision process as a totality—a theory which, in fact, encompasses the *whole* of the composition. Unlike the students, the experienced writers possess a non-linear theory in which a sense of the whole writing both precedes and grows out of an examination of the parts. As we saw, one writer said he needed "a first draft to figure out what to say," and "a second draft to see the structure of an argument buried beneath the surface." Such a "theory" is both theoretical and strategical; once again, strategy and theory are conflated in ways that are literally impossible for the linear model. Writing appears to be more like a seed than a line.

Two elements of the experienced writers' theory of the revision process are the adoption of a holistic perspective and the perception that revision is a recursive process. The writers ask: what does my essay as a *whole* need for form, balance, rhythm, or communication. Details are added, dropped, substituted, or reordered according to their sense of what the essay needs for emphasis and proportion. This sense, however, is constantly in flux as ideas are developed and modified; it is constantly "re-reviewed" in relation to the parts. As their ideas change, revision becomes an attempt to make their writing consonant with that changing vision.

The experienced writers see their revision process as a recursive process—a process with significant recurring activities—with different levels of attention and different agenda for each cycle. During the first revision cycle their attention is primarily directed towards narrowing the topic and delimiting their ideas. At this point, they are not as concerned as they are later about vocabulary and style. The experienced writers explained that they get closer to their meaning by not limiting themselves too early to lexical concerns. As one writer commented to explain her revision process, a comment inspired by the summer 1977 New York power failure: "I feel like Con Edison cutting off certain states to keep the generators going. In first and second drafts, I try to cut off as much as I can of my editing generator, and in a third draft, I try to cut off some of my idea generators, so I can make sure

that I will actually finish the essay." Although the experienced writers describe their revision process as a series of different levels or cycles, it is inaccurate to assume that they have only one objective for each cycle and that each cycle can be defined by a different objective. The same objectives and sub-processes are present in each cycle, but in different proportions. Even though these experienced writers place the predominant weight upon finding the form of their argument during the first cycle, other concerns exist as well. Conversely, during the later cycles, when the experienced writers' primary attention is focused upon stylistic concerns, they are still attuned, although in a reduced way, to the form of the argument. Since writers are limited in what they can attend to during each cycle (understandings are temporal), revision strategies help balance competing demands on attention. Thus, writers can concentrate on more than one objective at a time by developing strategies to sort out and organize their different concerns in successive cycles of revision.

It is a sense of writing as discovery—a repeated process of beginning over again, starting our new—that the students failed to have. I have used the notion of dissonance because such dissonance, the incongruities between invention and execution, governs both writing and meaning. Students do not see the incongruities. They need to rely on their own internalized sense of good writing and to see their writing with their "own" eyes. Seeing in revision—seeing beyond hearing—is at the root of the word *revision* and the process itself; current dicta on revising blind our students to what is actually involved in revision. In fact, they blind them to what constitutes good writing altogether. Good writing disturbs: it creates dissonance. Students need to seek the dissonance of discovery, utilizing in their writing, as the experienced writers do, the very difference between writing and speech—the possibility of revision.

8. *Writing Degree Zero in Writing: Degree Zero and Elements of Semiology*, trans. Annette Lavers and Colin Smith (New York: Hill and Wang, 1968), p. 20.
 9. *Course in General Linguistics*, trans. Wade Baskin (New York, 1966), p. 119.
 10. Jonathan Culler, *Saussure* (Penguin Modern Masters Series; London: Penguin Books, 1976), p. 70.

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Notes

1. D. Gordon Rohman and Albert O. Wielcke, "Pre-writing: The Construction and Application of Models for Concept Formation in Writing," Cooperative Research Project No. 2174, U.S. Office of Education, Department of Health, Education, and Welfare; James Britton, Anthony Burgess, Nancy Martin, Alex McLeod, Harold Rosen, *The Development of Writing Abilities* (11-18) (London: Macmillan Education, 1975).
2. Britton is following Roman Jakobson, "Linguistics and Poetics," in T. A. Sebeok, *Style in Language* (Cambridge, Mass.: MIT Press, 1960).
3. For an extended discussion of this issue see Nancy Sommers "The Need for Theory in Composition Research," *College Composition and Communication*, 30 (February, 1979), 46-49.
4. *Classical Rhetoric for the Modern Student* (New York: Oxford University Press, 1965), p. 27.
5. Roland Barthes, "Writers, Intellectuals, Teachers," in *Image-Music-Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), pp. 190-191.
6. "Writers, Intellectuals, Teachers," p. 190.
7. Nancy Sommers and Ronald Schleifer, "Means and Ends: Some Assumptions of Student Writers," *Composition and Teaching*, II (in press).

Summer Institute in Training Peer Tutors

Brooklyn College will offer a five-week institute in training writing peer tutors during summer, 1981, supported by a grant from the Fund for the Improvement of Postsecondary Education. The institute director is Kenneth A. Bruffee. The institute is based on the program described in Paula Beck, Thom Hawkins, and Marcia Silver, "Training and Using Peer Tutors," *College English*, December, 1978, and in Kenneth A. Bruffee, "The Brooklyn Plan: Attaining Intellectual Growth through Peer-Group Tutoring," *Liberal Education*, December, 1978; "Staffing and Operating Peer-Tutoring Writing Centers," *Basic Writing*, ed. Lawrence N. Kasden and Daniel R. Hoeber (Urbana, Ill.: NCTE, 1980); and *A Short Course in Writing*, 2nd ed. (Cambridge, Mass.: Winthrop, 1980).

Information and application forms for the 1981 institute may be obtained by writing Marcia Silver, Project Administrator, Brooklyn College Peer Tutor Training Institute, English Department, Brooklyn College, Brooklyn, N.Y. 11210. Applications must be received by April 15, 1981.

Pseudotransactionality, Activity Theory, and Professional Writing Instruction

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Pseudotransactionality—writing that is patently designed by a student to meet teacher expectations rather than to perform the “real” function the teacher has suggested—is a problem that has frequently troubled writing teachers, especially professional writing teachers. This article attempts to analyze the problem from a sociohistorical perspective by using two Russian theoretical exports: (1) M. M. Bakhtin’s concept of genre and (2) Vygotskian activity theory. The article concludes by suggesting how a sociohistorical perspective might help to counteract pseudotransactionality in the professional writing classroom.

Probably all teachers of professional writing have a dozen stories about *pseudotransactional writing*—that is, writing that is patently designed by a student to meet teacher expectations rather than to perform the “real” function the teacher has suggested. Let me begin this article by sharing such a story.

A few semesters ago, I asked students in my junior-level business communication class to write actual request letters to be sent to a genuine nonacademic audience. Students were given broad latitude in what they could write about: some chose to ask for information about a product, others wrote to realtors asking about the availability of housing, and so forth. The students were to hand in two copies of the letter along with a stamped, addressed envelope; I was to mail one copy of the letter to the audience and grade the other copy. The assignment was, of course, designed to be transactional—after all, it involved a “real” audience—yet as I graded the papers I was disappointed to see that the letters were a mix of transactional and pseudotransactional voices. The letters requesting product information, for instance, nearly all contained copious praise for those prod-

ucts. The letters requesting realty information explained in great detail *why* the students needed the information. In short, the letters tended to concentrate on verbal display at the expense of the brevity that usually characterizes such requests.

It is ironic that a supposedly transactional assignment brings out excesses of pseudotransactionality in students’ papers. Yet, in retrospect, I suppose I should have expected it. In “Spinning Like a Kite: A Closer Look at the Pseudotransactional Function of Writing,” Joseph Petraglia defines *transactional writing* as “that which does not pretend to function in any way other than it does” and *pseudotransactional writing* as “solely intended to meet teacher expectations rather than engage in a transference of information for the purposes of informing the uninformed or demonstrating mastery over content” (21). Petraglia sets up two poles here; my students’ papers are situated somewhere in between them, but closer to the pseudotransactional pole than I would like.

Pseudotransactionality is a particular problem for professional writing instructors. After all, few students are expected to write a comparison-contrast essay or a theme on a controversial topic after they graduate. But students quite often have to be prepared to write professional documents during internships and in their post-graduation jobs. Most writing teachers want them to be prepared to write transactionally, just as future employers expect them to be prepared.

In this article, I explore the problem of pseudotransactionality through the lens of two related theoretical approaches, Bakhtinian genres and Vygotskian activity theory. The first part of this article elaborates on the two approaches and uses them to discuss why pseudotransactionality appears in the first place. The second part suggests how we can deal with pseudotransactional writing as we teach our students to write for their future workplaces.

Bakhtinian Genres

A growing number of scholars from various theoretical camps have embraced M. M. Bakhtin’s concept of communication as sociohistorical rather than structural (e.g., Cole; Morson; Emerson; Wertsch; Berkenkotter and Huckin; Kent, “Hermeneutics”; Brady). For instance, externalists such as Thomas Kent view communication as “a hermeneutic guessing game” that cannot be reduced simply to a “grammar or theory of cognition” (*Paralogic Rhetoric* 158). Kent sees in Bakhtin’s concept of genre a way to describe this uncodifiable activity (166), since genres “cannot be reduced to a set of conventional elements that function together as a structural or organic whole” (“Hermeneutics” 295). Similarly, sociocognitivists Carol Berkenkotter and Thomas N. Huckin view genres as “dynamic rhetori-

cal forms" that "change over time in response to their users' sociocognitive needs" (4) and must be evaluated in terms of those needs.

In the Bakhtinian conception, genres evolve under pressure from two forces: history and addressivity. History influences the genre because each genre evolves from a previous genre (see, for instance, Voloshinov 68, 86, 93), and that previous genre exerts some pressure on what the new genre looks and acts like, even if the individual writers are unaware of the history of the genre (Ritva Engeström 202).

Addressivity also influences the genre: each genre evolves to fit a new activity that might be similar to yet different from the activity that the old genre responded to (Medvedev/Bakhtin 132; Kent, "Hermeneutics" 299). The genre cannot be separated from the activity to which it responds; it only makes sense in localized "spheres of human activity and communication" (Bakhtin 64; see also 65). Genres clue us in to what hermeneutic strategies we might successfully employ to understand an utterance in a particular activity (Kent, "Hermeneutics" 301-02).

Thus, genre is formed by the meeting of history—the past genres from which the present genre evolved—and addressivity—the changes that language users make to the genre in response to events. As Charles Bazerman puts it, "the regularities that appear in the genre come from the very historical presence of the emerging genre," but "each new text produced within a genre reinforces or remodels some aspect of the genre" (8) because each new text responds to a localized set of circumstances and a localized activity, and that response itself becomes a part of the genre's history. Berkenkotter and Huckin also stress the role of activity: "both genres and genre knowledge are more sharply and richly defined to the extent that they are localized (in both time and place)" (13-14). That is, although genres are influenced by the general features that their histories provide them, those features might be dropped or altered in localized instances of the genres because of the localized events to which they respond. (See Yates and Orlikowski for an example of how one genre, that of the memorandum, has evolved since its inception in response to various events.) To analyze how genres evolve, then, we—and students—need a sociohistorical approach to analyzing particular workplaces, one that allows us to see how both history and addressivity shape genres within those workplaces. One suitable approach is activity theory.

Activity Theory

Activity theory has its roots in L. S. Vygotsky's circle in the 1920s and was further developed by Vygotsky's colleagues A. N. Leont'ev and A. R. Luria (Raetivel 396). Although activity theory has its roots

in Marxism, it also was apparently influenced by the non-Marxist ideas of the Bakhtinian circle: the contemporaries Vygotsky and Bakhtin never cite each other, but some commonalities are evident (Emerson 27), and many scholars have connected the Bakhtinian concept of genre with activity theory (Davydov and Radzikhovskii; Emerson; Ritva Engeström; Yrjö Engeström, *Interactive Expertise*; Morson; Prior; Wertsch). Among the commonalities are, of course, an awareness of history and of social interaction.

Activity theory uses a unit of analysis that I will term an *activity network* (AN). In an activity network, one or more subjects use a tool to achieve an object(ive) (Russell) that results in an outcome. The activity itself is the cyclical transformation of an object (Yrjö Engeström, *Learning* 78). Perhaps the best way to explain this unit of analysis is through an extended illustration (figure 1).

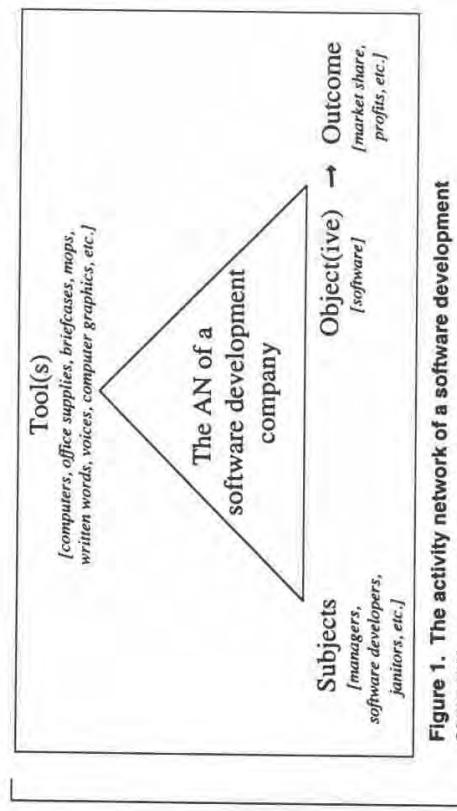


Figure 1. The activity network of a software development company.

In figure 1, the subjects are the people who are engaged in the AN, that is, those who carry on the activity of the institution. Although they perform different jobs and thus different actions—for instance, programmers generally program and janitors generally clean—those actions contribute to the institution's object(ive): software (Russell 53). The object(ive) has a double meaning, because it refers both to the object to be transformed and to the objective of transforming it, an objective that elicits different actions from different people within the AN. As the institution transforms the object (in this case, by developing and releasing new versions of a particular software package), it achieves a continually occurring outcome. Here, outcomes might include accrual of market share and profits.

The subjects mediate the transformation of the object through their use of tools. Here, the tools are both physical (computers, office

supplies, briefcases, mops) and semiotic (written words, voices, computer graphics). And just as physical tools have evolved to address certain activities, so have semiotic tools. "Variance in semiotic tools" stabilized through typical use, Russell suggests, "may be called genre" (54).

Like variance in other kinds of tools, genres have evolved under the pressure of history and addressivity. History can be seen both as institutional (the way an AN's genres have evolved) and individual (how a person's experience with particular genres has shaped that person's use of the genres). Addressivity can similarly be seen as institutional (the strategies an institution employs to handle recurring events) and individual (how an individual adapts a genre to address particular needs). Different ANs can use the same tools in their different activities, but those tools will be used differently and will tend to evolve differently to meet the different needs of the subjects. Naturally, a genre that has evolved in a particular AN—our mythical company, for instance—will differ significantly from a similar genre in another AN, such as that of a professional writing classroom.

Naturally, a genre that has evolved in a particular AN—our mythical company, for instance—will differ significantly from a similar genre in another AN, such as that of a professional writing classroom. (Reither 202-3).

Nevertheless, many agree that these efforts have limited success, primarily because for the students, classrooms are not workplaces (Reither 205; Mansfield 72; Freedman et al.). Each classroom and each workplace is a different AN. We cannot replicate "the workplace" because each workplace is different, just as each class is different. Granted, some of these ANs are parts of larger activity networks and therefore share some similarities—for instance, software development companies tend to use tools similarly because they belong to the same industry—and they may use tools in ways similar to the ways participants in computer science classes do, since those students are pursuing the object(ive) of entering the software development AN.

Figure 2 shows a simplified relationship between the activity networks of a computer science classroom and a future employer; if we wanted to pursue a broader analysis, we could conflate these two into a larger

activity network (that of "software development") in which a more diverse set of subjects uses a more diverse set of tools to transform a more general object(ive).

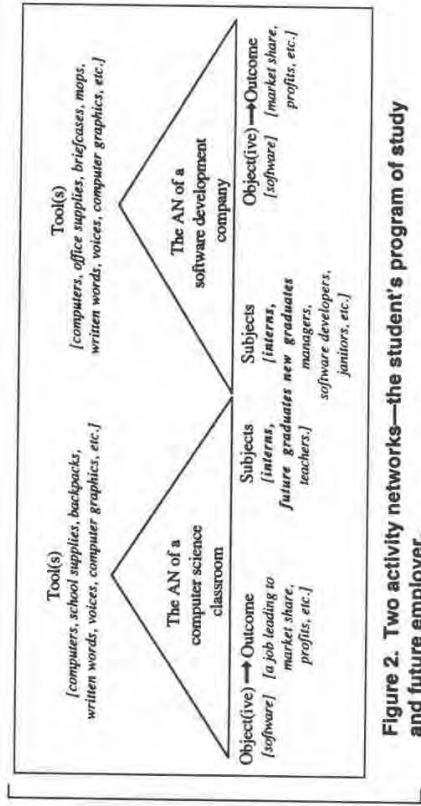


Figure 2. Two activity networks—the student's program of study and future employer.

Classroom and Workplace Activity Networks

Professional writing classrooms tend to attempt to replicate the activity network of the workplace through various means: having students participate in simulations (Freedman et al.); asking students to write in response to extended case studies (Driskill 42; Rozumalski and Graves); asking industry professionals to set assignments, give lectures, lead field trips, and evaluate papers (Hart and Glick-Smith); and engaging students in actual writing opportunities (Mansfield; Hill and Resnick; MacKinnon; Anson and Forsberg; Lutz). The latter sometimes results in documents that might even be used in industry

(Reither 202-3).

Nevertheless, many agree that these efforts have limited success, primarily because for the students, classrooms are not workplaces (Reither 205; Mansfield 72; Freedman et al.). Each classroom and each workplace is a different AN. We cannot replicate "the workplace" because each workplace is different, just as each class is different. Granted, some of these ANs are parts of larger activity networks and therefore share some similarities—for instance, software development companies tend to use tools similarly because they belong to the same industry—and they may use tools in ways similar to the ways participants in computer science classes do, since those students are pursuing the object(ive) of entering the software development AN.

As Anne Herrington points out, "each classroom presents a community in its own right, situated at once in two larger communities: a school and a disciplinary community" (333). Yet our professional writing classrooms attempt to reach future engineers, foresters, architects, botanists, and chemists as well as future computer science students. Each of these students is trying to join a community or AN that has evolved "standard" genres that meet its particular needs and reflect its particular history. That AN may contain several other ANs whose tools differ to meet their particular needs and reflect their particular genres.

To their credit, many if not most professional writing teachers realize that their students' future workplaces are too diverse to imitate in a single course, but they sometimes have trouble helping their students grapple with learning another AN's tools in a way meaningful to the ANs that those students are trying to enter.

One result is pseudotransactionality, which can be seen as a sort of overarching genre developed to facilitate certain object(ive)s of the writing course AN. Pseudotransactionality, to put it another way, can be conceived as a bundle of habits that a writer uses to achieve an object(ive). When a writer attempts to learn a new genre composed of a new set of habits, the old habits can interfere, as in the case of an engineering student who found himself writing in a workplace setting during an internship.

Jason evidently anticipated an audience that would evaluate his text based upon its correctness. That is, he saw a writer/audience relationship that echoed a common student/teacher relationship.

Partly this was because Mark was to some degree functioning like his teacher. But partly it was also because until this point he had probably seldom or never written for anyone who wasn't a teacher. His entire experience of writing fit into that mode. (Winsor 25) The student's past encounters with a genre and awareness of the teacher's goals cannot help but affect the genre's form. What results is a genre adapted for meeting the object(iv)e)s of the particular classroom AN in which the student writes, not the object(iv)e)s of a particular workplace. And, as the quote above points out, such a genre can take some time to unlearn.

Researchers have long recognized that classroom ANs tend to have object(iv)e)s that are quite different from those of workplace ANs. For instance, Freedman et al. claim that "classroom writing" and "workplace writing" have four basic differences (Table 1).

Table 1
Differences between classroom and workplace writing, according to Freedman et al.

Classroom Writing	Workplace Writing
<i>Epistemic:</i> For its own end.	<i>Instrumental:</i> For a separate end.
<i>Writer-oriented:</i> Focused on the writer's knowledge or skill.	<i>Reader-oriented:</i> Focused on how it affects the reader.
<i>Ephemeral:</i> Exists/is used only for a brief time.	<i>Continued:</i> Exists/is used indefinitely.
<i>Evaluated:</i> The reader has no stake in the document's success and therefore merely evaluates the document.	<i>Collaborated on:</i> The reader has a stake in the document's success and therefore collaborates with the writer.

Typically, a workplace writer's documents are for multiple audiences within an organization (Forsberg 46); they are part of a dialogue with a community of peers (Odell 19). In marked contrast, students' writing is clearly shaped by a very different relationship with a single reader (Freedman et al. 202, 204; Forsberg 45; Petraglia 24) and is primarily epistemic, that is, aimed towards producing tangible evidence of the students' competence as measured by the teacher's criteria (Reither 201-02). And students know that teachers typically will attempt to evaluate them all using the same static set of criteria—something that is usually not true in the workplace. This is not to deny that some writing assignments can include all of the characteristics of workplace writing, but we must be aware that students are also

addressing the activity of classroom writing, and that activity inevitably affects the forms of their utterances. The resulting versions of the genre are pseudotransactional: they have evolved to accomplish the goals of a specific classroom rather than those of the workplace that the classroom supposedly emulates.

Although teachers may be able to spot the characteristics of pseudotransactionality in a particular document, they might not be able to accurately predict what writing strategies will work better for a workplace AN. In fact, students are in many ways better prepared to evaluate their workplace genres than their teachers because of their interaction with related ANs. Dorothy Winsor, for instance, finds that her four research subjects "learned to write like engineers at work largely by trying to function within the engineering community" (19) during their internships.

Even within their coursework, however, students are learning how to function within their "communities" or ANs. Students studying computer science, for instance, are studying to enter that particular discipline or AN, an AN that encompasses both classes and workplaces. This AN has certain object(iv)e)s that shape its tools. For instance, the needs of this AN have produced the genre of the software development plan, a genre that tends to be telegraphic, have a highly articulated outline, and use visual genres such as finite state diagrams. This genre tends to be quite concise and organized compared to many other workplace genres.

Now suppose that an English teacher unfamiliar with the computer science AN tries to help a computer science student with a proposal, which includes a software development plan. The teacher is probably not familiar with the genre the student is using or the AN that most strongly influences the student's document, and may thus tend to give advice that will not be as successful. For instance, the teacher might advise the student to elaborate on a certain section, or to be less obvious about the document's structure. In a classroom AN, this unfamiliarity with workplace ANs may lead to nothing more than the student shrugging her or his shoulders and revising the document to make the teacher happy—sort of a rhetorical detour in the student's education, something that may not actually hurt (although it probably will not help either).

If, on the other hand, the student takes the advice to heart—and judging by the number of people who are unwilling to break meaningless rules about placing conjunctions at the beginning of a sentence or splitting infinitives, this is a real danger—then that student could be negatively affected by the teacher's advice. The advice becomes part of the student's personal history with the genre; it becomes a habit that the student will have to unlearn as she or he continues in the computer science AN.

To sum up, although a teacher may have greater knowledge of

general hermeneutic strategies (or at least what the AN of technical writing instruction constructs as general hermeneutic strategies), she or he knows less about the student's AN, and therefore may give advice that directly contradicts the object(ive)s of the AN.

Encouraging Students to Enter Workplace Activity Networks

If we accept the claim that genre evolution is constrained (although never fully determined) by addressivity and history, pedagogical implications follow. Below, I attempt to outline a few ways to encourage students as they write within various activity networks. First, as Reed Way Dasenbrock suggests (29), we should teach the various systemic elements of communication, the common habits that are often collected into professional writing genres, descriptively rather than prescriptively—that is, sociohistorically. I am thinking specifically of *genre habits that are rhetorically effective in most relevant ANs*—habits such as including certain information in the heading of a memorandum, for instance, or inserting an abstract at the beginning of an experimental article. We should be able to explain not just *what* the habits associated with a common professional genre are, but also *why* those habits have historically built up and *why* they have evolved differently for different ANs. Resources here might include sociohistorical research on the genre, such as Yates and Orlowski's research on the memorandum or Bazerman's on the experimental article. As we teach genres as collections of habits, we should append the caveat that they are *similar* to the genres writers might use in certain activities, not templates that writers *universally* follow or that are automatically successful. That is, we should continue to require of the students the actions of evaluating and writing that they traditionally perform in our classroom, but encourage them to examine the specific object(ive)s that are addressed by *their disciplines' genres*.

Second, we can ask students to take part in an AN outside of the English classroom, perhaps as apprentices, interns, or participants in a workplace (see Mansfield; Hill and Resnick; MackKinnon; Anson and Forsberg; Lutz) or as students in a program of professional education in their chosen field (Ackerman; Berkenkotter, Huckin, and Ackerman; Bazerman; Britt et al.; Herrington; Kent, *Paralogic Rhetoric*; McCarthy). The particular AN is not necessarily important: the point is not for the students to learn general "writing" skills, but rather to learn how to examine and appropriate localized genres and how to understand their uses in that AN. They should not expect to pick up merely a list of conventions. Rather, they should analyze the sociohistorical actions within that AN, because those actions strongly influence the genres that are used within those ANs. Such an analysis

might involve shadowing workplace professionals; interviewing writers; recounting particular incidents found relevant to their writing; examining previous documents to determine why they were or were not successful; ferreting out the object(ive)s of the AN and of related ANs; and determining how the student's own documents address those object(ive)s.

Such analyses can benefit not only the individual students but also the entire class: students can share their experiences, as various scholars have suggested (see Anson and Forsberg; Spilka). Thus, students can learn from each other how their activity networks shape the genres used within them. By reflecting on and sharing their experiences, students can demonstrate to each other the variations within workplaces, and as a result may begin to see genres as vital and evolving.

Finally, students can rhetorically analyze the workplace documents that they and others produce within their workplace ANs, explaining their rhetorical choices. Such rhetorical analyses would be transactional, because they do not pretend to be other than what they are. Additionally, rhetorical analyses fall within the focus of the teacher's field: the collection of habits into genres, the forming of utterances. Such an arrangement lets the teacher off the hook. No longer does the teacher have to judge the workplace document, a document whose genre addresses an AN that the teacher does not fully share and therefore cannot fully evaluate.

Implications

Some readers may be wondering at this point whether I view professional writing as something that must be learned entirely within the AN for which it is intended. Not at all. As Anson and Forsberg demonstrate in their study of interns, participating in an AN does not necessarily teach one the skills necessary to succeed within it. Simply immersing a student in a workplace AN is a bit like the old method of teaching a child to swim by throwing him or her in a lake: the method might often work, but the price of failure could be quite high. At the same time, the traditional approach of teaching students generalized communication strategies without reference to localized ANs will not help much either, as Thomas Kent takes pains to demonstrate in the last chapter of *Paralogic Rhetoric*.

In this article, I have argued that students should join other ANs and use the professional writing classroom as a forum for discussing them and as an opportunity to examine their practices. By involving students in a localized AN, we can encourage them to write transactionally and to learn *how to learn* genres.

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GENRES OF ORGANIZATIONAL COMMUNICATION: A STRUCTURALIST APPROACH TO STUDYING COMMUNICATION AND MEDIA

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Drawing on rhetorical theory and structuration, this article proposes genres of organizational communication as a concept useful for studying communication as embedded in social process rather than as the result of isolated rational actions. Genres (e.g., the memo, the proposal, and the meeting) are typified by communicative actions characterized by similar substance and form and taken in response to recurrent situations. These genres evolve over time in reciprocal interaction between institutionalized practices and individual human actions. They are distinct from communication media; though media may play a role in genre form, and the introduction of new media may occasion genre evolution. After the genre concept is developed, the article shows how it addresses existing limitations in research on media, demonstrates its usefulness in an extended historical example, and draws implications for future research.

Human communication has always been central to organizational action. Today, the introduction of various sophisticated electronic communication technologies and the demand for faster and better forms of interaction are visibly influencing the nature of much organizational communication. These pressures are giving rise to hitherto poorly understood changes in what, how, when, why, and with what effect organizational communication occurs. Yet, such changes are not unprecedented; the nature and role of communication in organizations is always evolving as individual actors interact with social institutions over time (Weick, 1979, 1987).

This ongoing interaction between individuals and institutions can be seen as an instance of what Giddens (1984) termed structuration. Structuration theory involves the production, reproduction, and transformation of social institutions, which are enacted through individuals' use of social rules. These rules shape the action taken by individuals in organizations; at

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the same time, by regularly drawing on the rules, individuals reaffirm or modify the social institutions in an ongoing, recursive interaction. Only a few researchers have drawn on Giddens's (1984) structuration theory in their treatment of organizational communication (Contractor & Eisenberg, 1990; Manning, 1989; McPhee, 1985; Monge & Eisenberg, 1987; Poole & DeSanctis, 1989, 1990; Poole & McPhee, 1983). For example, Poole and DeSanctis (1989) used structuralist concepts to examine how groups appropriate the interaction rules of their group decision support systems, thereby structuring their group communication and reinforcing or modifying their systems' influence over time.

This article adapts the concept of genre from rhetorical theory and uses it to explain organizational communication as a structuration process. Genre is a literary and rhetorical concept that describes widely recognized types of discourse (e.g., the novel, the sermon). In the context of organizational communication, it may be applied to recognize types of communication (e.g., letters, memoranda, or meetings) characterized by structural, linguistic, and substantive conventions. These genres can be viewed as social institutions that both shape and are shaped by individuals' communicative actions. By situating genres within processes of organizational structuration, the proposed framework captures the continuing interaction between human communicative action and the institutionalized communicative practices of groups, organizations, and societies.

GENRES OF ORGANIZATIONAL COMMUNICATION

Background and Concept

Rhetoricians and literary critics since Aristotle's time have used genre as the basis for classifying types of rhetorical discourse and literary works. In traditional literary scholarship (e.g., Holman, 1972), the term genre was typically and loosely defined to mean a classification based on form and topic, such as a tragedy, a comedy, the novel, and the epic. In rhetoric, discourse was classified into genres such as the elegy or the inaugural address by one or more of a variety of characteristics, including form, subject, audience, or situation. (For extensive reviews of this literature, see Campbell & Jamieson, 1978; Miller, 1984.)

Since the late 1970s, the concept of rhetorical genre has received considerable attention. Rhetoricians have attempted to define the concept more precisely than in the past and have taken a more contextual approach to it. Simons (1978: 42), for example, defined rhetorical genre as "a distinctive and recurring pattern of similarly constrained rhetorical practices," in which the constraint is based primarily on purpose and situation. Harrell and Linkugel (1978: 263–264) argued that "rhetorical genres stem from organizing principles found in recurring situations that generate discourse characterized by a family of common factors." Of the most use here, Miller (1984: 159) identified genres "as typified rhetorical actions based in recurrent situations." These attempts at redefinition of rhetorical genre all draw on Bitzer's (1968:

8) concept of a rhetorical situation composed of three critical elements: an exigence (something needing to be done), an audience (who must be affected or influenced), and constraints ("persons, events, objects, and relations which are parts of the situation because they have the power to constrain decision and action needed to modify the exigence").

Miller (1984) modified Bitzer's relatively objective notion of exigence by introducing an element of subjectivity. Drawing on Burke's (1973) notion that motives (i.e., human action as subjectively perceived) rather than objective circumstances constitute the essence of situations, Miller (1984: 157) argued that exigence is neither totally objective nor totally subjective but rather "a form of social knowledge—a mutual constraining of objects, events, interests, and purposes that not only links them but also makes them what they are: an objectified social need." In response to this objectified social need, humans enact typical rhetorical practices or genres characterized by patterns of form and substance. Thus, genres are typified rhetorical action in the context of socially defined recurrent situations. This concept of rhetorical genre has been used within rhetorical research to study various types of discourse, ranging from the experimental scientific article (Bazerman, 1988) to the documentary film (Gronbeck, 1978). In a study of genre in a professional community, Devitt (1991) used documents from six major accounting firms as a basis for identifying a number of genres common to the tax accounting profession (e.g., opinion letters and memoranda to the file).

Drawing on Miller's concept of rhetorical genres, we propose a similar concept: genres of organizational communication. This concept can be applied to a wide range of typical communicative practices occurring in organizations, and it provides a new perspective on organizational communication that is both interactive and socially embedded. Thus, it allows us to examine the production, reproduction, and modification of different types of organization communication over time and under different circumstances.

A genre of organizational communication (e.g., a recommendation letter or a proposal) is a typified communicative action invoked in response to a recurrent situation. The recurrent situation or socially defined need includes the history and nature of established practices, social relations, and communication media within organizations (e.g., a request for a recommendation letter assumes the existence of employment procedures that include the evaluation and documentation of prior performance; a request for a proposal is premised on a system for conducting and supporting research). The resulting genre is characterized by similar substance and form. Substance refers to the social motives, themes, and topics being expressed in the communication (e.g., the positive or negative recommendation and the supporting characteristics of the recommendee; the proposing of the project including its rationale and design). Form refers to the observable physical and linguistic features of the communication (e.g., inside address and salutation of a letter; standard sections of a proposal). There are at least three aspects of form in organizational communication: structural features (e.g., text-formatting devices such as lists and fields and devices for struc-

turing group interactions, such as an agenda and a chairperson for a meeting), communication medium (e.g., pen and paper or face to face), and language or symbol system (which would include linguistic characteristics such as formality and the specialized vocabulary of technical or legal jargon).

To illustrate, consider the meeting genre. Individuals invoke this genre in response to a recurrent organizational situation, defined generally by the set of organized group practices emerging from the socially defined demand for face-to-face interaction underlying contemporary organizational culture. In staging and participating in the meeting, participants draw on the characteristic features that constitute meetings: substance, defined generally as the participants' joint execution of assigned tasks and responsibilities, and form, including rearrangement of time and place, the face-to-face medium within which the meeting is typically executed, and structuring devices such as an agenda and the chairperson's role. A particular instance of this meeting genre would be, for example, a specific meeting of a personnel committee in a law firm. In this case, the recurrent situation is the institutionalized practice of meeting to evaluate employees, with its existing social relations of authority and legitimacy, and its past interactions. The substance of the meeting concerns evaluating the performance of certain employees. The form is a face-to-face meeting with a formal agenda, chaired by the director of personnel, minutes noted by the firm's secretary, and conducted in informal, everyday language.

Drawing on Giddens' (1984) notion of social rules, we posit that genres are enacted through rules, which associate appropriate elements of form and substance with certain recurrent situations. We call these rules genre rules. For example, in the case of the business letter, which is invoked in recurrent situations requiring documented communication outside the organization, the genre rules for substance specify that the letter pertain to a business interaction with an external party, and the genre rules for form specify an inside address, salutation, complimentary close, and correct, relatively formal language. The ways in which these genre rules influence the generation of specific communication is central to an understanding of genre as enacted within communities. When individuals draw on the rules of certain genres of organizational communication (genres as the vehicle of communicative action), they also reproduce these genres over time (genres as the outcome of communicative action). For example, when organizational members write business letters or engage in meetings, they implicitly or explicitly draw on the genre rules of the business letter or meeting to generate the substance and form of their documents or interactions. They also, in effect, reinforce and sustain the legitimacy of those rules through their actions.

A particular instance of a genre need not draw on all the rules constituting that genre. For example, a meeting need not include minutes or a formal agenda for it to be recognizable as a meeting. Enough distinctive genre rules, however, must be invoked for the communicative action to be

identified—within the relevant social community—as an instance of a certain genre. A chance encounter of three people at the water cooler, which is not preplanned and lacks formal structuring devices, would not usually be considered a meeting.

Genre rules may operate tacitly, through socialized or habitual use of communicative form and substance, or they may be codified by an individual or body into specific standards designed to regulate the form and substance of communication. Adherence to codified genre rules may be mandated at various social levels, as with laws requiring tax returns to conform to IRS standards, or explicit organizational regulations requiring expense reports that conform to corporate standards. Genre rules also may be standardized by being embedded in a medium, as with preprinted paper forms such as credit or job application blanks, or electronic templates such as the headings provided by electronic mail systems.

Inherent in the notion of genre as presented above is the issue of level of abstraction. For example, if the business letter is a genre of organizational communication, what about the recommendation letter? Similarly, if the meeting is a genre, what about the personnel committee meeting? In each case, the variants derived from the more general type differ primarily by being more specific in subject and form. Do they constitute genres? Miller (1984: 162) suggested that genre may be defined at different levels in different cultures and at different times, depending on "our sense of recurrence of rhetorical situations." Applying this notion to organizational genre, the business letter and the meeting might at one point be genres, whereas at another point, these types of communication might be considered too general and the recommendation letter or the personnel committee meeting might better capture the social sense of recurrent situation. Although Miller maintained that genre can only be identified at one of these levels in a specific time and place, Simons (1978: 37) argued that genre need not be identified at a single level: "Rather than haggling over the level at which something becomes a genre as opposed to a family or species, one might better recognize that genres 'exist' at various levels of abstraction, from the very broad to the very specific." Within limits, this flexible approach seems more useful in dealing with the vast range of communication in organizations; that is, the business letter and the recommendation letter, the meeting and the personnel committee meeting may all be designated as genres of organizational communication if there can be identified for each a recurrent situation, a common subject (either very general or more specific), and common formal features. For example, the study of genres in the tax accounting profession (Devitt, 1991) identified six distinct types of letters (e.g., opinion letters and promotional letters) and three types of memoranda (e.g., research memos and administrative memos).

It may be useful to discuss the relationship of genres on different levels of abstraction; if so, we can invoke a notion of subgenres within genres. For example, the positive recommendation letter could be viewed as a subgenre of the recommendation letter, which is a subgenre of the business

letter. The term subgenre is, of course, relative, because in the posited nesting, the recommendation letter is a subgenre of the business letter, but it is a genre in relation to its subgenre, the positive recommendation letter. Moreover, this nesting, as well as the concept of genre in general, must be understood to be situated in time and context. In the contemporary American climate of plentiful lawsuits and occasional public disclosure of recommendation letters, a situation may be emerging in which almost all recommendation letters are positive and, thus, the three nested genres can be collapsed into two genres.

Related to, but analytically distinct from, level of abstraction is the issue of normative scope. That is, how extensively shared must the social norms of a recurrent communicative situation, along with characteristic subject and formal features, be to qualify as a genre? Must a genre be universally meaningful, or may it be shared across certain types of organizations, within a single organization, or within a single group? What if it is widely applied across organizations in one culture, but not in those of another culture? To pose a contrasting case, what if a single individual has developed a consistent pattern of communicative action in response to a personally identified recurrent situation? Because recurrent situations are socially defined, we can disqualify as a genre the pattern invoked only by a single individual, though such patterns may be of interest as stages in the eventual emergence of a socially defined genre.

Because recurrent situations may be socially defined at any level above the personal, we posit that genres of organizational communication may be shared across the following various kinds of social communities: (a) those that are widely accepted in most advanced industrial nations (e.g., the memo and business letter), (b) those that are specific to organizations within certain societies or particular cultures (e.g., the Japanese tea ceremony or a U.S. environmental impact statement), (c) those specific to transorganizational groups such as occupations and industries (e.g., audit reports, SEC filings), (d) those that reflect distinct organizational or corporate cultures (e.g., the Procter & Gamble one-page memo), and finally (e) those genres that exist within introrganizational groups such as departments and teams (e.g., the "complex sheet" used by airline ground crews to coordinate the movement of planes into and out of gates, and the transfer of passengers and baggage into and out of planes, Suchman & Trigg, 1991). It appears that genres with a broad normative scope also are more likely to be at a high level of abstraction, and vice versa. Nevertheless, the two aspects of genre can be distinguished. It is, for example, possible to identify genres and subgenres with the same normative scope (e.g., the business letter and the recommendation letter are both used in organizations throughout the United States).

¹ In his examination of artistic genres, DiMaggio (1997: 448) termed this dimension universality.

To allow flexibility in use of the genre concept, we have defined it broadly in terms of both normative scope and level of abstraction. Nevertheless, undue proliferation of genres may also weaken the usefulness of the concept.² For example, Devitt's (1991) catalog of genres in tax accounting is useful in understanding various aspects of the tax accounting profession. If, however, such cataloging were extended to every industry, it would result in endless lists of genres comparable to the exhaustive (and exhausting) model letter books common in the 19th century (Weiss, 1945). Thus, there is a tension between too broad and too narrow a definition of genre. In a particular use of the concept, the domain or communicative phenomenon being studied should guide the researcher in determining the useful balance between too narrowly and too broadly constraining the genre concept. For example, the Procter & Gamble one-page memo may be considered a genre (or a subgenre of the memo) only for certain limited purposes such as studying the socialization of new Procter & Gamble employees.

Production, Reproduction, and Change Over Time

In discussing what constitutes a genre, we have only alluded to the more complex and central dynamic issue of how genres are produced, reproduced, and changed over time. This aspect of genres will now be elaborated upon.

We have suggested that genres emerge within a particular sociohistorical context and are reinforced over time as a situation recurs. As rhetoricians have also observed, these genres, in turn, shape future responses to similar situations. For example, Bitter's (1969: 13) discussion of recurrent rhetorical situations notes:

From day to day, year to year, comparable situations occur, prompting comparable responses; hence rhetorical forms are born and a special vocabulary, grammar, and style are established. . . . The situation recurs and, because we experience situations and the rhetorical responses to them, a form of discourse is not only established but comes to have a power of its own—the tradition itself tends to function as a constraint upon any new response in the form.

This view of communicative practices within sociohistorical contexts is particularly compatible with structuration theory (Giddens, 1984).

In structurational terms, genres are social institutions that are produced, reproduced, or modified when human agents draw on genre rules to engage in organizational communication. As social institutions, genres both shape and are shaped by communicative action. To borrow from Barley and Tolbert (1988: 2) on institutions, genres "are by-products of a history of negotiation among social actors that results in shared typifications which gradually acquire the moral and ontological status of taken-for-granted

facts."³ Figure 1 (adapted from Barley, 1986) depicts the processes by which genres are used and reproduced or changed over time in organizational communication.³ At any given time in a particular firm, genres of organizational communication exist and inform ongoing organizational communication (arrow 1 in Figure 1). Organization members in certain situations draw on the rules of substance and form of established genres in their communicative action (arrow 2 in Figure 1). By using (or not using) particular genre rules, individuals enact the established genres (or modified versions) (arrow 3 in Figure 1), thus reinforcing and reproducing (or challenging and changing) established genres over time (arrow 4 in Figure 1). The enacted genres then inform future communicative action, and the recursive cycle begins anew.

As this description suggests, although the processes of structuration generally reproduce genres over time, the processes may also change them. That is, even though genres facilitate and constrain communicative choices, genre rules do not create a binding constraint. Instead, human agents continually enact genres, and during such enactment they have the opportunity to challenge and change these genres. Barley and Tolbert (1988: 9) recognized three modes of enacting already-established social institutions—maintenance, elaboration, and modification—which can also be used to understand the production and reproduction of genres. When individuals enact the genres by using the rules of substance and form without alteration, they are maintaining the existing genres. When they consistently but slightly adapt genre rules to reflect new conditions—such as a new medium or a new locale—without substantially departing from those genre rules, they are elaborating the existing genres (e.g., a firm may customize its own memo stationery with an added field for file number). When individuals depart significantly and persistently from the rules of existing genres, they are modifying the existing genres (e.g., when prose reports are replaced by tabular, numeric reports in organizations).

Thus, on occasion, individuals modify (deliberately or inadvertently, whether by mandate or spontaneously) some of the established genre rules of substance and form. These modifications may be triggered by material or perceptual changes in the recurrent situation. That is, changes to the social, economic, or technological context (e.g., changed organizational forms, new or less expensive electronic media, revised reporting requirements), or changes in how social groups recognize and respond to situations (e.g., an ad hoc group's redefinition of itself into a regular task force) may occasion a deviation from habitual use of genre rules. Similarly, changes in elements of form, such as available media, structuring devices, and language, may allow or encourage individuals to violate genre rules. Although rules establish continuity with the past, they are not determining forces because

³ Although this article depicts institutional forces and social actions sequentially in both the discussion and in Figure 1, this is for analytical clarity only. Processes of structuration occur simultaneously and are often inseparable in practice.

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communicative action can create variations in the rules of substance and form. As Cohen (1989: 45) noted, "There is no guarantee that agents will reproduce regularities of conduct as they previously have done." Thus, the potential for genre modification is inherent in every act of communication. The extent to which established genres actually are modified will depend on the duration, normative scope, and nature of variation from existing genre rules. Significant and persistent modifications to genre rules that are widely adopted result in a modified genre. In some cases, these changes may be so extensive that they lead to the emergence of a new or modified genre (either one that is parallel with an existing genre or one that replaces a genre that has broken down). The result of such ongoing challenges is "that the set of genres is an open class, with new members evolving, old ones decaying" (Miller, 1984: 153).

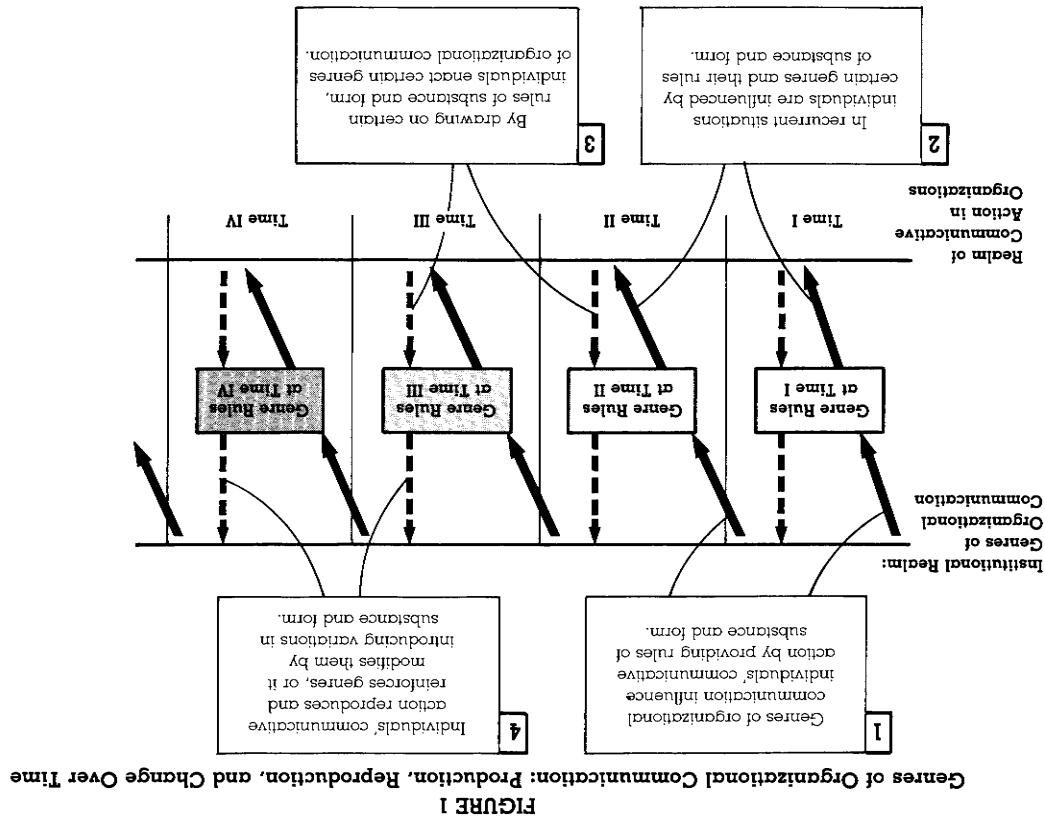
The structural account of genre production, reproduction, and change over time helps us to describe and interpret both historical and contemporary changes in communicative practices. It also provides a powerful lens through which to examine the relationships between organizational communication and communication media.

COMMUNICATION MEDIA AND ORGANIZATIONAL GENRES

Overview of Two Streams of Prior Research

Numerous studies focusing on many different variables have examined the relationship between organizational communication and communication media. Although the approaches adopted by these studies seem disparate, from a structural point of view, we can identify two dominant streams of research that are characterized by their opposing views of the role played by media in organizational communication. One stream of research focuses on the conditions that influence media choice, thus positing communication media as a dependent variable and examining the technical, economic, psychological, and social factors that influence use of media in organizations. The other stream of research focuses on the communication effects of using media, thus positing communication media as an independent or mediating variable that influences certain communicative behaviors or outcomes in organizations.

Research on media choice. The research on media choice has attempted to determine when and with what consequences individuals choose to use a particular communication medium. Such studies have examined the use and appropriateness of various media for different types of communication under various circumstances. Though there are several theories regarding media choice, such as those of social presence (Short, Williams, & Christie, 1976) and cost minimization (Reinsch & Beswick, 1990), the most widely studied recent theory, and the one used here to illustrate this stream, is that of *media richness* (Daff & Lengel, 1984, 1986; Daff, Lengel, & Trevino 1987; Trevino, Lengel, & Daff, 1987). This theory posited that media may be ranked on a continuum according to their capacity to provide immediate feedback, to convey multiple cues, to support personalization,



and to accommodate linguistic variety. The continuum runs from face-to-face interaction at the "rich" end through telephone communication, electronic mail (included only in later studies), and personally addressed written letters and memos to general bulletins and standardized quantitative reports at the "lean" end. The theory states that effective managers choose richer media to convey unequivocal or ambiguous messages and leaner media to convey unequivocal messages.

Empirical studies of media choice have shown some support for the media richness concept and its link with managerial effectiveness (Russ, Daft, & Lengel, 1990; Trevino et al., 1987), as well as the effect of situational and individual factors on media choice (Trevino, Daft, & Lengel, 1990). Other studies, however, have found that executives use certain media more often (Rice & Shook, 1990) or for different types of tasks (Markus, 1988) than the theory would predict. Some conceptual limitations have also been noted. Fulk, Schmitz, and Steinfield (1990), for example, pointed out that this theory is limited by assumptions about the rationality and objectivity of decision makers. Decisions about media do not occur in a vacuum; both decision makers and media are socially embedded within organizational settings. Fulk and her colleagues (1990) proposed a more comprehensive "social influence" model, which explains that media choice is based not simply on objective characteristics of media and tasks, but it is also based on subjective perceptions that are influenced by social and historical factors. The social influence model overcomes many of the difficulties of the media richness assumptions. Despite the incorporation of many social factors, this literature still focuses primarily on the factors determining media use.

Research on media consequences. In contrast, the other main stream of research has concentrated on the consequences of media use for communication structure, process, and outcomes (see reviews by Cuhon & Markus, 1987; Kraemer & Pisonneauet, 1990; Williams, 1987). To illustrate, studies have examined the extent to which electronic media filter out many of the cues—nonverbal (Trevino et al., 1990), social context (Sprout & Kiesler, 1986), and social presence (Rice, 1984; Short et al., 1976)—that are associated with face-to-face and other non-computer-mediated forms of communication. For example, one group of researchers (Siegel, Dubrovsky, Kiesler, & McGuire, 1986; Sprout & Kiesler, 1986) found that the language used in electronic communication media was less inhibited than that in face-to-face communication and also included many instances of what they called *flaming* (e.g., emotional outbursts, name-calling, exaggerated emphasis, inappropriate innuendos, sarcasm, and obscene language). More recently, however, the pervasiveness of this phenomenon in social settings has been questioned (Foulger, 1990; Motheson & Zanna, 1989; Rataelli, 1990). Other researchers have examined the influence of electronic media on communication patterns (Eveland & Bikson, 1988; Feldman, 1987) and language patterns (Ferrara, Brunner, & Whitemore, 1990; Foulger, 1990; Murray, 1985, 1987) within established communities. Despite the focus on social contexts in these studies, this literature still posits media as a relatively fixed influence on social and communicative behaviors.

Limitations of Two Streams of Prior Research

The two streams of research that have been sketched out in the previous section have shed light on numerous aspects of the relationship between media and organizational communication. Several commentators have critiqued this body of work (Contractor & Eisenberg, 1990; Fulk et al., 1990; Krone, Iablin, & Putnam, 1987; Weick, 1983), but the genre perspective on communication in this article highlights two specific areas of concern.

Causal relationships between media and organizational communication. As revealed in the previous section, most existing research focuses either on how technical, organizational, personal, or social factors influence media choice and use or on how media affect organizational communication, but not on both. A structural view of communication suggests that each of these accounts, by itself, is incomplete for it fails to examine reciprocal and recursive relationships between media and communication in organizations over time. A small number of researchers have used structural concepts to study communication media in organizations (Contractor & Eisenberg, 1990; Poole & DeSanctis, 1990). These approaches, like the genre perspective presented here, offer a way of resolving the dualism in the two dominant streams of existing research.

Definitions of media. The notion of communication media is used variously and inconsistently by different researchers in different studies. In particular, the concept of medium has often been confused with that of genre. Confusion arises when researchers compare genres of communication (e.g., memos or bulletins) with communication media (e.g., electronic mail or fax). Genres, however, may be physically created, transmitted, and stored in various media. Thus, comparing memos with electronic mail, for example, confounds the concept of communication medium with that of communication genre.⁴ Though a few researchers have applied the term genre to communication in electronic media (Foulger, 1990; Reder & Schwab, 1988), this concept has not been theoretically elaborated. Although our notion of genre is clearly differentiated from that of medium, we recognize their interaction by positing that medium may play a role in both the recurrent situation and the form of a genre. For example, a recurrent situation may include a specific medium (e.g., when an electronic mail message typically evokes an electronic mail response). Alternatively, a medium may be conceived as an aspect of a genre's form (e.g., letters are traditionally conceived of as paper-based).

The genre perspective on communication presented in this article, which draws on structural precepts and distinguishes between the physical means of communication (media) and the typified communicative

⁴ Stohl and Redding (1987: 457) identified this problem using the term *format* rather than *genre*. They wrote: "It must be noted also that the dividing line between 'medium' and 'format' is admittedly fuzzy; for example, between telephone, print, and oral media on the one hand; and conversations, interviews, committee meetings, letters and in-house presentation—all formats—on the other."

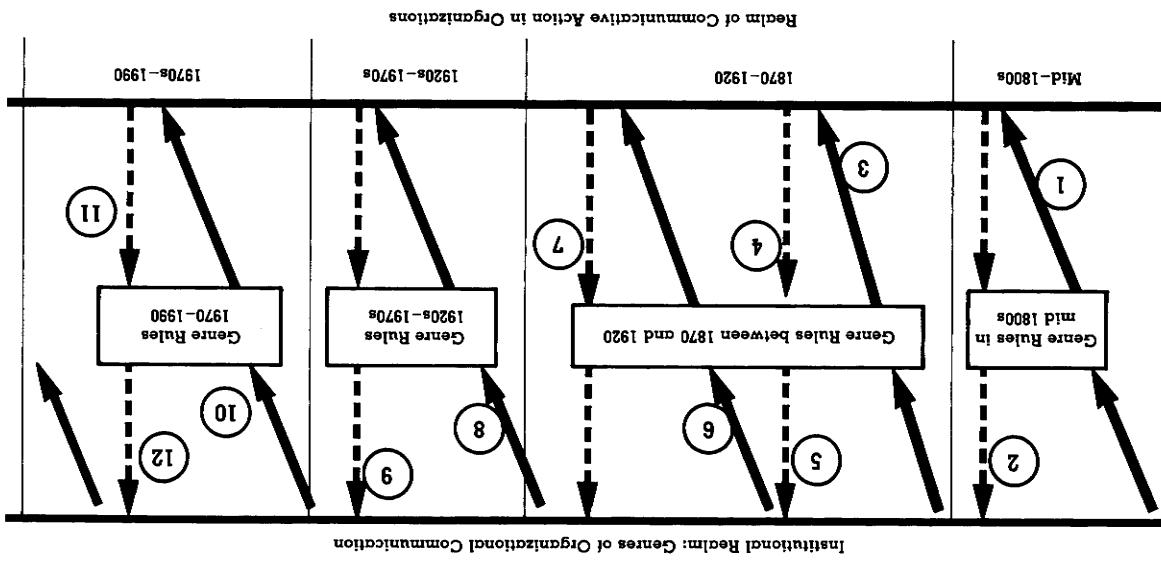


FIGURE 2
Emergence and Institutionalization of Memo Genre in Organizational Communication

action (genre), affords a powerful alternative approach to studying communication in organizations. To illustrate its usefulness, an exposition of the development over time of a particular organizational genre, the memo, follows.

GENRE EVOLUTION: HISTORICAL ILLUSTRATION

In this section the genre approach is used to examine the gradual evolution of the memo genre of internal business correspondence away from the business letter genre of external correspondence in late 19th- and early 20th-century American firms, and the recent elaboration of this genre in electronic mail. This evolution is depicted in structural terms in Figure 2.⁵ Beginning in the last quarter of the 19th century, an emerging ideology of management created a newly recognized recurrent situation within firms: the managerially defined need to document internal interactions on paper. This ideology, interacting with other situational factors including communication media, triggered the evolution of new rules of substance and form, resulting in the emergence of a particular genre of internal organizational communication—the memo. In recent years, that genre has influenced communication within new media such as electronic mail. The following historical account is based on Yates (1989a, 1989b) (where detailed historical documentation is provided).

Emergence of the Memo Genre

Business correspondence generated by members of a typical mid-19th century American firm was aimed primarily at external individuals or firms. Such communications followed the genre rules of the business letter, exemplified in many model letter books. Members of the firm having been instructed and socialized in the appropriate form of business correspondence, invoked this genre to conduct and document business with another party (arrow 1 in Figure 2). The substance of this genre was managing the business at hand, often a specific transaction (frequently indicated by an opening reference to a previous letter). The form was characterized by distinctive polite language (e.g., "In response to your esteemed favor of the 2nd inst. . . ." and "Your humble servant . . .") and by several standard structural features, including the placement of date, inside address, complimentary close, and signature. The communication medium associated with business letters was pen and paper. Regular use of the business letter genre in recurrent social situations served to reinforce its status as a social institution within firms (arrow 2 in Figure 2). The institutional force of the business letter genre served to shape many communicative transactions among firms of the mid-1800s.

⁵ As indicated previously, our sequential discussion and depiction in Figure 2 of institutional forces and social action is analytical only. Additionally, the timing of the major stages is only approximate.

A limited amount of correspondence among members of the same firm existed at this time, primarily to bridge physical distances when one party was not available for face-to-face discussion, as when one partner was away from the firm's headquarters on a buying or selling trip. When all involved parties were at the same physical location, ad hoc oral methods, supplemented by traditional financial accounts, were used to coordinate and control operations. In writing intrafirm correspondence to bridge distance, firm members invoked the same business letter genre. Internal letters followed the same conventions of form as letters to external parties, though the language often reflected greater shared knowledge and assumptions. The substance in such letters was still primarily managing the business at hand, but such letters tended to be less focused on a specific transaction and more likely to discuss a whole range of topics relevant to the firm.

Between 1870 and 1920 internal correspondence in manufacturing firms mushroomed in volume and changed in social motive, reflecting the broader socioeconomic changes occurring at the time. This period was one of tremendous firm growth. While at midcentury, small, owner-managed firms with only a single level of management (foremen) characterized the manufacturing sector, by the turn of the century many firms had grown, departmentalized, and acquired several layers of management. When these firms were managed by the oral, ad hoc methods of the earlier period, the result was chaos, loss of control by owners and managers, and dis-economies of scale. To improve efficiency and regain control from the workers and foremen, managers developed new approaches and techniques that coalesced into a new managerial philosophy, later labeled systematic management (Littler, 1961). This ideology, which emerged in engineering and management journals of the period, stressed the importance of documenting operational processes and outcomes and of establishing flows of written communication for internal coordination and control. Written documents were preferred to oral exchanges in many cases because documents could be stored for later consultation and analysis. They created a form of organizational memory.

The emphasis on documentation and use of internal information created a new recurrent situation—the managerially defined demand for documentation of internal interactions (vertical or horizontal, within a single site or between company sites) for later reference. Even though the telephone, widely adopted by businesses shortly after its introduction in 1876, facilitated oral communication within and between the growing factories and plants of this period, it did not satisfy management's demand for documentation. To respond to this exigence, managers increasingly turned to internal correspondence, initially invoking the rules of the business letter genre (arrow 3 in Figure 2).

The growth and expanded functions of internal correspondence put new demands on media for the creation and storage of written communication, and new media evolved and diffused in response to the demands. The typewriter, introduced in the 1870s, was widely adopted by large firms

in the mid-1880s to speed the production of all correspondence.⁶ The typewriter influenced emerging genre rules over subsequent decades by making certain structural features (e.g., underlining, all capital letters) easy to distinguish, thus opening the way for increased use of such features as subheads. Tab stops were added to typewriters around the turn of the century, making lists easier to type. Such formatting features were rarely adopted for external letters where the business letter genre continued to hold force. Internally, however, they were more freely adopted to ease the creation and processing of correspondence, hence introducing modifications in the genre rules for internal business letters (arrow 4 in Figure 2). Moreover, typists, a new occupational group which quickly emerged to "operate" this new technology, served as agents of standardization of document format within and across firms. Variation from the business letter genre in internal correspondence thus became common across many organizations, and it was reinforced through ongoing use (arrow 5 in Figure 2).

The new systematic methods of management demanded not simply the creation of many internal documents, but also their ready retrieval for subsequent reference. Storage during this period included both bound volumes for copies of outgoing correspondence and individual, book-like letter boxes for storage of incoming documents. Managers' desire for more accessible storage media encouraged the development and adoption of vertical filing systems (introduced in 1893 and widely adopted in the early years of the 20th century) to replace both types of storage and to combine all documents in a single, functional system. This storage medium was intended to make documents more accessible for reference, organizing correspondence by subject rather than chronology.

Vertical files occasioned changes in rules for the substance and form of internal correspondence. The fact that a document could only be filed under a single subject led some firms to institute procedures limiting internal correspondence to a single subject and requiring subject lines to aid file clerks (arrow 6 in Figure 2). For example, when Scovill Manufacturing Company adopted vertical files, headquarters explained the new filing system in correspondence with the firm's New York store and issued very specific requirements that each letter cover only one subject, to be designated at the top of the sheet. Such a change to standard practice, however, did not come unopposed. One week after this mandate was issued, headquarters wrote to reprimand some lapses in providing the requested subject lines, ending with this statement: "We are changing our system of filing, and we must INSIST that you pay particular attention to this matter." Through such monitoring and exhortations, headquarters finally achieved general use of these standardized communication rules restricting the substance and introducing a new structural lecture into its internal correspondence.

⁶ Detailed analysis of the records of specific firms undercuts a technologically deterministic argument, showing that, in at least these cases, the typewriter did not cause the growth in correspondence, but was adopted after the growth was well under way, as a way of dealing with it (Yates, 1989c).

With widespread adoption of vertical files, such rules were widely imposed by other organizations and enacted through individuals' use of these rules (arrow 7 in Figure 2). Eventually, new forms of headings (with the familiar To, From, Subject, and Date fields of today's memo headings) evolved to simplify the addressing conventions for internal documents and to put all the pieces of information relevant to identifying, storing, and retrieving the document in clear view of the file clerk and the recipient of the document. Initially, the exact form of the new headings varied from person to person. Then, either by mandate from management or by hardening custom among typists, the order and placement of heading elements were standardized (though different firms might employ slightly variant elaborations) (arrow 8 in Figure 2). The new headings also eliminated some of the language characteristic of the business letter genre: the polite language of salutations and complimentary closes. Some firms also urged the elimination of other standard polite phrases in favor of directness and brevity, though this change was harder to enforce and occurred only gradually.

Thus, over time, changes in communication substance and form were introduced to better accommodate the demands of internal correspondence (Table 1 traces the evolution of memo genre rules). Through mandate and habitual use, these changes were gradually accepted, legitimized, and reinforced within organizations (arrow 9 in Figure 2), and this pattern of communicative action became recognizable as a new genre of organizational communication. The adoption of the term memorandum or memo rather than business letter to designate internal correspondence was one of

the last features to be widely accepted, officially signalling the recognition of a new genre of organizational communication.⁷ Although these changes did not eliminate the business letter genre, they did lead to the abandonment of the business letter genre for intraorganizational communication. Over subsequent decades, however, some elements of the business letter genre have decayed and others have been elaborated. Even through the business letter has retained its traditional structural elements and their placement, its language has been simplified and made more direct. In addition, structural devices that emerged in the memo (e.g., subject lines, subheadings, and lists) have been adopted as elaborations to the business letter.

The Memo Genre in Electronic Mail

We now turn to a discussion of both how the established memo genre has influenced communication in electronic mail and how the widespread adoption and use of electronic mail in organizations has set the stage for the emergence of new computer-mediated genres of organizational communication. The memo genre, as reinforced and elaborated since the 1920s, was created, transmitted, and stored on paper. With the advent of computers and the demand for faster communication and access to information, a new electronic medium of organizational communication—electronic mail—was created. Systems designers embedded the structural features of the memo heading into the new medium. In this case, computers rather than people routed the messages, so the fields of the memo heading were designed to be readable by computers, so its widespread adoption shows that designers (whether implicitly or explicitly) retained elements of an existing and familiar genre in moving to a new medium (arrow 10 in Figure 2).

Electronic mail messages often demonstrate other aspects of memo substance and form as described previously, indicating that users are drawing on that familiar genre for some of their communication in this newer medium (as was the case with the early internal correspondence and the business letter genre). For example, some electronic mail messages are used to document internal events or outcomes for future reference, often with subject matter restricted to a single topic. Moreover, the language of such messages often exhibits the direct but noncolloquial usage typical of memos. Further, these electronic mail messages may contain subheadings and lists, in spite of the typically more limited formatting capabilities of most systems. In such cases, then, electronic mail messages may clearly be classified as memos, elaborated within the electronic mail medium (see Table 1).

TABLE 1
Emergence and Institutionalization of Memo Genre Over Time

Time Period	Examples of Genre Rules
mid-1800s	Maintenance of Business Letter Genre Substance: Transacting business with external parties. Form: Content and placement of date, inside address, salutation, complimentary close; formal, polite language with extensive use of standard phrases.
1870–1920	Emergence of Mono Genre for Internal Correspondence Substance: Documentation of internal interactions and outcomes; restricted to single subject. Form: Addition of subject lines; compression of inside address and salutation; optional use of subheads or lists; less formal and polite language.
1920–present	Maintenance of Mono Genre Substance: Standard exchange and documentation of internal interactions and outcomes; restricted to a single subject. Form: Standardized memo heading; direct language.
1970s–1990s	Elaboration of Memo Genre in Electronic Mail Substance: Internal and external exchanges and some documentation; not restricted to single subject. Form: Memo heading template embedded in medium; less use of other structural devices; increasingly informal language.

⁷ During most of the period under discussion, memorandum generally referred to a written note or reminder to oneself. The origin of the term reinforces the central social motive of the emergent genre by emphasizing written documentation for future reference. Although the term was occasionally used in its current sense as early as the late 19th century, its use in that way is not consistent until around 1920.

Yet electronic mail differs from paper in its capabilities, creating new options and new constraints affecting the invocation of the memo genre. This medium allows very rapid asynchronous exchanges, both because it is transmitted so rapidly and because intermediaries such as secretaries are often bypassed. In contrast, editing facilities in electronic mail are often much less sophisticated than those in word processing. The system header format follows that of the memo, except that it uses system identifiers in place of names in the To and From fields. Although these are sometimes clearly recognizable variants on the individuals' names, sometimes they are nonmeaningful sequences of letters and numbers. Also, various local electronic mail systems have been linked by large, multinode networks such as Bitnet and CompuServe, making them useful for interorganizational communication (which would typically call for a letter, informal note, or telephone call rather than a memo).

These differences may help explain some of the variations from memo genre rules that can be observed in many electronic mail messages. For example, messages sometimes contain author-added headers and sign-offs, which occasionally resemble those of a letter (e.g., "Dear Chris" and "Regards, Jane") or more often those of an informal note (e.g., "Hi, Chris—" and "Jane"). The language in many electronic mail messages is more informal and colloquial than is generally used in memos, and spelling and grammatical errors considered inappropriate in memos tend to be tolerated in this medium. These deviations may, in part, reflect the typical rapidity of and lack of secretarial mediation in this medium, as well as its weaker editing facilities and the lack of typing skills among many electronic mail users. In terms of substance, electronic mail is often used to convey messages that would not typically be handled through memos and that require no documentation (e.g., a two-line invitation to meet for lunch or a one-word response to a question). The possibility of rapid but nonintrusive exchanges may encourage individuals to use the medium for messages that are ephemeral and too incomplete to stand alone, unlike the memo and the business letter, which are intended for future reference and, hence, are more comprehensive.

Thus, organizational members draw selectively on the memo genre rules in this new medium (arrow 11 in Figure 2), sometimes maintaining it and sometimes elaborating it (arrow 12 in Figure 2). However, some electronic mail messages resemble genres other than the memo, such as the voicemail message or the informal note, or display unique characteristics. For example, Markus's (1988) study of electronic mail usage found a convention of what she calls *mosaic* messages, which result from the appending of responses to received messages to create continuity and conversational context. Variation in form and substance in response to similar situations reveals, as would be expected within a new medium, some ambiguity among individuals about what genres are appropriately invoked in which situations. Whether unique variations such as the mosaic messages represent the first stage in the emergence of one or more new genres of organizational communication remains to be seen. The emergence of

such new genres, however, need not signal the demise of the memo genre, just as the memo genre emerged in parallel with, not in place of, the business letter genre. The memo genre may coexist with any potential new genres that emerge in the new medium, allowing individuals to enact any one genre (or combination of genres) in specific situations.

EXPLANATORY POWER OF GENRE APPROACH

The explanation of the emergence and institutionalization of the memo genre provided in the previous section shows how the genre approach furnishes a number of advantages vis-à-vis more traditional approaches to organizational communication and media. In particular, it allows us to transcend the two limitations in research on media identified earlier. First, the genre approach allows the integration of the two separate causal perspectives in media research, and second, it addresses the conceptual issues surrounding the nature and role of media in organizational communication.

Integration of Causal Perspectives in Media Research

The concept of genre developed here integrates two approaches to studying media that typically have been treated separately in the literature. It suggests that the conditions influencing media use and the consequences of media use are tightly coupled in a process of structuration over time. Thus, the practice of focusing on one set of relationships at the expense of the other, although useful for certain analytic purposes, may, if overused or used in isolation, encourage a misleading reliance on one-sided explanations—either technological determinism or rational choice (Markus & Robey, 1988; Orlikowski, In press). For example, many individuals do not put opening salutations and closing sign-offs in electronic mail messages. From the perspective of technological determinism, this practice, which could be seen as impersonal in comparison to a letter, or a note, may be attributed to the depersonalizing influence of electronic media. From the perspective of rational choice, this practice may be attributed to the rational decision of individuals to avoid redundancy with the system header and, thus, to work efficiently.

The genre perspective, on the other hand, does not attempt to understand the practice as an isolated act or outcome, but as communicative action that is situated in a stream of social practices which shape and are shaped by it. Any time a new communication medium is introduced into an organization, we expect that existing genres of communication will influence the use of this new medium, though the nature of this influence will reflect the interaction between existing genres and human action within specific contexts. In this case, the absence of salutations and sign-offs may be attributed to users drawing on memo genre rules that inhibit the use of openings and closings, an influence encouraged by the memo-like heading of their electronic mail systems. The reciprocal nature of the genre approach also allows us to see the unintended institutional consequences of the users' actions—that such use of genre rules reinforces the legitimacy of the memo

genre and extends its reach into electronic media. Conversely, when individuals add greetings and sign-offs, the genre perspective allows us to interpret their actions as invoking other genres, such as the informal note or the letter, or as modifying existing genre rules in ways that may ultimately lead to the emergence of new genres in response to new recurrent situations. Finally, by focusing on process and recursive interaction over time, this approach points researchers toward longer range explanations that put contemporary media such as electronic mail in historical perspective.

Classification of the Nature and Role of Media

The approach presented here avoids the confusion between medium and genre by allowing us to distinguish between them and to understand how they shape each other. Media are the physical means by which communication is created, transmitted, or stored. Genres are typified communicative actions invoked in recurrent situations and characterized by similar substance and form. Though a genre's form may at one point include the medium, that genre may also expand into other media, as with the memo genre, when it is involved within electronic mail, or as with accounting records that have migrated from clay tablets, to ledger books, to punched cards, and most recently to electronic files.⁸

Further, clarifying the nature of medium and genre may inform previous studies of media. In particular, this distinction raises questions about the media richness continuum, which combines media and genres on a single scale. For example, the memo and bulletin are different genres traditionally associated with the same medium and, thus, should occupy the same point on the continuum. The fact that they occupy separate points suggests that genre mediates the influence of communication media. Recognition of genre's mediating influence on communication may also illuminate phenomena such as flaming, currently attributed primarily to new media. Because the language of flaming is not at all characteristic of the memo and business letter genres, it should not be common in situations in which individuals are enacting these more traditional genres in electronic mail, with their characteristic structural indicators and substance. In cases where flaming occurs, there may be other violations of the rules of these genres, as well as the possible emergence of new genres of which flaming is more characteristic. Thus, the distinction between medium and genre makes possible a richer understanding of communication in new media.

IMPLICATIONS FOR FUTURE RESEARCH

The concept of genres of organizational communication developed and illustrated here, illuminates the complex ways in which types of organizational communication emerge in interaction with certain sociohistorical contexts.

⁸ Note that even though the movement of a genre into a new medium may result in its movement out of the old medium, it is also possible for the genre to continue to be invoked in both media.

ditions, become institutionalized through reinforcing cycles of use, and evolve over time and in relation to changes in situation. This theoretical approach suggests both areas for future research and methodological approaches to such research.

Future Research Topics Using Genres of Organizational Communication

Empirical research is needed to investigate the various social, economic, and technological factors that occasion the production, reproduction, or modification of different genres in different sociohistorical contexts. For example, the case of the memo suggests that under different historical conditions, different factors may influence genre development more strongly. In the late 19th and early 20th centuries, a changing ideology of management significantly shaped the social recognition of a new recurrent situation that led to the emergence of a particular type of communicative action (writing internal correspondence to document organizational interactions and outcomes). At the same time, new communication media (such as the typewriter and vertical files) played a role in shaping the form of the newly emerging memo genre. The recent adoption of new communication media may be triggering the modification of existing genres such as the memo, as well as the emergence of new genres. Electronic mail, for example, may make it convenient to communicate in situations where no communication or a different type of communication would have occurred in the past. To the extent that such situations come to be recognized as recurrent, new genres of organizational communication may emerge, and their form may, in part, reflect the capability of the media. Although some developments in the structural and linguistic features characterizing electronic mail have been noted, without further empirical study it is not clear whether these have become sufficiently widespread or stable within smaller or larger communities to be institutionalized as genres. Further research should also illuminate which factors or conditions influence the possible emergence of such genres in electronic communication media.

Another important factor influencing the development and institutionalization of genres is the national, industrial, organizational, or occupational context. For example, genres with a wide normative scope, such as the memo, cross such boundaries fairly easily, though they may be elaborated to reflect particular local environments. In contrast, genres with a more limited normative scope, sometimes subtended within particular contexts—for example, opinion letters to clients in the accounting profession (Devitt, 1991) or customer support calls in service organizations (Penitland, 1991). When genre rules are not mandated, they are likely to emerge and be institutionalized in specific contexts and communities first; they will achieve broader acceptance later only if the emerging genre is perceived by a larger community to respond to a common recurrent situation. Comparative research would illuminate the range of influences across different industries, organizations, occupations, and nations. In addition, detailed examinations of

genre emergence within organizations may uncover a process by which groups and organizations adopt as genre rules practices originating with individuals.

The concept of genre has much broader implications than those discussed thus far. Because communication is central to organizations, genres of organizational communication can be expected to influence a wide range of organizational phenomena. For example, some areas for study include the influence of genres on information exchange and influence in social networks, the role of genres as carriers of ideologies or cultures at the organizational level, and the use of genres as instruments of impression management at the individual level. Although it is not possible to explore these issues in this article, we briefly describe one such research area—the role of genre in organizational power and prestige.

Within the framework posed in this article, genre rules would function both as instruments and outcomes of organizational power and politics. Scott (1987: 508) observed that institutional rules "are important types of resources, and that those who can shape or influence them possess a valuable form of power." For example, near the end of the 19th century, the president of the Illinois Central Railroad was having trouble getting his middle managers to provide financial analyses of proposed track improvements. Consequently, he tried to impose a new genre rule for such proposals—that they include an assessment of the project's expected return on investment (Yates, 1989a). To the extent that imposed rules become institutionalized through others' continued enactment of them, new genre rules are outcomes of power play. Where they are not adhered to (the president of the Illinois Central Railroad quickly learned that his subordinates simply failed to understand the concept of return on investment and thus provided irrelevant assessments), the exercise of power fails. In fact, such an exercise of power may backfire if superiors accept compliance at face value, not realizing that the information provided is vacuous or distorted.

Power also may be exercised through the manipulation or selective application of existing genre rules. As Eisenberg and Phillips (1991) pointed out, individuals manipulate communication through the strategic use of devices such as ambiguity, politeness, and agenda control. For example, the chair of a meeting may deal with the unexpected raising of a sensitive issue by invoking the formal agenda to suppress the issue, while at other times this same chair may allow discussion of a nonsensitive topic that was not on the formal agenda. In these cases, individuals apply genre rules to their advantage—thereby using the rules as instruments of their power. Both direct imposition and selective application of genre rules may occur at multiple levels, affecting individuals, groups, organizations, occupational communities, and even nations.⁹ Genres thus represent another vehicle for

the potential implementation of power and influence in and across organizations, with consequences not only for the shaping of organizational communication but also for decision making, information processing, and strategic action.

Methods of Studying Genres of Organizational Communication

The genre phenomenon clearly needs elaboration through further empirical study within particular contexts. Although this phenomenon must be understood both synchronically and diachronically, specific studies may take one or both of these approaches. Synchronic analyses would identify the existing genres influencing communication and media use within certain contexts, either by searching for the presence of well-established genres such as the memo or the meeting, or by identifying genres based on detailed analysis of communication form, substance, and the invoking situation. Such analyses also might examine the relationship between genres and other factors such as national culture, communication climates, or work practices. Although synchronic studies focus on a fixed period of time, such studies, nevertheless, must be sensitive to differences in genre dimensions due to diachronic factors such as emergence, maintenance, modification, and decay.

Diachronic studies would investigate the production, reproduction, and change of genres through communicative action over time. Monge, Farace, Eisenberg, White, and Miller (1984) pointed out the importance of capturing process in the study of communication. Longitudinal studies of genre would explore the process underlying the ongoing evolution of genres of organizational communication. For example, studies could examine communication within an organization or industry before and after the introduction of a new medium, or they could trace the use of a new medium within a particular community over the first several months or years to see how existing genres are maintained or modified and new ones emerge. Such studies could also investigate the interaction between genre production, reproduction, or modification and other variables such as power and corporate culture. In addition to longitudinal studies with time spans restricted to researchers' project durations, the memo example demonstrates the importance of studying developments over much longer time periods. Historical studies (e.g., Bazerman, 1988; Yates, 1989a) can contribute to the understanding of the role of genre in organizational communication through in-depth retrospective analyses. Whether the time period covered is short or long, diachronic analysis is essential to observing the processes of genre emergence, maintenance, elaboration, modification, and decay.

Field studies seem appropriate in both synchronic and diachronic investigations because they allow researchers to investigate the genre phenomenon contextually and without constraining the direction of effects examined. Though laboratory experiments have many advantages (e.g., replicability, greater researcher control, and ability to manipulate variables and minimize confounding effects), they isolate the phenomenon of interest

⁹ During the recent Senate confirmation hearings on Supreme Court Justice Clarence Thomas, much political commentary centered on the manipulation and negotiation of the genre rules of such confirmation hearings.

from an organizational context. Thus, such studies would be unable to account for the socially and historically embedded nature of genre, and it would be difficult for researchers to investigate the reciprocal and recursive relationship between organizational communication and genre posited in the theory presented here. In addition, because genres occur within communities ranging from the work group to the organization or professional community, and finally to the national culture, genre studies must be situated within specific contexts and must take into account the normative scope of the genres present in that context.

In conclusion, our genre approach to organizational communication takes into account the inherently situated and dynamic nature of organizational processes. Adapting a concept from rhetoric and using the premises of structuration, we have interpreted organizational communication, not as the result of isolated, rational actions, but as part of an embedded social process that over time produces, reproduces, and modifies particular genres of communication. We expect that this concept of genre will provide new and productive ways of understanding communicative action in organizations.

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Learning to Use, Useful for Learning: A Usability Study of Google Apps for Education

Abstract

Using results from an original survey instrument, this study examined student perceptions of how useful Google Apps for Education (GAFE) was in students' learning of core concepts in a first-year college composition course, how difficult or easy it was for students to interact with GAFE, and how students ranked specific affordances of the technology in terms of its usability and usefulness. Students found GAFE relatively easy to use and appreciated its collaborative affordances. The researchers concluded that GAFE is a useful tool to meet learning objectives in the college composition classroom.

Keywords

Google Apps for Education, cloud-computing, networked learning communities, student motivation, instructional technology, usability testing, first-year composition

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Introduction

Google Apps for Education (GAFE) is a suite of cloud-based Google Apps packaged and provided free of charge to educational institutions.¹ For users, Google provides cloud-based server storage with Google Drive and with email functions through Gmail; Google provides institutions an administrative interface to manage their users' accounts and connect them with existing campus student information systems (SIS). Institutional users also have access to Google Docs for word processing, Google Sheets for spreadsheets, Google Slides for real-time video collaboration, and other Google applications. As such, GAFE is a service-oriented architecture (SOA), whereby a third-party delivers "an integrated and orchestrated suite of functions to an end-user" using network-based "loosely and tightly coupled functions, or services" (Vouk, 2008, p. 235). Use of GAFE by the institution's users is governed by its own terms of service (Google, n.d.c) along with the institution's individual networking and computing use policies and procedures. GAFE relies on each institution's account administrators to set up accounts for student-users using institutional account credentials. In our case, the @institution.edu email address. This method of account creation ensures FERPA² compliance and protects data shared on Google servers through Google Apps following applicable institutional and federal standards and guidelines. Users login to Google Apps for Education through either the main Google Accounts page (<https://myaccount.google.com>) or the institution's single sign-on (SSO) portal, if implemented. The goal of GAFE login is to ensure a transparent login experience to access what are visually branded as the institution's Google Apps.

The Google Apps for Education website touts the benefits and security of GAFE to student and administrative users and identifies several composing and collaborative uses that GAFE affords students and teachers, claiming that it is "an ideal environment for learning in the 21st century" (Google, n.d.a). Vouk (2008) has reiterated that "[t]he most important Cloud entity, and the principal quality driver and constraining influence is, of course, the user" (p. 238). ISO has defined usability specifically in term of the user as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (International Standards, Usability definitions, para 2, n.d.). Effective products are designed with user requirements and the end-user in mind, but usability testing determines whether the designers' intentions are met when actual users interact with the interface. Faculty members using digital technology to teach writing and communication should be concerned less with how well GAFE complies with established principles and standards of the computer-software industry, or even industry opinion about GAFE's suitability as a tool for composing. Of primary concern should be how usable and useful students find the experience of using GAFE in the context of composing.

Both usability testing and the Google Apps tools and interface were originally designed for use in industry: conducting usability testing in the college composition classroom required remediating both the methodology and the technology to the education environment, as was modeled by Miller-Cochran and Rodriguez (2006) in their usability study of an online course. Through concurrent and retrospective probing, as well as a mixed-methods survey administered at the end of the semester, the authors sought to test the benefits of GAFE as claimed by Google and to determine the usefulness and usability of the interface in heterogeneous first-year composition (FYC) classes at two open-access higher education institutions. More directly, the goal of this usability testing was to determine whether the technology facilitated composing and student learning in FYC.



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¹ Although Google introduced Google Classroom in 2014, that product is designed as a productivity tool for teachers to help them save time. Keep classes organized and improve communication with students" (Google, n.d.b). Google Classroom functions as an interface overlaid on top of GAFE; the primary functionality and interaction for students is with GAFE itself.

² Family Education Rights and Privacy Act (FERPA), 20 U.S.C. § 1232g; 34 CFR Part 99.

Literature Review

As Jameson (2013) has noted, "Heuristic testing concerns what experts think; usability testing concerns what users do" (p. 398). Although heuristic testing is certainly valuable, it does not measure how users interact with an object of study; usability testing on the other hand, explores how real people actually use something for a particular purpose (Barnum, 2011). Nielsen (1993), Nielsen and Mack (1994), Rogers, Sharp and Preece (2011), and Goodman, Kunavskiy and Wood (2012) have established principles of usability testing that have become standard in the engineering as well as the computer and software design industries. After the proliferation of the World Wide Web in the 1990s, these principles were used to determine how people read, navigated, and used web pages (Garrett, 2010; Krug, 2014). However, usability testing and user-centered design are being increasingly applied to other industries and situations, including the way health care workers use electronic health records (Lavery et al., 2012), the way students read electronic textbooks (Lim, Song and Lee, 2012), or the way children collaborate on wikis (Hadjerrouit, 2012). Miller-Cochran and Rodrigo (2006) used usability testing to determine how well students could navigate their online composition courses, and Panthee Blackboard to determine how well it worked in fostering student agency and invention in the writing process. Jameson (2013) advocated usability testing in the business communication classroom as a way to enhance learning and build empathy for user experiences. Tang, Winoto and Leung (2014) used usability testing to determine whether groupware truly fostered the collaborative learning environment designers intended. None of these studies or scholars have examined GAFE specifically, nor the use of cloud-computing in the composition classroom. Miller-Cochran and Rodrigo (2010) noted that design must "anticipat[e] users' needs and expectations" (p. 1), and Eymann (2009) stated that usability must always be "coupled" with design (p. 223). Discussions and descriptions of online and digital writing pedagogies, including Brabazon (2002), Cook (2005), the Conference on College Composition and Communication (2013), and Defew (2015), have reminded teachers that the pedagogy and not the technology should drive the tool's implementation. Faculty are not in the position to redesign the technological tool as the result of usability testing, although they can customize the tool's use in the classroom and submit feedback to the software designers. More importantly, faculty have the ability to design how the technology is introduced, implemented, modified, made available, and interwoven into the skills, tasks, and objectives of the composition classroom. Usability measures user interactions in a specific context; in the case of this site and object of study, GAFE's usability and usefulness must be measured against how well it enabled composing, not how well students interacted with the technology in more general ways.

Methods

The following sections describe the mixed-methods design of the study, define the participants as a non-probability volunteer sample, identify the independent variable as GAFE, and detail the IRB-approved procedures of the study.

Study Design

Throughout the semester, faculty members as participant-observers used a modified form of concurrent probing (CP) to question students as they worked on tasks during face-to-face instruction. Instructors moved about the classroom as students worked individually or in groups, monitoring their progress on the tasks and asking follow-up questions of student-users retrospective with the survey at the close of the semester, the authors were less concerned with strict user experience measurements or interrupting or interfering with a user during their interaction with GAFE. The results of CP activities during face-to-face instruction informed the question development for the mixed-methods survey.

At the close of the semester, the authors used retrospective probing (RP) to ask questions about students' thoughts, attitudes, and actions using GAFE in the course and for composing. This was primarily accomplished via the survey described below. While students did not watch a video replay of themselves using the interface, they could return to their compiled portfolio within GAFE to recall specific interactions over the course of the semester.

This study was a cross-sectional, mixed-methods, non-experimental design. The independent variable was the GAFE interface, particularly Drive and Docs. The continuous dependent variables were the students' use patterns and their perception of GAFE's usefulness and ease of use. Categorical dependent variables included participant demographics and their device and browser use. Although qualitative data were collected via open response questions, only the closed response quantitative questions are presented here.

The questionnaire collected information about behavior, preferences, and facts. Bounded continuous and dichotomous responses were primarily used. Neither questions nor responses were randomized, and bounded questions were presented as a continuum from least to greatest. The survey instrument is described in greater detail in the following Materials subsection, and a copy is included in the Appendix.

Participants

Participants were selected using non-probability volunteer sampling from among the students enrolled in and attending the authors' composition courses in Spring 2014. One author used GAFE for two sections of *College Composition I* (one held in the computer classroom, another held in traditional classroom) and one section of *College Composition II* in a computer classroom at a mid-size community college serving a diverse rural, urban, and suburban commuter population. The other author used GAFE for one section of *Critical Research and Writing I* in the continuing studies school of a small liberal arts college. The first author's classes consisted of 60 students at two campuses. The second author's class consisted of 14 students attending weekly evening classes on the main campus. Of these 80 students, 54 responded to the survey, a 68% response rate. Demographic characteristics of the combined participant demographic appear Table 1. We used the standard US Census codes to determine student demographic characteristics.

Table 1. Participant Demographic Characteristics

Self-identified age range	Self-identified gender ^a	Self-identified ethnic background
18–24 (73%)	Female (68%)	Asian (5%)
25–34 (13%)	Male (31%)	American Indian (5%)
35–54 (13%)		Black (18%)
55+ (<2%)		Native Hawaiian/Pacific Islander (2%)
		White (70%)

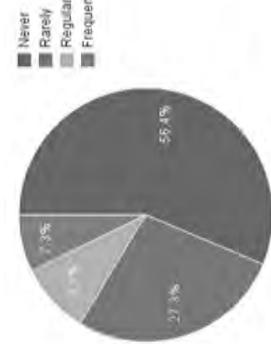
^a Not all participants identified gender in their responses.

The 68% overall response rate provided us with a relatively large sample size in comparison to many usability studies. It is important to keep in mind that, although the results probably generalize to the population of FYC students at these universities, there might be important differences between the students who volunteered to complete the survey and those who declined.

The majority of participants (83%) reported they had never or rarely used Google Drive applications, and only nine respondents indicated they used Google Drive regularly or frequently, as indicated in Table 2 and Figure 1.

Table 2. Previous Use of Google Drive

Frequency	Number	Percentage
Never	31	56%
Rarely	15	27%
Regularly	5	9%
Frequently	4	7%
Note: n = 55		

**Figure 1.** Previous Use of Google Drive, n = 55.**Materials**

The independent variable in this study was Google Apps for Education.³ In GAFE applications like Drive and Docs, files can be shared with the public, with members of the institution, or with specific individuals with an email address using the "Share" button (always located in the upper right of each application). Google Drive enables customized group and individual sharing and permissions at the folder and file levels, so entire folders of Google Drive (and other files within a folder) can either inherit parent folder permissions or have custom permissions set.

Sharing a Google Doc means that those given appropriate permissions may access and edit the file simultaneously; an affordance that is not shared by other word processors. Microsoft Word, for example, can share files and track changes, but only a single user may access the file at a given time. Google Docs tracks every change made by every user, and every change can be undone by rolling the file back to any previous version. The document is saved automatically after every change as long as stable Internet access is available, so there is little concern about losing data as a result of unsaved changes.

Sharing folders and files supports the creation of a composing community focused on a common subject or object of inquiry. The teacher can create the collaborative environment using shared folders and a scaffolded writing assignment that requires file sharing among groups and associated feedback on written work. Once shared with appropriate permissions (the authors

³ The authors acknowledge that the independent variable could not be fully controlled. As an SOA, GAFE's interface differs slightly depending on platform, browser, and user customization, including acceptance of new updates. While a single platform, browser, and configuration was modeled during face-to-face instruction, the authors could not control how users interacted with GAFE outside of class. Indeed, this flexibility is one of GAFE's affordances. The authors asked survey questions to determine which browser and platform students used in an attempt to provide some controls.

generally required sharing with editing permissions to enable collaboration), students and instructors alike were able to easily insert comments and make suggestions.

The comments feature in Google Docs affords rich commentary from students and teachers alike throughout the composing process, from low-stakes feedback in invention, drafting, peer review, and revision, to formal assessment from the instructor. Comments enable multi-way conversations that empower students to respond to peer and teacher feedback. Google Docs supports unlimited commentary on highlighted text passages, and comments can also be threaded to at least one level in subsequent responses. Comments can also be marked as resolved, an action that clears the on-screen comment thread but saves the entire comment text for access as needed. Users can respond to comments asynchronously or in real time during a composing session. In addition, synchronous in-document chat is available, meaning users can "text" one another as they work together on a document. The combination of collaborative tools makes Google Docs and Google Drive versatile applications for group composing activities in synchronous and asynchronous contexts.

Following Miller-Cochran and Rodrigo's heuristic (2006, p. 102), we determined tasks based on the following categories:

- tasks users would need to be able to do to use GAFE in any context (i.e., login, determine an appropriate app based on need, access various apps, create and name files, organize files)
- tasks users must repeatedly do in this specific context (i.e., share a file and/or folder, upload files, add, read, reply to, and resolve comments, access revision history, work synchronously and asynchronously in shared documents, use word processing affordances of Google Docs to compose and format, use editing/formatting to make revisions)
- tasks student-users have had trouble with in the past, based on instructor observation and experience (i.e., saving files in the correct places, locating files, exporting files to other formats)
- The following attributes of GAFE, or tasks performed by users, were assessed on the survey:

- Account setup
- Login process
- Visual interface/visceral design/look and feel
- Text styling
- Icons
- Adding comments
- Reading comments
- Sharing files or folders
- Collaborating with others
- Revision history
- Cloud-based access and storage
- Synchronous chat
- Platform
- Browser
- Location of use
- Familiarity with the interface prior to exposure

The survey instrument was an original design constructed as a Google form within the GAFE interface. Google Forms was chosen as the survey container because it is free, easy to use and share, because all participants already had Google Apps accounts, and because it has the ability to export results into more robust data analysis software. The survey consisted of 28 questions, in four sections: Access and Use, Function and Utility, Effectiveness, and Attitudes. Survey questions were designed to obtain data related to the five factors of usability and used the standard Likert and Likert-type scales to measure attitudes and values along the negative-

positive dimension. As advocated by DeVellis (2012), questions regarding preference should use an even number of options on the Likert and Likert-type scales. There is still considerable debate about whether an odd-number or even-number of responses is more effective, but in order to avoid confusion about the midpoint options' meaning, the tendency to over-choose the midpoint rather than thinking critically, and data tending to merge toward the mean, we used a 4-point scale for the section on function and utility. However, when asking participants about how their expectations matched their experience of using Google Drive, a 5-point scale gave students a midpoint value—*matched my expectations*—that fell directly between the *better than expected* or *worse than expected* values.

Procedure

After the study was approved by the Institutional Review Board, the survey was administered to participants online and shared as a general (non-personalized) URL via email message to individual students' institutional email accounts. Google forms offer no method for tracking whether a recipient has completed the survey. As a result, each researcher sent a follow-up email message to all potential participants one week after the initial message to the same students, asking them to consider completing the survey if they had not yet done so. Students were given a choice of when to take the survey; their participation was unmonitored and researchers did not interact with participants as they completed it. One week following the reminder email message to students, the authors closed the survey to additional results.

Participants provided consent by reviewing and approving the consent statement online, which enabled them to complete the survey. Because the authors also served in a position of authority as teachers, participants were invited to participate in the study after all assignments had been submitted. Students received no benefit for completing the survey.

The authors collected real-time and reflective use information throughout the semester, but made no attempt to connect data collected via these methods with survey data. This usability test sought to generate generalizable data on overall usability for the tasks of composing rather than real-time data on the ease of use of a particular interface or activity in GAFE. Although the survey's usability questions were quantitative and sought to address use of specific aspects of GAFE for composing practices. Aside from the consent statement, no survey question was required. As a result, n values sometimes fluctuated from question to question.

The survey did not require or allow personally identifying information to be included, other than demographic information as noted in the previous Participants section. Aside from the survey responses, the only additional data collected and recorded during the survey was a completion timestamp, recorded in the form mm/dd/yyyy hh:mm:ss. Although no personally identifying information was collected, the survey results are considered confidential, but not anonymous, because the field of possible participants was known to the researchers. To the best of the researchers' knowledge, the confidential results are not re-identifiable, and no attempts have been made to correlate responses to individual students. Reported data are aggregated so that no specific individual can be inferred in the results.

Individual records were downloaded from Google Forms and stored in Google Sheets (spreadsheet). In a limited-access Google Drive folder physically housed on a Google server and accessible only by the researchers, String fields were converted to numeric fields (*Strongly Disagree = 1, Disagree = 2, Agree = 3, Strongly Agree = 4*) before importing. For yes/no questions, an answer of Yes was assigned a value of 1 and no was assigned a value of 0. All variables were assigned names related to the question and the aligned construct in order to facilitate analysis and aggregation. Data were analyzed using descriptive statistics, including percentages, means, standard deviation, and frequencies. Data were visualized using charts and graphs functionality within Google Sheets.

Results

In an effort to address the usability of GAFE as a tool for collaborative composing, the following sections discuss the tools used to access GAFE, the location of GAFE use, the browsers used to access GAFE, the students' perceptions of Google Drive's interface, and the ranking of the most and least useful functions.

Tools Used to Access GAFE

Students identified platforms they used to access GAFE. Researcher objectives were to differentiate between networked computer access and networked smartphone or tablet access, to evaluate multiple platform usability as a cloud-based (rather than locally installed) application, and to specify the ownership of the devices in order to roughly determine their access to technology. Students could select any platform(s) that applied. As results in Table 3 and Figure 2 suggest, most students accessed GAFE using a personal computer and/or a school-owned computer. Laptop and desktop computers were combined as a single platform to represent the "closing gap" between desktop and laptop costs, numbers, and experiences, and to differentiate the "computer" experience of Google Drive from the mobile experience (represented here by smartphone and tablet device). Although 93% of students accessed Google Drive from a personal laptop and tablet or desktop, other platforms received high percentages (see Table 3 and Figure 2). Because respondents could select all options that applied, the data demonstrated that students accessed Google Drive from multiple platforms during the study, even though they may have preferred one platform over another.

Table 3. Platforms used to access Google Drive

Platform	Number	Percentage
My personal desktop/laptop	52	93%
My work desktop/laptop	10	18%
College computer during class	40	71%
College computer in a lab (outside of class)	23	41%
My smartphone	19	34%
My tablet device	8	14%

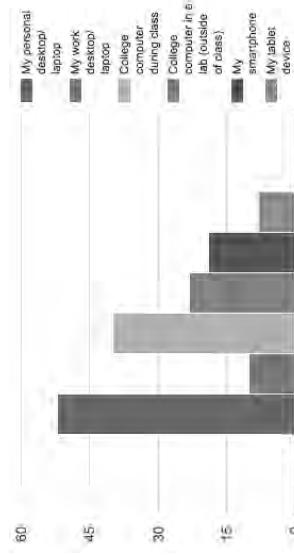


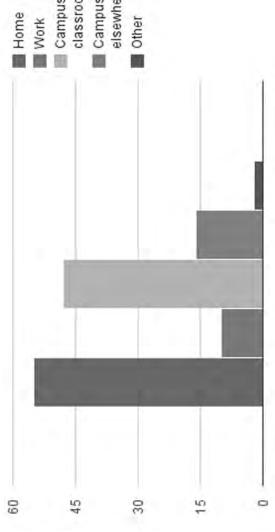
Figure 2. Platforms used to access Google Drive.

Location of GAFE Use

To assess access as well as usage preferences, students were asked to choose all locations where they used GAFE. As the data in Table 4 and Figure 3 demonstrated, students regularly accessed Google Drive at home—a likely sign of reliable internet access.

Table 4. Locations Where Google Drive Was Accessed

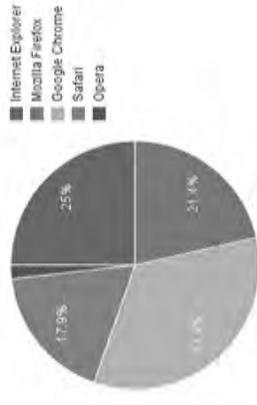
Location	Number	Percentage
Home	55	98%
Work	10	18%
Campus classroom	48	86%
Campus elsewhere	16	29%
Other	2	4%

**Browsers Used to Access GAFE**

Students identified the browser they used to access GAFE, a choice that may impact the product's usability. Google's own browser, Chrome, is designed from the ground up to optimize the Google Apps for Education suite of products* and Google recommends using Internet Explorer for running "legacy apps" (Google, n.d. a). Data in Table 5 and Figure 4 showed fairly even distribution among student browser preferences to access GAFE, with Chrome garnering the most uses, possibly as a result of one of the authors modeling its use.

Table 5. Browsers Used to Access Google Drive by Number and Percentage

Browser	Number	Percentage
Internet Explorer	14	25%
Mozilla Firefox	12	21%
Google Chrome	19	34%
Safari	10	18%
Opera	1	2%

**Figure 4.** Browsers used to access Google Drive.**Student Perceptions of Google Drive's Interface**

According to Don Norman (2005, 2013), good design requires that attributes and features are visible, that the relationship between function and control is perceived and exploited, and that constraints are used intelligently so that they do not detract from the experience. High usability correlates to a feeling of effortless ability to discern and enact the right action at the right time. Students were asked to evaluate the ease of use of specific GAFE features and functions (see Table 6 and Figure 5). The question employed a 4-point Likert scale using values of *Very easy* (4), *Somewhat easy* (3), *Somewhat difficult* (2), and *Very difficult* (1). The relatively low 95% confidence interval (no greater than ± 0.19) of the means suggested students found easy to use specific GAFE features, while the calculated 95% confidence interval suggested that at least 75% of the population represented by the sample would find the GAFE tasks easy to learn, remember, and understand (see Table 6).

Table 6. Ease of Use of Specific Google Drive Features and Functions

	Account Setup	Login Process	Look & Feel	Text Styling	Icons	Adding Comments	Reading Comments	Sharing
Very easy (4)	33	34	31	32	35	37	37	34
Somewhat easy (3)	18	19	16	14	21	17	15	14
Somewhat difficult (2)	3	1	7	7	1	2	2	4
Very difficult (1)	0	0	0	0	0	0	0	1
Responses	54	54	53	54	54	54	54	53
Mean	3.56	3.61	3.44	3.47	3.57	3.61	3.65	3.53
Standard deviation	0.60	0.52	0.71	0.72	0.53	0.60	0.55	0.72
95% conf. interval (mean)	± 0.16	± 0.14	± 0.19	± 0.14	± 0.16	± 0.15	± 0.19	
Positive responses (%)	94.4	98.2	87.0	86.8	98.2	96.3	96.3	90.6

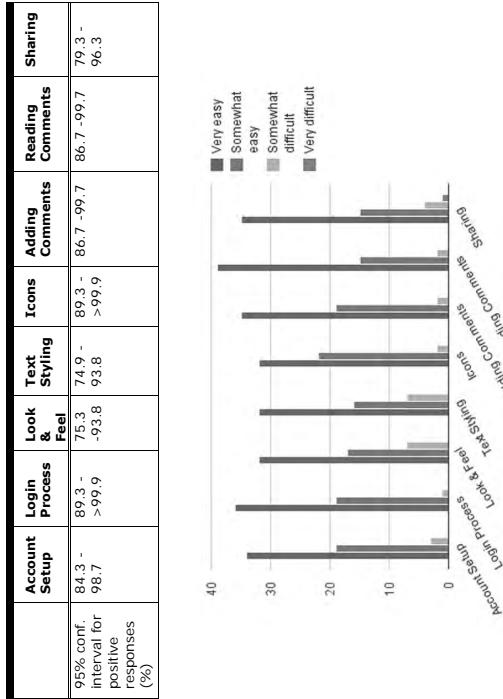


Figure 5. Ease of use of specific Google Drive features and functions.

Given the large number of first-time Google Drive users (see Table 1), students identified fewer issues with usability than might be expected. Norman (2005) correlated a positive feeling or affect toward a design with one's ability to use it. Students' perception of the usability of the interface was likely influenced by the similar design to other software. This familiarity likely led to students' improved perceptions of the tool's ease of learning, task efficiency, ease of remembering, understandability, and ultimately, their subjective satisfaction—the five factors of usability.

Student Perceptions of Usefulness of Specific Features

We asked students to evaluate the usefulness of specific features of Google Drive, using a Likert scale from *Very Useful* (4) to *Not At All Useful* (1). The mean of each set of responses on the 4-point Likert scale reflects an overall sense of usefulness for specific affordances of Google Drive, with all means scoring above 3 (*Somewhat Useful* or *Very Useful*) on the scale. Even the tool perceived to be least useful, Chat (mean = 3.16, n = 53), received overall support, with its lower ranking likely correlating to the fact that the chat affordance is only available synchronously, versus other features that are available at any time. Collaboration, Document Sharing, and Commenting received the highest scores for usefulness. Collaboration developed as a response to increasing comfort with document sharing and comment throughout the semester, which may explain why these three features received the highest satisfaction scores (Table 7 and Figure 6).

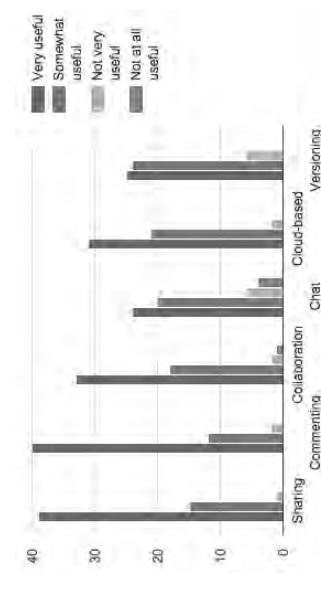


Figure 6. Usefulness of specific Google Drive features.

Ranking Most and Least Useful Functions

We asked students to compare functions and rank them relative to one another using the values *Most Useful* or *Least Useful*. Asking the question this way teased out clearer attitudes toward more and less useful functions of Google Drive. The researchers focused on the three most useful and three least useful features as ranked by the participants. The full results (Figure 7)

showed that, compared to other features, Sharing Documents, Collaboration, and Commenting were the three most useful features, while Synchronous Chat, Cloud-based, and Document Versions were considered the least useful functions of Google Drive. Table 8 isolates and highlights the percentage of most useful (Sharing, Commenting, and Collaborating) and least useful (Chat, Cloud-based, and Versioning) features as ranked by the participants. These results likely reflect the way we used Google Drive in our classes—we stressed and reinforced the value of collaborating in Google Docs (in particular among Google Drive apps) and de-emphasized the use of synchronous chat.

Table 8. Most and Least Useful Functions of Google Drive

	Sharing	Commenting	Collaboration	Chat	Cloud-based	Versioning
Most useful	18 (32%)	14 (25%)	15 (27%)	1 (2%)	7 (13%)	0
Least useful	4 (7%)	9 (17%)	5 (9%)	16 (30%)	6 (11%)	13 (25%)

Note: Most useful: n = 55; Least useful: n = 53

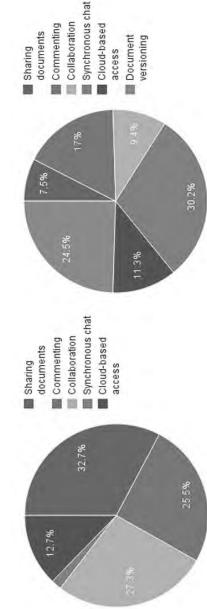


Figure 7. Most useful (left) and least useful (right) functions of Google Drive.

Recommendations

As a commercial product, Google continually (and often without fanfare or advance notice) updates its products based on available data and feedback. This reality yields several recommendations:

- Results indicate that students generally found GAFE usable, useful, and easy-to-learn. While care should be taken to model and introduce new technology in the classroom, faculty can have a reasonable expectation that the vast majority of users will find little difficulty accessing and mastering GAFE.
- Composition teachers in higher education settings should consider using GAFE in their classrooms to implement pedagogies that help students become better writers, more aware of rhetorical situations and their social characteristics.
- Given the increasing institutional demands for IT infrastructure, the security, reliability, and utility of GAFE should be considered favorable by higher education administrators seeking to provide tools for faculty and students.
- Researchers should collaborate to develop additional GAFE usability testing protocols for instructional use, including composition contexts, and seek to publish results of usability test results in journals and avenues easily accessible to educational scholars and practitioners.
- Educators and researchers should seek avenues to have their voices heard by Google, to influence future development of Google Apps for Education to take into consideration students and instructors as primary users among professional and personal users.

- Google should seek to be more transparent with users—administrators, faculty, and students—in its plans for current and future development of GAFE applications and interfaces.

Conclusion

In this study, the primary investigators were two faculty members seeking to test the usability of Google Apps for Education for teaching composition to heterogeneous populations of students at their local institutions. The objective of the study was not simply to evaluate whether GAFE met the functionality and ease-of-use claims described in Google's marketing copy, but to determine the usability of the tool within the broader suite of applications within multiple composition classrooms, and potentially within the broader context of composition pedagogy. The objective of usability testing is to evaluate the object as it is actually used by the intended audience, which in the case of GAFE is students. Although Google likely conducted professional usability testing of GAFE, the results of this study go further in demonstrating how students evaluated the usefulness and usability of the interface as used over time in an educational setting and integrated into course instructional design. The study followed suggestions made by Eymann (2009) and Miller-Cochran and Rodrigo (2006, 2010) that faculty must anticipate user needs and expectations as an integral part of design, which the authors demonstrate to include the instructional design of the technology-in-use.

After using a combination of CP and CTA usability methods to inform the RP survey design, a mixed-methods instrument given at the close of the semester assessed usability by asking participants to evaluate their use of GAFE for classroom composing assignments. Quantitative questions focused on ease of use and perceived usefulness of specific functions and features of the interface for composing practices. The data collected on the ease of use, usefulness, and most and least useful functions and features demonstrate that the vast majority of participants found GAFE features at least somewhat easy and somewhat useful for assigned composing practices. Few participants found one or more GAFE features least useful relative to other functions for composing assignments. The data collected on browsers, platforms, and locations of use and access to GAFE features suggest that GAFE is largely accessible and at least somewhat usable on multiple browsers and platforms, regardless of location, assuming stable Internet access is available.

Overall, the results of the study demonstrate that the Google Apps for Education is relatively easy to use for most users, even those unfamiliar with Google Docs or other Google Apps. Usability of the tool for composing may result in what Norman (2005) described as "positive affect [that] arouses curiosity, engages creativity, and makes the brain into an effective learning organism" (p. 26). The sharing and collaboration capabilities and affordances of GAFE enable participants to improve their composing skills. As a result of these findings, we consider GAFE a useful and user-friendly tool available for teachers with experience using Google Drive applications, such as the authors of this study. Though the user interface and ease of use of specific features is considered useful and usable, this study did not assess how *faculty member* found GAFE in terms of its usability and usefulness. Scholars caution that instructors require training in implementing a technology in the composition classroom in order to ensure it does not drive the pedagogy and is aligned with learning outcomes and best practices (DePew, Spangler, & Spiegel, 2014). This conclusion in particular demonstrates the need for local training opportunities for teachers to introduce relatively new technologies like GAFE as useful tools for improving existing or emerging pedagogies. Students attempting to use GAFE in the classroom who are taught by instructors unfamiliar or uncomfortable with GAFE affordances and constraints would probably have their perceptions of the technology's usefulness and usability affected.

Ubiquitous broadband connectivity has not yet adequately extended beyond urban and suburban centers to encourage implementation of GAFE in all locales. Accessibility, while impressively widespread, remains problematic for those using screen reading devices and other tools for accessibility, an aspect of the tool we did not directly test, but the limitations of which we've experienced firsthand.

Limitations

The following is a list of limitations that occurred in this study:

- Although the participant population consists of multiple sections of composition courses on several campuses, the overall sample size is small, limiting the generalizability of the data.
- Although open access institutions have heterogeneous populations that created different user groups, greater attention to controlled user groups based on categories would improve comparative analysis, which was not conducted with this study.
- Users were not differentiated by school, so a comparison of contexts could not be conducted.
- This study does not take into account differences in pedagogical style or instructional delivery, which may have affected students' perceptions of GAFE.

Opportunities for Future Research

A usability study comparing use of GAFE from various browsers and devices would be very useful. In particular, certain affordances are unavailable on the mobile interface (smartphones and tablets). Factors such as operating system, browser, screen size, and typing with texting vs. QWERTY methods would be useful differentiating factors to compare in terms of usability. Additional studies should seek to test the usability of GAFE among differently abled users, including deaf and hard-of-hearing users and blind or visually impaired users.

The decision to use Google Docs in the classroom should support the learning outcomes of the course. For writing teachers, those outcomes include creating communities of inquiry that integrate cognitive, social, and teaching presence (Garrison & Vaughan, 2007); providing low-stakes student-centered composing opportunities and engaging student and instructor feedback (Warnock, 2009); reinforcing critical and liberatory pedagogies (Reilly & Williams, 2006, p. 59); and teaching and exemplifying meta cognitive reflection on the technologies themselves as applied rhetoric (DePew, 2015). Google Docs and Google Drive, as applications in Google Apps for Education, support these outcomes. More research specifically about how cloud-computing and GAFE affect composition and rhetoric theory and pedagogy is needed.

Tips for Usability Practitioners

Usability practitioners can use the following tips while conducting a similar study:

- Recognize that students will access the technology anytime, anywhere. This has implications for instructor availability and inconsistent design or functionality across platforms.
- Understand that Google may elect to make changes to the features and visual design of GAFE at any time. Google may also change its Terms of Service at any time. These have implications on use and usability, as well as the results of cross-sectional and longitudinal research studies.
- Be prepared for differences in GAFE usability based on the tools participants use to access it. This includes changes based on web browser, browser version, device, operating system, Internet speed, and GAFE version. While this can be mitigated in a controlled testing environment, it does not then replicate the actual usability of the tool as accessed by users.
- Limit the number of affordances evaluated in a single question. As Table 6 demonstrates, results from testing a large number of affordances in a single question can be unwieldy for reporting purposes.

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**Part One: Informed Consent
Consent Form for Attitudes about Google Drive Use in the Composition Classroom**

This survey assesses your attitudes toward using Google Drive for composition and collaboration in this course this semester. The survey results will be used to understand how students use Google Drive applications for composition and to predict how local classroom use might apply in global composing environments. Completing the survey should take about 15 minutes. You are not at risk of harm by participating in this study. You will not receive any direct benefits from participating. Survey participation does not affect your grade in this course. Principal Investigators

- Daniel Hocutt, dhocut@richmond.edu, University of Richmond
 - Maury Brown, mebrown@germannac.edu, Germanna Community College
- Your consent to participate in this survey is voluntary. You may choose to withdraw at any time without penalty, and you may choose not to answer any questions without penalty. We do hope that you will answer honestly and carefully, in order to assist us in improving this course in the future.

Survey results will be used in conference presentations and academic publications.

Your survey responses are confidential. We will not publish your name in any research findings or results. Your identity will be shared only between the principal investigators. Questions about this survey may be directed to the principal investigators or to the chair of the University of Richmond Institutional Research Board at rijnas@richmond.edu or (804) 484-1565.

Statement of Consent (Required)

This study has been described to me, and I understand that my participation is voluntary and that I may discontinue my participation at any time without penalty.

I understand that my responses will be treated confidentially and used for research that includes conference presentations and/or academic publications.

I understand that if I have questions, I may pose them to Daniel Hocutt or Maury Brown, principal investigators.

I have read and understood the statements written above. By clicking "Yes" and taking this online survey, I am providing my consent to participate, and attesting that I am over 18 years of age.

- Yes >> CONTINUE
- No

Part Two: Survey

Unless otherwise specified, questions in this survey are about your experience using Google Drive applications during the course this semester. All questions are optional. Select any of the following platforms you used to access Google Drive (select all that apply):

- My personal desktop/laptop
- My work desktop/laptop
- College computer during class
- College computer in a lab (outside of class)
- My smartphone
- My tablet device

Select any of the following locations where you accessed Google Drive (select all that apply):

If you used a smartphone or tablet as your primary device, indicate how you entered text (select all that apply):

- I typed on the touch screen
- I used a Bluetooth keyboard
- I used a voice recording app

Select the *primary* browser you used to access Google Drive (select one):

- Internet Explorer
- Mozilla Firefox
- Google Chrome
- Safari
- Opera
- Other

Select the *primary* tool you used for drafting compositions (select one):

- Word processor application (e.g., Microsoft® Word®, OpenOffice.org®)
- Google Document
- Paper and pen/pencil
- Audio or video recorder
- Other

Prior to this class, how often had you used Google Drive? (select one)

- Never
- Rarely
- Regularly
- Frequently

Below are some of the functions of Google Drive. Please rank these functions with 1 being the most useful and 6 being the least useful:

- Ability to share documents with others
- Ability to comment on others' documents (and receive comments from others)
- Ability to create a document collaboratively with others
- Ability to chat on screen with others while working on the document
- Ability to access documents from any device connected to the internet
- Ability to return to an earlier version of the document

On a scale of 1 to 4, evaluate the following aspects of your use of Google Drive for class purposes. Use the following values for your scale.

1 = Very easy

2 = Somewhat easy

3 = Somewhat difficult

4 = Very difficult

- Google Account setup
- Login process (either college single sign-on or Google Account)
- Visual interface ('look and feel' of creating and sharing a Google document)

Styling a document (font, type size, line spacing, etc.)

- Icons for folders, documents, tools, and functions
- Adding comments in another's document
- Reading comments posted to your own document
- Sharing a document with another user or the instructor

On a scale from 1 to 5, evaluate how using Google Drive affected your expectations about the following classroom activities and functions. Use these values for your scale.

1 = Better than expected

2 = Somewhat better than expected

3 = Match my expectations

4 = Somewhat worse than expected

5 = Worse than expected

For example, using Google Drive made *in-class activities and assignments* *value 1-5 here!*

In-class activities and assignments

- The relationship of the instructor with students
- Your relationship with your classmates
- Your role as a student
- Your writing or composing process
- The grading process
- Your understanding of a draft
- Your definition of a composition or paper
- Peer review
- Collaboration as a composing tool

Will you continue using Google Docs after leaving this class?

- Yes, definitely
- Probably
- Maybe
- No

What factor or factors affected your decision? (TEXT ENTRY)

Has using Google Drive in the class affected your attitude toward "cloud computing" (saving, accessing, and sharing files and folders online, not on/from your own hard drive)?

- Yes
- No

What factor or factors informed your response? (TEXT ENTRY)

What would you consider the *most important* benefit of using Google Drive in a composition class? (Select only one)

- Free word processing (or other) applications
- 24/7 access with networked device
- Collaborative tools (comments, versioning, in-app chat)
- Connection to college networking account
- Document/folder sharing

What factor or factors contributed to this selection? (TEXT ENTRY)

How would you rate your experience using Google Docs this semester?

- Very good

Everyone's Invited: A Website Usability Study Involving Multiple Library Stakeholders

Elena Azadbakht,
John Blair, and
Lisa Jones

- Good
- Average
- Bad
- Very bad

What factor or factors contributed to this rating? (TEXT ENTRY)

What did you *like* about using Google Drive in the classroom this semester? (TEXT ENTRY)

What did you *dislike* about using Google Drive this semester? (TEXT ENTRY)

How did you feel knowing that others in the class could read your papers? (TEXT ENTRY)

What was the easiest part of using Google Drive? (TEXT ENTRY)

What was the most *difficult* or most *confusing* part of using Google Drive? (TEXT ENTRY)

Part Three: Demographics
The following information is optional, but providing responses will help us to understand if your experience is shared by others.

Your age:

- 18-24
- 25-34
- 35-54
- 55+

Prefer not to say

Your gender:

- Male
- Female
- Prefer not to say

Your race or ethnicity:

- 1. Are you Hispanic or Latino?
- Yes
- No
- 2. Regardless of your answer to the prior question, please select one or more from the following ethnicities that best describe you:

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White

Thank you for your participation. Your responses are appreciated and valued.

SUBMIT

ABSTRACT

This article describes a usability study of the University of Southern Mississippi Libraries website conducted in early 2016. The study involved six participants from each of four key user groups—undergraduate students, graduate students, faculty, and library employees—and consisted of six typical library search tasks, such as finding a book and an article on a topic, locating a journal by title, and looking up hours of operation. Library employees and graduate students completed the study's tasks most successfully, whereas undergraduate students performed relatively simple searches and relied on the Libraries' discovery tool, Primo. The study's results displayed several problematic features that affected each user group, including library employees. These results increased internal buy-in for usability-related changes to the library website in a later redesign.

INTRODUCTION

Within the last decade, usability testing has become a common way for libraries to assess their websites. Eager to gain a better understanding of how users experience our website, we assembled a two-person team and conducted the first usability study of the University of Southern Mississippi Libraries website in February 2016. The Web Advisory Committee—which is tasked with developing, maintaining, and enhancing the Libraries' online presence—wanted to determine if the content on the website was organized in a way that made sense to users and facilitated the efficient use of the Libraries' online resources.

Our usability study involved six participants from each of the following library user groups: undergraduate students, graduate students, faculty, and library employees. Student and faculty participants represented several academic disciplines and departments. All of the library employees involved in the study work in public-facing roles. The Web Advisory Committee and Libraries' administration wanted to know how each of these groups differ in their website use and whether they have difficulty with the same architecture or features. Usability testing helped illuminate which aspects of the website's design might be hindering users from accomplishing key tasks, thereby identifying where and how improvement need to be made. We included library employees in this study to compare their approach to the website to that of other users in the

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hope of increasing internal stakeholders' buy-in for recommendations resulting from this study. This article will discuss the usability study's design, results, and recommendations as well as the implications of the study's findings for similarly situated academic libraries. We will give special consideration to how the behavior of library employees compared to that of other groups.

LITERATURE REVIEW

The literature on library-website user experience and usability is extensive. In 2007, Blummer conducted a literature review of research related to academic library websites, including usability studies. Her article provides an overview of the goals and outcomes of early library-website usability studies.¹ More recent articles focus on a portion or aspect of a library's website such as the homepage, federated search or discovery tool, or subject guides. Fagan published an article in 2010 that reviews user studies of faceted browsing and outlines several best practices for designing studies that focus on next-generation catalogs or discovery tools.²

Other library-website studies have reported on the habits of user groups, with undergraduates being the most commonly studied constituent group. Emde, Morris, and Claassen-Wilson observed University of Kansas faculty and graduate students' use of the library website, which had been recently redesigned, including a new federated search tool.³ Many of the study's participants gravitated toward the subject-specific resources they were familiar with and either missed or avoided using the website's new features. When asked for their opinions on the federated search tool, several participants said that while it was not a tool they saw themselves using, they did see how it might be a helpful for undergraduate students who were still new to research. The researchers also provided the participants with an article citation and asked them to locate it using the using the library's website or online resources. While half the participants did use the website's "E-Journals" link, others were less successful. Some who had the most difficulty "search[ed] for the journal title in a search box that was set up to search database titles."⁴ This led Emde, Morris, and Claassen-Wilson to observe that "locating journal articles from known citations is a difficult concept even for some advanced researchers."

Turner's 2011 article describes the result of a usability study at Syracuse University Library that included both students and library staff. Participants were asked to start at the library's homepage and complete five tasks designed to emulate the types of searches a typical library user might perform, such as finding a specific book, a multimedia item, an article in the journal *Nature*, and primary sources pertaining to a historic event.⁵ When asked to find Toni Morrison's *Beloved*, most staff members used the library's traditional online catalog whereas students almost always began their searches with the federated search tool located on the homepage. Participants of both types were less successful at locating a primary source, although this task highlighted key differences in each groups' approach to searching the library website. Since library staff were more familiar than students with the library's collections and online search tools, they relied more on facets and limiters to narrow their searches and some even began their searches by navigating to the library's webpage for special collections.

Library staff tended to be more persistent; draw upon their greater knowledge of the library's collections, website, and search tools; and use special syntax in their searches, like inverting an author's first and last names. "Library staff took more time, on average, to locate materials," writes Turner, because of their "interest in trying alternative strategies."⁶ Students, on the other hand, usually included more detail than necessary in their search queries (such as adding a word related to the format they were searching for after their keywords) and could not always differentiate various types of catalog records, for example, the record for a book review and the record for the book itself. Turner concludes that the students' mental models for searching online and their experiences with other web-search environments influence their expectations of how library search tools work and that library-website design should take these mental models into consideration.

Research on the search behaviors of students versus more experienced researchers or subject experts also has implications for library website design. Two recent articles explore the different mental models or mindsets students bring to a search. The students in Asher and Duke's 2012 study⁷ generally treated all search boxes as the equivalent of a Google search box⁸ and used very simple keyword searches.⁷ This tracked with Holman's 2010 study, which likewise found that the students she observed relied on simple search strategies and did not understand how search interfaces and systems are structured.⁸

METHODS

Our research team consisted of the Libraries' health and nursing librarian and the web services coordinator. We worked closely with the head of finance and information technology in designing and running the usability study. A two-week period in mid-February 2016 was chosen for usability testing to avoid losing potential participants to midterms or spring break. We posted a call for participants to two university discussion lists, on the Libraries website, and on social media (Facebook and Twitter). We also reached out directly to faculty in academic departments we regularly work with and emailed library employees directly. We directed nonlibrary participants to a web form on the Libraries website to provide their name, contact information, university affiliation/class standing, and availability. The health and nursing librarian followed up with and scheduled participants on the basis of their availability. Each student participant received a ten-dollar print card and each faculty participant received a ten-dollar Starbucks gift card.

To record the testing sessions, we needed a free or low-cost software option. Since the Libraries already had a subscription to ScreenCast-O-Matic to develop video tutorials, and the tool allows for simultaneous screen, audio, and video capture, so we decided to use it to record all testing sessions. We also used a spare laptop with an embedded camera and microphone.

The health and nursing librarian served as both facilitator and note-taker for most usability testing sessions. Participants were given six tasks to complete. We encouraged participants to



narrate as they completed each task. The sessions began with simple, secondary navigational questions like the following:

- How late is our main library open on a typical Monday night?
 - How could you contact a librarian for help?
 - Where would you find more information about services offered by the library?
- Next, we asked the participants to complete tasks designed to assess their ability to search for specific library resources and to illuminate any difficulty users might have navigating the website in the process. Each of the three tasks focused on a particular library-resource type, including books, articles, and journals:
- Find a book about rabbits.
 - Find an article about rabbits.
 - Check to see if we have a subscription/access to a journal called *Nature*.

After the usability testing was complete, we reviewed the recordings and notes and coded them.

For each task, we calculated time to completion and documented the various paths participants took to answer each question, noting any issues they encountered. We also compared the four user groups in our analysis.

Limitations

Although we controlled for user type (undergraduate, graduate, faculty, or library employee) in the recruitment of study participants, we did not screen by academic discipline. Doing so would have hindered our team's ability to include enough graduate students and faculty members in the study, as nearly all the volunteers from these two groups were from humanities or social science fields. The results might have differed slightly had the study successfully managed to include more faculty from the so-called hard sciences and allied health fields.

Additionally, the order in which we asked participants to attempt the tasks might have affected how they approached some of the later tasks. If a participant chose to search for a book using the Primo discovery tool, for example, they might be more inclined to use it to complete the next task (find an article) rather than navigate to a different online resource or tool. Despite these limitations, usability testing has helped improve the website in key ways. We plan to correct for these limitations in future studies.

RESULTS

Every group included a participant who failed to complete at least one of the six tasks. An adequate answer to each of the study's six tasks can be found within one or two pages/clicks from the Libraries homepage (Figure 1). The average distance to a solution remained at about two page loads across all of the study's participants, despite a few individual "website safaris."



UNIVERSITY LIBRARIES

Figure 1. University of Southern Mississippi Libraries' homepage.

Graduate students tended to complete tasks the quickest and were generally as successful as library employees. They preferred to use Primo for finding books but tended to favor the list of scholarly databases on the "Articles & Databases" page to find articles and journals. Undergraduates were the second fastest group, but many struggled to complete one or more of the six tasks. They had the most trouble finding books and locating the journal by title. Undergraduates generally performed simple searches and had trouble recovering from missteps. They were heavy users of Primo, relying on the discovery tool more than any other group.

The other two user groups, faculty and library employees, were slower at completing tasks. Of the two, faculty took the longest to complete any task and failed to complete tasks at a similar rate as undergraduates. Likewise, this group favored Primo nearly as often. In contrast, library employees took almost as long as faculty to complete tasks but were much more successful. As a group, library employees demonstrated the different paths users could take to complete each task but favored those paths they identified as the "preferred" method for finding an item or resource over the fastest route.



The majority of study participants across all user groups had little trouble with the first three tasks. Although most participants favored the less direct path to the Libraries' hours—missing the direct link at the top of the homepage (Figure 2)—they spent relatively little time on this task. Likewise, virtually all participants took note of the links to our “Ask-A-Librarian” and “Services” pages located in our homepage’s main navigation menu. This portion of the usability study alerted us to the need for a more prominent display of our opening hours on the homepage.



Figure 2. Link to “Hours” from the homepage.

Of the second set of tasks—find a book, find an article, and determine if we have access to *Nature*—the first and last proved the most challenging for participants. One undergraduate was unable to complete the book task, and one faculty member took nearly eight minutes to do so—the longest time to completion of any task by any user in the study. Primo was the most preferred method for finding a book. Although an option for searching our Classic Catalog (which uses Innovative Interfaces’ Millennium integrated library system) is contained within a search widget on the homepage, Primo is the default search option and therefore users’ default choice. Interestingly, even after statements from some faculty such as “I don’t love Primo,” “Primo isn’t the best,” and “the [Classic Catalog] is better,” these participants proceeded to use Primo to find a book. Library employees were evenly split between Primo and Classic Catalog.

One undergraduate student, graduate student, and library employee were unable to determine whether we have access to *Nature*. This task was the most time consuming for library employees because there are multiple ways to approach this question and library employees tended to favor the most consistently successful yet most time-consuming options (e.g., searching within the Classic Catalog). Lacking a clear option in the main navigation bar, the most popular path started

with our “Articles & Databases” page, but the answer was most often successfully found using Primo. Several participants tried using the “Search for Databases” search box on the “Articles & Databases” page, which yielded no results because it searches only our database list. The search widget on the homepage that includes Primo has an option for searching e-journals by title, as shown in Figure 3. However, nearly all nonlibrary employees missed this feature. Participants from both the undergraduate and graduate student user groups had trouble with this task, including those who were ultimately successful. Unfortunately, many of the undergraduates could not differentiate a journal from an article, and while graduate students were aware of the distinction, a few indicated that they were not used to the idea of finding articles from a specific journal.



Figure 3. E-journals search tab.

When it came to finding articles, undergraduates, as well as several faculty and a few library employees, gravitated toward Primo. Others, particularly graduate students and library employees, opted to search a specific database—most often Academic Search Premier or JSTOR. However, those who used Primo to answer this question arrived at an answer two to three times faster because of the discovery tool’s accessibility from the homepage. Regardless of the tool or resource they used, most participants found a sufficient result or two.

Common Breakdowns

Despite the clear label “Search for Databases,” at least one participant from each user group, including library employees, attempted to enter a book title, journal name, or keyword into the LibGuides’ database search tool on our “Articles & Databases” page (Figure 4). Some participants attempted this repeatedly despite getting no results. Others did not try a search but stated, with





confidence, that entering a journal, book, or article title into the “Search for Databases” field would yield a relevant result. A few participants also attempted this with the search box on our Research Guides (LibGuides) page, which searches only within the content of the LibGuides themselves.

Across all groups, when not starting at the homepage, many participants had difficulty finding books because no clear menu option exists for finding books like it does for articles (our ‘Articles & Databases’ page). This was difficulty was compounded by many participants struggling to return to the Libraries homepage from within the website’s subpages. Those participants who were able to navigate back to the homepage were reminded of the Primo search box located there and used it to search for books.



Figure 5. The answer to the “How do I find books?” FAQ item leads to several subpages.

DISCUSSION

Using the results of the study, we made several recommendations to the Libraries’ Web Advisory Committee and administration: (1) display our hours of operation on the homepage; (2) remove the search boxes from the “Articles & Databases” and “Research Guides” pages; (3) condense the “Help & FAQ” pages; and (4) create a “Find Books” option on the homepage. All of these recommendations were taken into account during a recent redesign of the website. We also considered each user group’s performance and its implications for website design as well as instruction and outreach efforts.

First, our team suggested that the current day’s hours of operation be featured prominently on the website’s front page. Despite “How late is our main library open on a typical Monday night?” being one of two tasks that had a 100 percent completion rate, this change is easy to make, adds convenience, and addresses a long-voiced complaint. Several participants expressed a desire to see this change implemented. Moreover, this is something many of our peer libraries provide on their websites.

The team’s next recommendation was to remove the “Find Databases by Title” search box from the “Article & Databases” page. During the study, participants who had a particular database in mind opted to navigate directly to that database rather than search for it. Another such search box exists on the “Research Guides” page. Although most of the participants did not encounter this search box during the study, those that did also mistook it for a general search tool. Participants

from all groups, especially undergraduate students, assumed that any search box on the Libraries' website was designed to search for and within resources like article databases and the online catalog, regardless of how the search box was labeled. Given our findings, libraries with similar search boxes might also consider removing these from their websites.

Another recommended change was to condense the "Help & FAQ" section of the website considerably. The "Help & FAQ" section was too large and unwieldy for participants to use successfully without becoming visibly frustrated, defeating its purpose. Moreover, Google Analytics showed that only nine of the more than one hundred "Help & FAQ" pages were used with any regularity. Going forward, we will work to identify the roughly ten most important questions to feature in this section.

The final major recommendation was to consider adding a top-level menu item called "Find Books" that would provide users with a means to escape the depths of the site and direct them to Primo or the Classic Catalog. When participants would get stuck on the book-finding task, they looked for a parallel to the "Articles & Databases" menu option. A "Getting Started" page or LibGuide could take this idea a step further by also including brief, straightforward instructions on finding articles and journals by title. In effect, this option would be another way to condense and reinvent some of the topics originally addressed in the "Help & FAQ" pages.

Comparing each user group's average performance helped illuminate the strengths and weaknesses of the website's design. We suspect that graduate students were the fastest and nearly most successful group because they are early in their academic careers and doing a great deal of their own research (as compared to faculty). Many of them are also responsible for teaching introductory courses and are working closely with first-year students who are just learning how to do research. Faculty, because their research tends to be on narrower topics, were familiar with the specific resources and tools they use in their work but were less able to efficiently navigate the parts of the website with which they have less experience. Moreover, individual faculty varied widely in their comfort level with technology, and this affected their ability to complete certain tasks.

CONCLUSION

The results of our website usability study echo those found elsewhere in the literature. Students approach library search interfaces as if they were Google and generally conduct very simple searches. Without knowledge of the Libraries' digital environment and without the research skills library employees possess, undergraduates in our study tended to favor the most direct route to the answer—if they could identify it. This group had the most trouble with library and academic terminology or concepts like the difference between an article and a journal. Though not as quick as the graduate students, undergraduates completed tasks swiftly, mainly because of their reliance on the Primo discovery tool. However, undergraduate students were less able to recover from missteps; more of them confused the "Find Databases by Title" search tool for an article search tool than participants from any other group. Since undergraduates compose the bulk of our user

base and are the least experienced researchers, we decided to focus our redesign on solutions that will help them use the website more easily.

Although all of the library employees in our study work in public-facing roles, not all of them provide regular research help or teach information literacy. Since most of them are very familiar with our website and online resources, they approached the tasks more methodically and thoroughly than other participants. Library employees tended to choose the search strategy or path to discovery that would yield the highest-quality result or they would demonstrate multiple ways of completing a given task, including any necessary workarounds.

The inclusion of library employees yielded the most powerful tool in our research team's arsenal. Holding this group's "correct" methods side-by-side to equally valid methods of discovery helped shake loose rigid thinking, and the fact that some library employees were unable to complete certain tasks shocked all parties in attendance when we presented our findings to stakeholders. Any potential argument that student, faculty, and staff missteps were the result of improper instruction and not of a usability issue was countered by evidence that the same missteps were sometimes made by library staff. Not only was this an eye-opening revelation to our entire staff, it served as the evidence our team needed to break through entrenched resistance to making any changes. We were met with almost instant, even enthusiastic, buy-in to our redesign recommendations from the Libraries' administration. Therefore, we highly recommend that other academic libraries consider including library staff as participants in their website usability studies.

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It's Time There Was an App for That Too: A Usability Study of Mobile Timebanking

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ABSTRACT

Timebanking refers to community-based volunteering in which participants provide and receive services in exchange for time credits. Although timebanking takes advantage of web technologies, the lack of flexibility in managing web-based timebanking transactions and the difficulty of attracting younger adults whose contributions would be highly valuable to the community still remain as major challenges. The authors' design research attempts to address these issues by leveraging the unique affordances of smartphones and their attractiveness to young adults. In this paper, the authors introduce a timebanking smartphone application and present a 5-week user study with 32 young adults. The results highlight the potential of timebanking for young population with an application that facilitates access to communications and transaction-management activities, and strengthens social connection and the sense of community attachment. The authors in particular present new affordances of smartphone technology on timebanking, including (1) transaction time reduction, (2) location and time-sensitive timebanking activity support, and (3) real-time coordination. The authors discuss design challenges and opportunities of smartphone-based timebanking.

Keywords: Case Study; Design Research; Mobile Local Community; Mobile Timebank; Social Connections and Interactions

INTRODUCTION

Timebanking formalizes community-based volunteering by tracking service transactions amongst community members in terms of the time taken to perform the services (Cahn, 2000). Members can "earn" time by providing a service and "spend" it by receiving a service. Unlike conventional monetary systems, time created from any type of work has equal value. Timebanking does not require reciprocal service exchanges, but members can give and receive services in a flexible way. For example, a person who has a vehicle can give a senior

citizen a ride to and from the hospital and be compensated with time credits. The earned time credits can then be used to ask a different timebank member to fix his/her computer. At its core, timebanking encourages people to use their own unique and valuable skills to help others. This helps timebank members develop a sense of self-efficacy and achievement, regardless of their professional or income level (Cahn, 2000; Collom, Lasker, & Kyriacou, 2012; Lasker et al. 2011).

Any community interested in timebanking can run a timebank. Mostly, a timebank is formed by motivated individuals for their local community who see the value of timebanking. Each timebank has administrators and coordinators who manage members and timebanking activities. At this stage, a local timebank adopts one of the existing technology software platforms designed to facilitate managing and operating a timebank more efficient ways. There have already existed a few large timebank organizations providing web-based software platforms to simplify what was traditionally paper-based work by coordinators. *TimeBanks USA* (<http://timebanks.org/>), one of the largest timebank organizations consisting of about 250 local timebanks with over 25,000 members in North America and 13 other countries, created a web-based platform called Community Weaver. *hOurworld* (<http://hOurworld.org/>), another national non-profit organization that has over 190 local timebanks with over 20,000 members (as of June 2014), also provides a web-based platform called Time and Talents. Such timebanking platforms facilitate more efficient timebanking interactions for members as well as reducing the work for coordinators. For instance, members can easily set up their accounts, provide and access a list of requests and offers, and record time credits. For coordinators, they can easily manage overall members' activities and time credits.

In this paper, we are interested in tackling

webpage of their timebank when they are in need of services, in the position to offer help, or in the stage of reporting time credits. This could lead to underreporting of timebank transactions, which in turn lowers the visibility of timebank contributions to the public good, giving rise to underestimates of the utilization of timebanking. Good estimates of utilization and benefits are needed when seeking funding for timebanks; thus, reporting those transactions is important. The second challenge is that timebank members are disproportionately single, Caucasian, and highly educated elderly females (Collom et al. 2012). Because of this, the types of timebanking services available are limited to some extent. This lack of a fully diverse population and lack of a broad range of services both reduce the attractiveness and viability of timebanks. For these reasons, timebanks consider a diverse membership as a key to their survival.

Considering a number of positive influences that have been created and supported from technology to timebanks, we believe that leveraging newer technology would provide better solutions that have not been well addressed in web technology. Many timebanks that we have contacted (e.g., hOurworld, TimeBankUSA, CommunityForge, etc.) want to leverage opportunities from new technologies yet still confront a number of challenges such as limited personnel resources and shortage of funding (Collom et al. 2012; Molnar, 2011). In this regard, we proposed to bring timebanking to the smartphone platform because smartphones have become widely adopted by people. We introduce the design and implementation of a timebanking smartphone application in collaboration with one of largest timebank organizations, hOurworld. Since a timebank's success depends on the participation of a diverse set of members, timebanks are especially interested in growing their members by engaging the young adult population. We conducted a five-week user study involving 32 young university students. From the study, we investigate their adoption and early use of the application on the hypothesis that supporting

timebanking activities with a more personal device might fit students very well because the ownership of smartphones is particularly high (nearly 80%) among that population (Smith, 2013), and, with the energy and diverse skills, they would be an ideal population to attract to timebanking, diversifying the population and leading the way for other young adults. Our study summarizes the overall usage of the timebanking smartphone application by students and highlights some distinctive affordances of smartphones for timebanking. To measure the specific affordances of mobile technology, we specifically present its affordances on timebanking in three directions: (1) transaction time reduction, (2) location and time-sensitive timebanking activity support, and (3) real-time coordination. We further consider if timebanks with a smartphone platform and a new user group could be part of the whole vision of timebanking by articulating participants' social connections and their sense of community attachment.

The following are the contributions of this study. First, we present timebanking activities created and shared among a young population through the timebanking smartphone application, which has not been reported in previous timebanking literature. Second, we discuss new affordances of the timebanking smartphone application, which will broaden the range of timebanking task-related services, activities, and interactions. Third, we articulate some fundamental aspects of timebanking, including social connection and sense of community attachment, and some challenges encountered during the study for application design improvement.

RELATED WORK

Motivations, Opportunities, and Challenges of Timebanking

A number of existing virtual currencies are operated and maintained by utilizing technologies to allow their users to easily manage a personal account and engage in economic transactions. "Bristol Pounds" is an example,

taking the form of a city-wide electronic local currency. Local people exchange their money for Bristol Pounds and use them with participating businesses via various methods (paper, web, or mobile) of payments. Another example is "Bitcoin," a peer-to-peer electronic virtual currency system (Grinberg, 2011). It utilizes the computational power of end-users' computer hardware to perform mathematical calculations for the Bitcoin network to create and track Bitcoin. Users can use a web or mobile interface to earn and spend their Bitcoin and manage them via their personal electronic wallet. Although it receives a lot of criticisms (because of its safety, privacy, sustainability issues, and more), a growing number of local businesses now accept Bitcoin, expanding its application. However, credits used in timebanking (also called time dollars) are different from those currencies because time dollars are created and exchanged through social interactions and volunteer activities, which are valued only in the time it takes to perform them, as opposed to a conventional monetary value.

Still, the motivation and intention of utilizing technology in timebanking is similar to that in other currency systems with respect to increasing the efficiency of managing timebanking task transactions and credits. In addition, recent research on timebanking has tried to leverage technology benefits and opportunities by proposing the development of a central hub system in which different timebanks are linked and members can exchange services, and earn and spend time credits across borders (Huber & Martignoni, 2013).

However, more important aim of timebanking is to build social connections among community members and meet a variety of needs, including but not limited to economic ones, whereas other systems of local currency, including Local Exchange Trading Systems (LET'S) and Ithaca Hours, mostly emphasize economic exchanges. Within this perspective, survey studies (Collom, 2011) and interview studies (Marks & Lawson, 2005; Ozanne, 2010; Seyfang, 2004) have shown a positive relationship between timebanking and members' sociality.

Timebanks are one of a number of non-profit peer-to-peer exchange systems that offer many *social and practical benefits* to their members (Seyfang and Longhurst, 2013). Participation in timebanks increases volunteerism as well as fostering richer social networks, enhancing sense of belonging in the community, and accruing social capital.

Motivations for participation in timebanking activities are slightly different among timebanks (Lasher et al. 2011). Some members seek to meet their economic needs while others find social connection and engagement to be the primary reasons of their timebank usage. Membership diversity is regarded as one of the main challenges in most timebanks, along with other challenges including member involvement, funding, and recruiting new members (Collom et al. 2012). Therefore, founders and coordinators in timebanks are constantly finding ways to increase participation of existing members and recruit new members in the local community who have different skills, strengths, services, and motivations.

Affordances of Mobile Technology

The recent report indicates that 56% of American adults are now smartphone users and the number of smartphone adoptions has steadily increased across different age groups since its first introduction in mid-2007 (Smith, 2013). A growing number of people are utilizing their smartphones as portable computers, spending a lot of time using them for certain tasks that used to be done on the desktop PC (Karlson et al. 2009; Jara et al. 2014). This is because of the fact that smartphones not only incorporate benefits from desktop technology, they are also highly personal as people carry their smartphones with them most of the time (Geser, 2004).

Among a number of affordances of mobile

space (Green, 2002), meaning that it allows people to access services wherever they go and transcends limitations of geography and distance when digitally communicating with others. Second, immediacy refers to the quality of bringing one into direct and instant involvement with something (e.g., entities, events, actions, etc.) in somewhat more time-critical situations or conditions (Andkar & D'Incau, 2002). When it is linked to mobile technology, immediacy usually pertains to how fast one could meet his/her expectations in terms of obtaining or accessing information in a particular situation or context. Indeed, these two affordances have shown a lot of technological and social impacts on people with respect to facilitating telecommunications and information access as well as connecting to and interacting with others (Beale, 2009).

When we consider these two affordances in a local community context, we can imagine many usage scenarios. For example, a local citizen consumes information pertinent to a local community and interacts with any local content through their mobile device whenever he or she wants. Mobile phone usage has penetrated into local communities. As mobile phones have become indispensable part of people's daily lives, a growing number of people use their device to consume local community news or events information and feel that the mobile device helps them keep up with information about their local community (Purcell et al. 2011). It is not surprising to see that people simply open up the applications and easily get the locally relevant information (e.g., news, events, foods, entertainment, etc.) while they are on the go.

Notably, this suggests some opportunity; for example, various types of local community information (e.g., news, events, meetings, etc.) will be accessed through mobile applications when requested, and people can also create new content by themselves and share it with their friends or the public through emails or other social media channels. Similarly, a previous research report indicates the positive relationship between the level of one's mobile technology use and engagement in civic mobile applica-

tions (Hornig et al. 2014). For example, there have been a number of research studies aiming at utilizing mobile technology in the context of local communities in different manners. Some examples include *Discussion in Space (DIS)*, which is a feedback platform utilizing large screens to advertise community relevant questions and issues to the public and mobile devices that allow local residents to easily add their thoughts about those local questions and issues (Schroeter, 2012). *Local State College* which the mobile tour application that presents local historical landmarks (Han et al. 2014a) by providing an interface to allow local residents to augment additional stories and personal experiences to the landmarks, making them more interactive and dynamic local places on their mobile device. *Local News Chatter* is the first smartphone application that provided an algorithm to filter and associate local tweets that are relevant to local news topics, where the aggregated news and tweets are then presented in a tag cloud (Han et al. 2014b).

Similar to the goals of the aforementioned projects, we aim at exploring community awareness and participation specifically in a timebanking context leveraged by mobile technology. Apparently, timebanking is local volunteer activities and based on volunteer activities and face-to-face and mutual interactions. In this sense, we strive to explore and articulate the opportunities as well as challenges of mobile technology intervention to timebanking space. We would also like to investigate social connections and interactions that could be formed and maintained by people in a same community.

Timebanking and Mobile Technology

The idea of leveraging mobile technology in timebanking has already existed before; for example, Castolo et al. (2004) report development of a system prototype, emphasizing mobility, to support health care-related timebanking in Europe. Up to now, however, that idea has not been further developed, because timebanks

have lacked the resources to develop mobile infrastructure.

According to the discussions with founders and coordinators in major timebank organizations, a shortage of funding software developers has meant that timebanks have not come close to keeping up with the growth of mobile technology (Bellotti et al. 2013). However, they regard access to timebanking through mobile devices as an urgent need, to increase interactions among members and attract more participants. Due to the overwhelming interest in adopting mobile technology, a number of studies have recently proposed the technical and social opportunities of leveraging mobile technology to timebanking. For example, Carroll (2013) presents a set of scenarios of mobile timebanking, emphasizing the notion of co-production in which the provider and the recipient create and enact a timebanking service together. Bellotti et al. (2014) discuss the future potential of utilizing context-awareness in mobile timebanking to support and facilitate more dynamic and efficient timebanking activities. These research efforts have shed light on a lot of possibilities for the application of smartphone technology in the context of timebanking.

TIMEBANKING SMARTPHONE APPLICATION

Our design approach is to leverage and extend back-end database services of existing timebanks. We are collaborating with hOurworld and have been developing and designing the mobile timebanking application through a series of discussions.

The information transmission between the server and mobile clients is processed by RESTful Web service (Representational State Transfer). The fundamental idea is that the server provides the APIs (Application Programming Interfaces) and information transmission is implemented through these APIs. The APIs are described in JSON (JavaScript Object Notation) format, which provides better and fast

performance and is less resource-intensive than XML (Extensive Markup Language). Mobile clients initiate requests to the server, and the server processes requests and returns appropriate responses through the APIs. Then the clients receive them and display on the device properly. They also cache the data received from the server, reducing redundant and unnecessary data transmission. In this sense, all transactions and activities will be stored and logged in the server database.

The smartphone timebanking application incorporates synchronous interaction and location sensing as background services. Thus, it supports constantly checking for changes and updates both of incoming data streams and the device's current location as a background service. They provide notification messages without requiring the launch of an application, and filter information displays by location. Such features enable synchronous interactions that are also highly efficient. For example, the user can check a list of service requests from his or her neighbors, and the list presentation can be filtered and prioritized by where the user is current located; a request made minutes before for a quart of milk from the next-door neighbor would be prioritized very high if the user was standing in the grocery store.

The application supports the notification feature that allows users to receive a notification for any incoming messages from others or status updates of their tasks in near-real time. Users can also access their task history and profile information.

USER STUDY

The application supports the notification feature that allows users to receive a notification for any incoming messages from others or status updates of their tasks in near-real time. Users can also access their task history and profile information.

Figure 1 illustrates the design of the timebanking application. There are various types of information that a user could add, such as a title, description, preferred date and time frame, estimated time to complete the task, and task location. After the task is posted, other users can access a list of tasks and see detailed information for each task. In addition, a built-in messaging function was also designed to support text-based communication between two users, allowing them to set a schedule, negotiate timebanking activities and so on. If available, users can also communicate via email exchanges. Once the task is completed, the task requestors will be able to provide a satisfaction rating and additional comments for the job to support a reputational aspect of timebanking activities.

sisting of their smartphone usage to understand their technology affinity and two scenarios of mobile timebanking activities (Table 1) to set their expectations and then answered questions, reflecting their initial attitudes toward the concept of mobile timebanking. We utilized a Likert scale of 1 to 5, where 1 = *Strongly Disagree* and 5 = *Strongly Agree*.

Second, after the pre-study survey, participants were instructed to install the application on their smartphones (either Android or iOS). We provided them with the application download link. During five weeks, we encouraged them to post freely while they used the timebanking application. There were no additional requirements. Moreover, participants were allowed to post requests even if they did not have time credit to spend. In fact, to some extent, many timebanks allow minus time hours especially for the firsttimebank members. All transactions and usages of the timebanking application are logged in the server.

After five weeks of application use, participants again were asked to completed an online post-study survey, which included participants' overall experiences (e.g., reasons for posting and taking a task, how the task was completed, etc.), their satisfaction after completing transactions, familiarity with the person involved in the transactions, and open-ended questions including sense of community attachment and challenges encountered. Note that, although the practice of managing timebank is an important issue in any timebanks, it is beyond the scope of this research inquiry as we focus on the design of mobility to enhance timebanking practices.

Procedure

Our research team introduced the notion of timebanking to participants at the beginning of the study. The study consisted of three steps: a pre-study survey, a five-week application use, and a post-study survey. First, participants received an online survey questionnaire, con-

Figure 1. Screenshots of the timebanking smartphone app running on both Android and iOS platforms (names anonymized): Add task view (left), task list view (mid), and task details view (right)

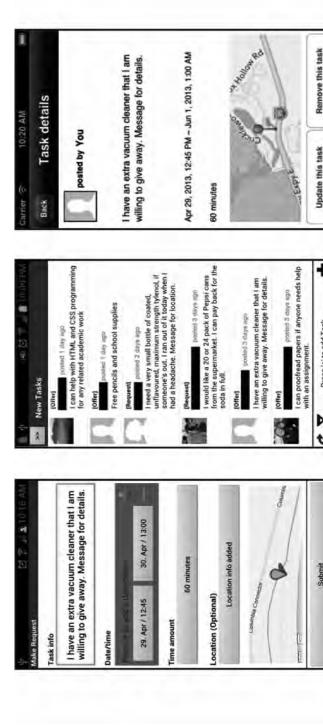


Table 1. Mobile timebanking scenario used in the pre-survey

<p>Mary was in the market to buy some groceries. While she was shopping, she quickly checked Mobile Time Bank requests. One of her neighbors, John, had posted a request for a quart of milk an hour ago. She would be driving right past his home anyway. Since she already knew John, she called him up and told him the milk was on the way. She also accepted the request in her Mobile Time Bank app. She had a brief chat with John while dropping off the milk. As she left, she felt good about helping someone, but also was struck by how easy it was to do, earning time bank credits as well.</p>

Participants

so interested in economic gain such as obtaining needed services (Mean: 2.7; SD: 0.8) and goods that they could not provide for themselves (Mean: 2.4; SD: 0.9).

Overall, although the participants had never heard of timebanking before, they seemed to be motivated to help and interact with others and were generally interested in using timebanking with their smartphone.

According to the pre-study survey results (i.e., mobile timebanking scenarios), we found that participants' first impressions and attitudes toward the timebanking application were quite positive. They considered using the application for the purposes described in the two scenarios to be slightly appealing (Mean: 3.5; SD: 1.0).

On average, they agreed slightly that this study would give them opportunities to meet new people or make friends (Mean: 3.5; SD: 0.9) and they were more convinced that the application would provide opportunities to use their skills, knowledge, or resources to do something for others (Mean: 3.9; SD: 0.7).

When we asked them about motivations to join this study, their responses consisted of "altruistic reasons," including helping people in need (Mean: 3.5; SD: 0.8), gaining satisfaction from helping others (Mean: 3.4; SD: 1.0), or improving their local community (Mean: 3.5; SD: 0.7). Participants were, on the whole, not

consider whether the tasks were categorized into either requests or offers (where request means "I need some service" and offer means "I can provide some service"), because our intention here was to explore different types of tasks and to find if there were some tasks particularly

pertinent to timebanking with a smartphone. We focus on describing each category with examples of the posted tasks and detailing more stories about each category.

Overall, participants requested or offered a variety of tasks. "Free Stuff" and "For Sale" were the most common posts; however, "Free Stuff" had a higher completion rate (65%) than "For Sale" (41%). There were several examples in "Free Stuff," including giving away some textbooks (e.g., "Free security in computing textbook.") or extra items (e.g., "I have an extra vacuum cleaner that I am willing to give away"), or offering free food (e.g., "I will bake a cake for you. Message for details..."). As those tasks in "Free Stuff" seemed quite easy to take and complete, it might have a high completion rate. Examples in "For Sale" include, "I need a calculus book by James Stewart &... I will buy it." In general, tasks or services which deal with items (e.g., exchange, sell, give away) are common in other existing timebanks (Collom et al. 2012) even though they are not strictly valuable in terms of time, and our study showed similar results.

A number of tasks were posted in "Transportation." Several participants looked for and were willing to offer a ride (e.g., "Heading to Target in an hour, anyone needs a ride?"), but only 30% of them were completed. For "Buying," a few participants asked someone to purchase some goods or items for them (e.g., "I would like a 20 or 24 pack of Pepsi cans from the supermarket. I can pay back for the soda in full.") or asked if anyone needed something because they would be there shortly (e.g., "I am going to Walmart this afternoon. Message me if you need something.") Nearly half of the posted tasks were completed (46%).

Tasks in "Social Contact" are especially pertinent to a young adult population because most of them referred to playing video or computer games together online. While the tasks in this category are usually related to offline meetings or gatherings (e.g., potlucks, picnic, etc.) in traditional timebanks, our participants showed somewhat different but unique activities that reflect a characteristic of a young adults population. Examples include, "It would be nice to have someone to play games with on the internet tonight, feel free to message me first." More than half of the tasks in this group were completed (54%).

Among all timebanking tasks posted, in particular, those in "Free Stuff," "For Sale," "Transportation," "Social Contact" are consistent with transactions documented in prior work (Collom et al. 2012), indicating timebanking in young adults on smartphones still fosters traditional timebanking transaction types.

We also note that the tasks in "Proofread," "Tutoring," and "Information Inquiry" are highly pertinent to university students, indicating that our participants appropriated the timebanking smartphone application to meet their academic goals. Tasks in "Proofread" (e.g., "I can proofread papers if anyone needs help with an assignment") and "Tutoring" (e.g., "I am good at Math until 140 course level and can help you if you need help.") were examples of this. While the completion rate in "Proofread" was high (50%), we found that in "Tutoring" was quite low (14%), perhaps because tutoring requires offline interactions whereas proofreading can be done remotely. Some participants used the application for "Information Inquiry." We found that most tasks in this category were about students' major or career; for example, "I would like an IST minor, please send me a detailed description of what exactly their degree is and answer any questions I might have since I am thinking about minoring in it." Over half of them were completed (67%) again, perhaps because those tasks also can be easily done via online communications.

In summary, the results show that young adults used the mobile timebanking application in many different ways. All of the tasks were the ones observed in non-mobile timebanking contexts, yet some of them (e.g., "proofread,"

"Tutoring" and "Information Inquiry") seem to

be highly pertinent to participants' school life,

which are not found to be highly popular in conventional timebanks (Collom et al. 2012).

It is also important to note that young participants engaged in timebanking quite actively,

Overall Timebanking Activities from the Smartphone Application

During a five-week study, participants posted 116 tasks (66 requests and 50 offers) and completed 51 tasks (29 requests and 22 offers; 44% of the total tasks) as shown in Table 2. After the study was finished, all authors coded the tasks and classified them into nine groups (including "others").

For this analysis, we did not specifically consider whether the tasks were categorized into either requests or offers (where request means "I need some service" and offer means "I can provide some service"), because our intention here was to explore different types of tasks and to find if there were some tasks particularly

Table 2. Overall activities in mobile timebanking by university students (sorted by the number of posted tasks)

Category	Posted (Count)	Completed (Count)	Completion Rate (%)
Free Stuff	17	11	65%
For Sale	17	7	41%
Proofread	14	7	50%
Tutoring	14	2	14%
Buying	13	6	46%
Transportation	13	4	30%
Social Contact	11	6	54%
Info. Inquiry	9	6	67%
Others	8	2	25%
Total	116	51	44%

providing the fact that active timebank members (who regularly engage in timebanking) tend to complete 5-7 services per quarter (which is 1-2 service(s) per month; Collom, 2012). This also indicates a possibility of high engagement by young populations when mobile timebanking is introduced.

Potential Opportunities of Timebanking from the Smartphone Application

In this section, we present the study results within the lens of the three affordances of smartphone technology on timebanking, including reducing transaction time, supporting location and time-sensitive timebanking activities, and coordinating in real-time.

Ability to Reduce Transaction Time

All the timestamps for task transactions were logged in our database; thus, we were able to calculate the sensitivity of time in task completion. As shown in Table 3, if we assume that participants regularly updated task transactions during the study, most completed tasks took less than a week. Especially we found that those in “Buying,” “Proofread,” and “Free Stuff” were completed within three days on average. It is also worth noting that the minimum values for each category were mostly less than one day (for example, the minimum results of “Buying,”

“It is important to note that, according to timebank coordinators, most traditional timebank members tend to report task completion several days later. From the discussions after the study, the coordinators and system developers of timebanks agreed with the point in which completing a task within two days from the original posting date does rarely happens in practice of traditional timebanking. We noted that this result might be influenced by the notion of *mobility* and *immediacy* of mobile technology, because participants received the notification about the updates from the application and were able to report the hour right from it.

It has been well known in timebanking communities that many timebank members do not report hours right after they complete the service or task because computers are not always available or accessible. Also in many cases, they forgot to report hours even if they completed the tasks. Reporting hours through

“Proofread,” “Free Stuff,” and “For Sale” are less than a day), indicating some participants utilized the smartphone application to meet their needs or help others quickly. This seems to be due to greater accessibility as some participants checked the list of posted tasks regularly using their smartphone.

I tried to browse the app regularly to see what sort of things people had posted. (P12)

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It has been well known in timebanking communities that many timebank members do not report hours right after they complete the service or task because computers are not always available or accessible. Also in many cases, they forgot to report hours even if they completed the tasks. Reporting hours through

the mobile application was designed to be easy, and it seems participants found in the same way too. In this sense, timebanking with a mobile application seemed to facilitate managing timebanking activities and transactions quickly and conveniently.

Ability to Post and Complete Location and Time Sensitive Tasks

To measure locational aspects of task transactions, we collected detailed stories of each completed task from participants during the post-study. We inductively coded and operationalized each story based on *how* and *where* the available task was accessed and taken by participants. Through this process, we were able to analyze if each task contained time- and location-sensitive components. We decided to consider a task as time- and location-sensitive if it was completed because (1) the task taker was in or near to the place that had been specified in the task description and (2) both the original in the task description and (2) both the original

task requestor and the taker reported the task as being completed in two days.

Statistically, we first found that the total number of fine-grained timebanking activities was 21 (1.8% out of a total of 116) for all tasks and 7 (1.4%) for the completed tasks. Those were from the three categories: “Free Stuff,” “Transportation,” and “Buying.” Some of these timebanking posts were shown in Figure 2. Although some items in those categories can be viewed as conventional timebanking tasks

(Collom et al. 2012), their management and scheduling seemed to be influenced and facilitated by the smartphone application.

Here we present two detailed usage examples (which was completed in a day) from “Buying” and “Transportation.” First, in the “Buying” category, there was a task involving buying items named:

I need a pack of A4 paper if someone is near a store. I can meet on campus or give directions to my apartment if needed

Figure 2. Examples of posted tasks during the study. Blue pushpins indicate ‘Requests’ and red pushpins indicate ‘Offers.’ Some of the task examples are more location and time sensitive.

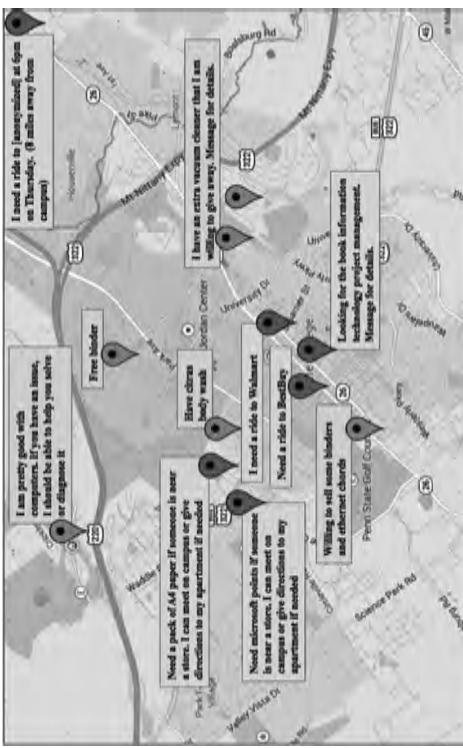


Table 3. Average time-to-task-completion calculated from the timestamp (unit is day); sorted by mean; “Others” excluded)

Category	Mean (SD)	Min	Med	Max
Buying	2.8 (2.6)	0.2	2.6	7.3
Proofread	2.9 (2.5)	0.9	1.9	7.9
Free Stuff	3.0 (2.7)	0.9	1.9	7.3
Social Contact	3.5 (2.1)	1.0	2.7	6.2
Transportation	4.0 (2.5)	1.0	3.9	7.3
For Sale	4.1 (3.9)	0.5	3.5	12.3
Tutoring	4.4 (2.0)	2.9	4.5	
Info. Inquiry	7.1 (5.0)	1.1	6.6	13.5

After few hours, one participant took this task, because he was at the location specified in the task description:

I took this task because I saw it while I was at BestBuy looking for something else. I was able to pick up A4 paper and give them to him on campus later that day. He paid me back. (P24)

The task taker (P24) did not go to the store just for the purpose of timebanking; therefore, it is worth noting that completing this type of task requires a number of pre-conditions including (1) the taker was at the right place to start it and getting to the right place to complete it was not inconvenient, (2) he found the task from the application, (3) he had enough money for this, and (4) he was willing to take the task. Consequently, we found that both participants felt great about this task completion because it was easy for the task taker, and valuable to the recipient.

Very satisfied with this task. The task was convenient to complete because I was already at Best Buy. (P24)

Another example is from the "transportation" category, in which there was a case for offering a ride. One participant posted a task (on Thursday morning) for a ride to the place located around 8 miles away from the university.

I need a ride to Bellefonte at 6pm on Thursday. (P1)

After few hours of posting, this task was taken by someone who actually lives in that area:

I live in Bellefonte and found that someone needed a lift, so I sent a message to him and we exchanged phone numbers to meet up. (P12)

After they completed the task, both participants showed a high satisfaction, because one participant (P1) was able to have a free

ride and the other participant was able to help and offer a ride easily (P12):

We had to change times to meet, but I think it worked quite well. (P12)

Another salient opportunity that we could see from these examples is the way that the timebanking application allows one to provide service to another as a secondary task. Busyness has been identified as an obstacle to participation in timebanking (Lascher, 2011); therefore, this "altruistic multitasking" may enable greater participation by busy people. Some participant comments supported this aspect:

I found that factors such as how busy I was with other things and if needed anything done at the time affected how willing I was to help other people. (P11)

I feel like it would contribute to the community by helping people with chores or things that they need, but do not have time to get or do it for themselves. (P5)

Ability to Coordinate in Real-Time

User study results also showed that timebanking with a smartphone application enabled near real-time coordination and communication among participants. We found that a total of 24 participants exchanged text messages during the study. As we closely looked at those messages, there are some overlapping cases where participants asked more details about the task posted, coordinated a time to meet, exchanged additional personal information (e.g., phone number, if both participants are willing to), and so on. According to participants, it seems that many of them found the messaging feature useful:

The messaging function was useful to sort out specific details about the tasks that couldn't be described in the task name. (P17)

I used this quite extensively to set up meeting times and solidify details otherwise unmentioned in the task. (P29)

There was one usage case in which two participants exchanged messages for task management while they were at random places such as café or in transit. Figure 3 illustrates the flow of message exchanges between two participants. Here we would like to emphasize that how a timebanking smartphone application facilitates communications between two participants. It allowed them to set up the date/time and the location to complete the task as quickly as possible. A similar practice could occur within web-based transactions; however, mobile timebanking facilitates communications among participants by allowing them to get notified of and exchange messages in real time because a lot of people nowadays have their mobile device with or nearby them. These all make the whole timebanking process fast.

Figure 3. Examples of message exchanges between two participants for coordinating time to meet (task category: free stuff)

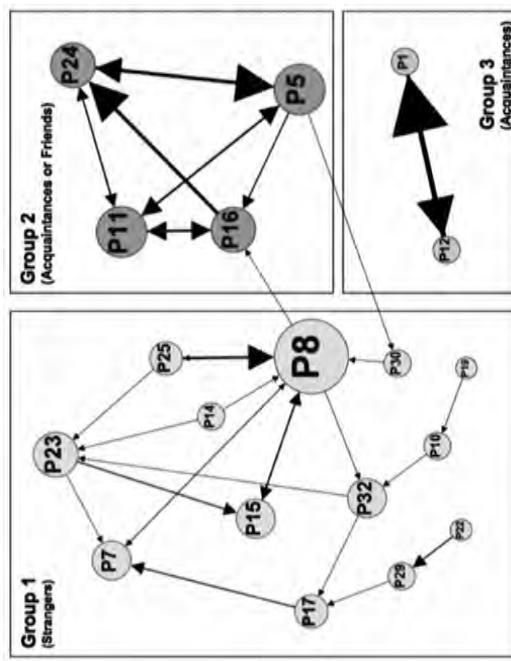


literature suggesting that there are always both active and non-active members participating in timebanking activities (Collom, 2011).

We examined how each participant interacted with others because timebanking depends on individual interactions and communications. We chose to use the level of *familiarity* as a potential variable because it is important especially for new potential timebanking members. To understand this, we collected the level of familiarity from participants during the post-survey, by asking them to indicate how familiar they were with other participants prior to completing a task, by choosing one of three options: *Friend*: I am very close to this user; *Acquaintance*: I know this user a little; *Stranger*: I did not know this user before. When investigated how participants were connected with others based on the level of *familiarity* and the number of completed tasks between the two, to see how social relationships influence choice of whom to transact with.

We ran a social network analysis tool, Gephi (Bastian, Heymann, & Jacomy, 2009), to visualize all transactions (Figure 4). Among 32 participants, we found that all participants posted at least one task and 19 participated in at least one task completion (represented as 19 nodes). Other 13 participants were still in the middle of the handshake processes at the termination of the five-week study period (e.g., waiting for the task requestor approve a task, or waiting for others to take task requestor's tasks, etc.). Each node represents an individual participant, and the size of nodes represents the number of transactions with others. Each edge represents one or more transactions between the two, and the width of edges represents both familiarity and number of transactions. The edge width is calculated as follows: $width = (\text{the number of transactions}) X (\text{familiarity score}, from 1 to 3)$. The sizes of arrowheads on the edges indicate the number of times the one they point to was the recipient of a service. We then identified three small communities in the whole network. Each group is colored differently in

Figure 4. Social connections among 19 participants (who completed at least one task) based on the number of completed tasks and familiarity between two acquaintances



the figure. The nodes in Group 1 (yellow) are strangers, those in Group 2 (orange) are either acquaintances or friends, and those in Group 3 (green) are acquaintances.

Figure 4 highlights two observations. First, participants showed different preferences when interacting with others. On the one hand, no participants in Group 1 had any preexisting ties with each other before taking part in this study. However, many of them interacted and completed tasks with at least two other participants, and some of them completed multiple tasks with several other participants (e.g., P8 has 7 links and P23 has 5 links). People in timebanks that resemble P8, with several connections to others in an interconnected group as well as with those in a different group, would be able to bridge holes in the overall I-network. According to Burt (2010), such people see opportunities first and distribute innovative ideas to everyone else; therefore, it would be desirable if such people could be recognized and promoted in the timebanking network to increase and facilitate interactions. On the other hand, most of the participants in Group 2 tended to interact with others (sometimes multiple times) with whom they had preexisting ties (either high or mid familiarity between the two), and two participants in Group 3 only interacted with each other.

Second, we found a number of reciprocated interactions (a participant helping another in return after previously being helped by them). Reciprocation is an important concept in timebanking because it is closely related to the formation of social bonds (Putman, 2000). It is more obviously shown in Group 2 and 3, but there are some connections in Group 1 as well. One particular finding is that, although most connections were not reciprocal, demonstrating the effectiveness of the "pay-it-forward" timebanking model, some participants seemed to gain more satisfaction when they had mutual contributions. In the previous section, we described one example of the completed tasks in "Buying" between the two participants (P8 and P15) who had not had preexisting ties. We

noticed that P15 reciprocated by helping P8 on proofreading a writing assignment a few days later:

I am good at proofreading papers and I feel great that I could help him out this way for his help with Walmart. (P15)

These reciprocated interactions imply two insights. One is the creation of a new social relationship. The previous case between P8 and P15 is such an example where both came to know each other while completing multiple tasks:

I will say Hi to Rick if I see him again and spend some time talking with him. (P15)

Another is about reinforcing existing relationships. This inference is especially supported by one completed task: *I need a ride*

to Bellefonte at 6pm on Thursday." between P1 and P12 in Group 3 (which was previously discussed). They already knew each other but were not well acquainted enough before taking part in the study. When P1 first took the task posted by P12, one of the initial actions was to exchange their phone numbers. While communicating and interacting to complete the tasks, they became more familiar with each other. The following are each one's comment about the other.

He is a fun person to talk to. (P1)
If feel more connected to this person than before. (P12)

So the reciprocal interactions that we see in Group 2 and 3 are the reinforcement of ties that already exist. As evidenced by their greater thickness, preexisting ties seem to

make it easier to respond to others' posts. And dyadic reciprocity also correlates highly with a preexisting tie, even to the point of exclusiveness and isolation among people who interact a great deal as depicted in Group 3. This is an area of interest for further study and analysis.

Sense of Community Attachment

One particular aspect of sense of community attachment was the increased awareness of local community in regard to sharing various types of timebanking tasks, which complies with what timebanking studies have reported (Seyfang, 2004). For example, participants were surprised by the fact that there were a lot of tasks posted by others and mentioned that they were many people willing to help each other in this community:

It has definitely given me more confidence and trust in the community because now I feel like the community would be there to help me when I need any help. (P8)

They also mentioned that timebanking helped them get a clearer idea of people's general feelings toward one another in the area where they live:

I think this app could contribute to the community as a way to trade items locally, as well as a way to network with people inside the community you normally wouldn't have met. (P16)

Some participants also indicated that this study helped them gain self-esteem and now believed that helping others was not as complicated as they had expected. This perspective is also consistent with one of the positive outcomes of timebanking, which refers to the realization of one's own unique skills that can be used to help others and for volunteering in the community (Coleman, 1998):

I found my most valuable skills are writing related and I could help people with this more and more. (P32)

A number of participants also expressed that they wanted to give back to the timebank community after they received successfully completed services. As previously discussed, reciprocated interactions creates and strengthens bonds among members in the same community, enriching social networks. Participants mentioned that mobile timebanking would allow local people to engage with each other and help each other even for the simplest tasks. This would lead to a growing sense of caring and respect for community members because local residents will be willing to help each other out and to inspire others to help people in the community without monetary compensation. Overall, these comments suggest that the experience greatly exceeded participants' initial lukewarm expectations of mobile timebanking as well as corresponding with positive outcomes of timebanking in general. Therefore, we can say that the idea of augmenting a smartphone platform into timebanking makes sense for this young student population.

Usability and Challenges

We investigated some usability aspects of the mobile timebanking application in the post survey. Most participants said that they found the design of the application straightforward and easy to understand. Perhaps this is because of the fact that the application has been designed and implemented through a series of investigations and discussions with an existing timebank. Some participants mentioned they liked the idea of extending the idea of timebanking into a mobile platform:

Conceptual currencies have always been a really interesting concept to me, so wrapping my head around the time currency concept was entertaining. There was nothing particularly challenging about the experience from the application. (P12)

I personally didn't find any challenges. I felt it pretty easy to use, and it didn't take much time to figure out. (P16)

Participants' positive comments about the application show a potential to be an extension of an existing practice of timebanking for current timebank members.

At the same time, we also found some challenges (which are not necessarily related to usability issues) that participants encountered during the study. First, participants faced some difficulties when communicating with others. Some of them actually complained about the low response rates from others, leading to the situation in which the tasks could not be completed. Because all transactions and interactions were done voluntarily, it was relatively easy for anyone to simply ignore the calls or messages or to break up the connections without any notice. Participants reflected on this issue:

I was frustrated, because one person didn't end up completing my task, even though I messaged him multiple times. (P8)

Everything was good, but some people were not good at communication than others. (P14)

Second, some participants mentioned that although they were able to see a number of available tasks, yet there were still not a lot of tasks that they could actually perform due to a lack of resources (e.g., car for transportation, computer/programming skills for tutoring, etc.).

Also, because all participants were students, the types of tasks might not be diverse enough:

It seems like a lot of participants are looking for a certain text book or a certain set of skills that I don't have such as graphic design, programming, etc. (P17)

It is worth noting that those two challenges seem to be consistent with what has been reported in other timebank studies that could limit participation. For example, in the

national survey of timebank coordinators, "contact difficulties" and "unavailable/desirable service" are identified as one of the top challenges (Collom et al. 2012). Perhaps they are fundamental issues in timebank communities. However, the first challenge could potentially be mitigated by adding additional awareness features to make the transaction process more transparent. The second challenge might in part be addressed by having more timebanking members with different talents and specialties. Most participants in our study also believed that more interesting and various types of tasks would need to be posted, if timebanking is to become more widely adopted.

DISCUSSION

Research Contributions

Earlier in this paper, we have indicated that membership diversity and limited software capability have been considered major challenges for many existing timebanks. We argue that utilizing smartphone technology for timebanking would mitigate them, because more people are adopting smartphones. Our study results suggest that smartphones would allow flexible management of tasks and communications on a personal device.

The contribution of this paper is threefold. First, our study showed how the young adult population, who had not heard of timebanking before, used the timebanking smartphone application. According to participants, using the timebanking application was quite straightforward and easy. Complying with their initial motivations of using the application from mobile timebanking scenarios, they posted and completed a number of different types of tasks and interacted with others during the study. Moreover, some tasks in "Proofread," "Tutorial," and "Information Inquiry" seemed to be highly relevant to their school life.

We found a number of tasks in the "For Sale" category were posted and completed. One might raise a question about this category

that violates the no goods rule of timebanking because exchange of items of monetary value could threaten timebanking's so far tax-exempt status. Collom et al. (2012) also note this perspective, and according to them, it appears that members donate or sell their goods to their timebank, and staff members price them into hours rather than directly exchanging goods or items by themselves or using money. Some timebanks manage an item shop from which members can buy items only through their time dollars. We believe once the smartphone timebanking application is integrated with existing web-based platforms and is supervised by timebank organizations, this issue could be handled in a similar manner.

Second, while some tasks were included in existing practices of timebanking activities, some other tasks seemed to be influenced by smartphone affordances. We have identified and presented three affordances of smartphone technology on timebanking, namely, reducing transaction time, supporting location and time-sensitive timebanking activities, and coordinating in real-time based on the usage data (see Figure 5). Regarding transaction time, many timebanking tasks and transactions were completed in a week, and some of them were even done in two or three days, which we believe seemed to be influenced by mobility and immediacy characteristics of the smartphone. Our discussion with timebank administrators and coordinators indicated that timebanking with a mobile application allows users to manage timebanking services and report completed tasks quickly and easily, compared to those activities through a web-platform. For location and time-sensitive activities, our analysis indicated that around 15% of the posted and the completed tasks could be considered as time- or location-sensitive; for example, one participant found a task through the application while he

was at the store and was able to complete that task, making both the task requestor and the task taker satisfied. For real-time coordination, we found that many participants utilized a messaging feature quite a lot to ask more information about the task, set up and negotiate time to meet (if the task requires offline interactions) exchange additional information, and so on. This messaging feature along with notifications allowed participants to manage and complete their timebanking transactions easily and quickly.

These more smartphone-compatible timebanking activities ask us to think about applying context-aware and adaptive system design (Bellotti et al. 2014). One possible design idea is to proactively target people with task recommendations, based on their present situation. For example, a timebank member might be targeted for notification of a tasks involving buying and delivering an item when s/he is at Walmart. Additional opportunities include recommending the best available person who can complete a task to its owner (who can then decide to make a personal request) or providing expected completion time based on a history of members' task completions and their specialties to allow flexible management of task and service transactions.

Third, we investigated whether extending timebanking into the smartphone platform shows similar outcomes to traditional timebanking with respect to social connection and interaction, and a sense of community attachment. Regarding the first perspective, we presented the analysis of the completed tasks based on the level of familiarity. We found that the number of completed tasks varied a lot; for example, some participants interacted with others, whom they had not known previously, once or even multiple times, while others interacted (sometimes exclusively) with people whom they had a preexisting tie with. We also observed several reciprocated interactions, which either created or maintained (or both) social bonds that could be further developed into social relationships. This analysis suggested the interesting idea where there should be systematic support for active members (like P8 in our study) to make their activities more visible so that others can recognize, applaud and learn from those members. Especially, for new members, this design would help them to see how active timebanking members can be. For the sense of community attachment, participants mentioned that they were aware of and surprised by various types of tasks and services that other participants shared, as well as their willingness to help others. Design efforts to increase the visibility of different and unique timebanking-related information, such as presenting most active members or popular posted and completed tasks on a monthly basis, and so on, would increase the recognition of the value of timebanking by both existing and potential members.

Limitations and Future Work

The study results described and discussed in this paper were based on the usage and experience of young university students. We acknowledge that the results in this paper cannot immediately be generalized to other populations or existing timebanks, because of the limited number and particular demographics of our participants and relatively short-term application usage. Existing timebanking members might show different usage of the timebanking application and user experiences. More extensive usage of the application as well as the time dollar usage patterns would be far better articulated in a larger study. We are also interested in investigating additional affordances of mobile technology and their impacts on timebanking as well as evaluating their relationships.

Also in the social interaction analysis,

we only considered the initial familiarity level between two participants prior to completing any tasks. But, clearly, there might be some changes of familiarity between two participants after they complete some tasks or interact with each

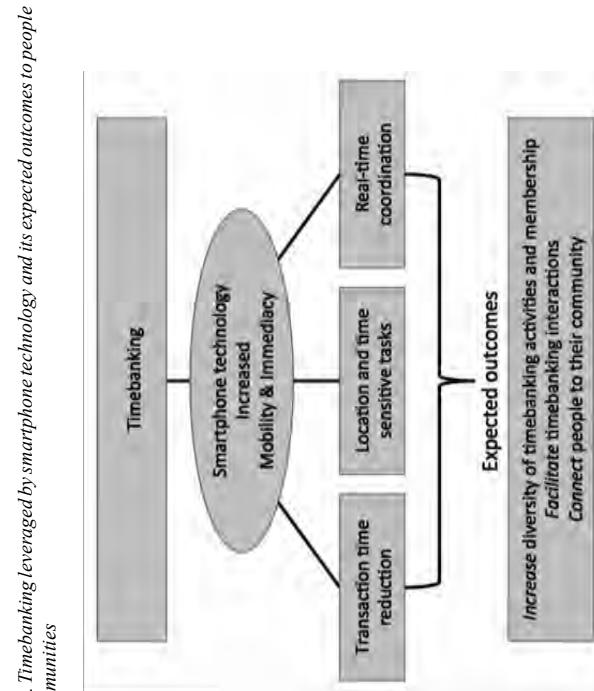


Figure 5. Timebanking leveraged by smartphone technology and its expected outcomes to people and communities

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- other. This study may not be enough to allow a relationship to grow significantly. Because we are interested in exploring the influence of relationship changes on people's task and social management, we plan to investigate this through long-term and extensive user studies in the future with one or more real timebanks.
- We are in the process of revising the application, based on participants' feedback and lessons about further design opportunities. Because our timebanking smartphone application is now being augmented to integrate with existing timebank infrastructures to be managed by real timebank communities, we have deployed the application to their affiliated timebanks. As existing members of timebanks have shown great interest in having a mobile version of timebanking, we believe this will allow us to investigate the effects of timebanking with a smartphone platform in broader ways.

CONCLUSION

Our study participants were positive to the idea of timebanking and expected to use the timebanking application in the future, showing its potential to increase membership and service diversity. Our study suggests that timebanking on a smartphone platform will support existing timebanking transactions as well as creating more opportunities for users to provide or receive community-based volunteer tasks or services through greater accessibility to the application and through being able to take advantage of mobility and immediacy (i.e., being in the right place at the right time for certain tasks). Because a growing number of people are adopting smartphones, integrating timebanking services and activities with the smartphone application would attract more people to it. Like many positive or encouraging outcomes from conventional timebanking, smartphone-based timebanking shows great potential to foster community exchanges and create and reinforce social connections and social capital among members of a local community.

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Plotting Likert and Other Rating Scales

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Abstract

Rating scales such as Likert scales and semantic differential scales are very common in marketing research, customer satisfaction studies, psychometrics, opinion surveys, and numerous other fields. We illustrate, review, and critique several forms of graphical presentation of results from studies using rating scales. These graphical forms include tables, bar charts of means, grouped bar charts, divided bar charts, ribbon charts, multiple pie charts, waffle plots, radar plots, and diverging stacked bar charts. We show the advantages of, and recommend diverging stacked bar charts. We demonstrate how to create diverging stacked bar charts in R and Tableau.

Key Words: psychometrics, diverging stacked bar charts, graphics

Introduction

Likert scales result when survey participants are asked to rank their agreement with survey items on a scale that includes *strongly disagree*, *disagree*, *neither agree nor disagree*, *agree* and *strongly agree*. Some authors also include scales with other numbers of categories about attitude. Semantic differential scales include other opposites such as *not interesting to interesting*. Cox (1980) discusses the debate about the optimal number of response options alternatives. We make recommendations for graphing the number of response alternatives you use.

Section 1 critiques a number of types of graphs that are often used to present rating scales. Section 2 presents a new R package for computing and plotting diverging stacked bar charts, our recommended method.

1. Graph forms used to present results of rating scales

1.1 Tables

Survey results are often presented in tables. Table 1 presents a data set published in the October 2005 issue of *Anstat News* by Luo and Keyes (2005) that will be used throughout this paper. It provides the results of a survey of ASA members with 6 to 15 years membership. The respondents were asked whether they agree that their primary position is professionally challenging. Tables are excellent for providing exact values. Tables do not make it easy to see the distribution of subsets of the sampled respondents.

	Total Count	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Total
All Survey Responses	565	50.1	40.7	4.8	3.7	0.7	100
Employment sector	253	64.0	30.8	3.2	2.0	0.0	100
Academic (nonudent)	176	40.5	47.9	7.0	4.2	2.8	100
Business and industry	71	38.0	45.7	7.0	4.2	3.0	100
Federal, state, and local government	38	53.5	35.3	5.3	5.3	5.3	100
Other (including retired students, not employed, etc.)	34	29.4	44.1	14.7	5.9	5.9	100
Race	400	51.0	41.8	4.5	2.8	1.0	100
White	122	53.3	46.2	3.3	3.3	0.0	100
Asian	10	47.0	40.0	10.0	10.0	0.0	100
Black or African American	17	35.3	55.3	5.3	11.8	0.0	100
Education	175	37.1	49.1	5.7	6.9	1.1	100
Masters's and Below	388	55.9	36.9	4.4	2.3	0.5	100
Gender	356	50.6	41.0	4.2	3.4	0.8	100
Male	200	51.0	38.0	6.0	3.5	0.5	100
Female	156	49.0	42.0	4.0	2.6	0.0	100

* General Note: Due to small number of respondents in some cells, we combined some of the response categories.
† The total count does not include nonrespondents.

Table 1: Percentages for Agreement that primary position is professionally challenging by demographics characteristics.

1.2 Bar Charts

Luo and Keyes also asked respondents if they felt increasing professional recognition was important. Figure 1 shows the survey responses for those who did and did not think increasing professional recognition was important. Robbins (2005) discusses perceptual problems with pseudo-three-dimensional charts such as Figure 1. A similar chart could be drawn for each of the demographic categories in the table.

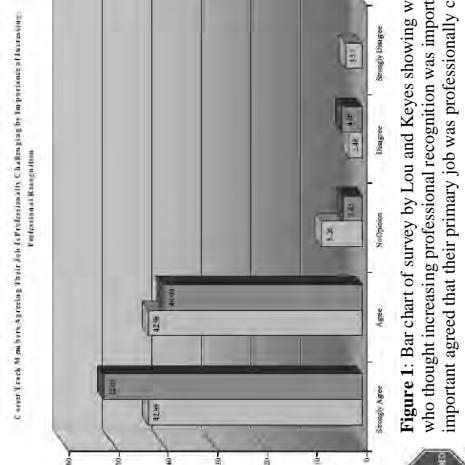


Figure 1: Bar chart of survey by Lou and Keyes showing whether members who thought increasing professional recognition was important or not important agreed that their primary job was professionally challenging.



We find it confusing to have some of the survey results in a table with other similar results in a graph. Our recommended presentation in Section 1.3 places all results in a single graphical presentation.

1.3 Diverging Stacked Bar Charts

Figure 2 shows a diverging stacked bar chart. The percentages of respondents who agree with the statement are shown to the right of the zero line; the percentages who disagree are shown to the left. The percentages for respondents who neither agree nor disagree are split down the middle and are shown in a neutral color. The neutral category is omitted when the scale has an even number of choices. The categories within each sector are ordered by the percentages who agree. It is difficult to compare lengths without a common baseline. In this situation, we are primarily interested in the total percent to the right or left of the zero line; the breakdown into strongly or not is of lesser interest so that the primary comparisons do have a common baseline of zero.

Is your job professionally challenging?

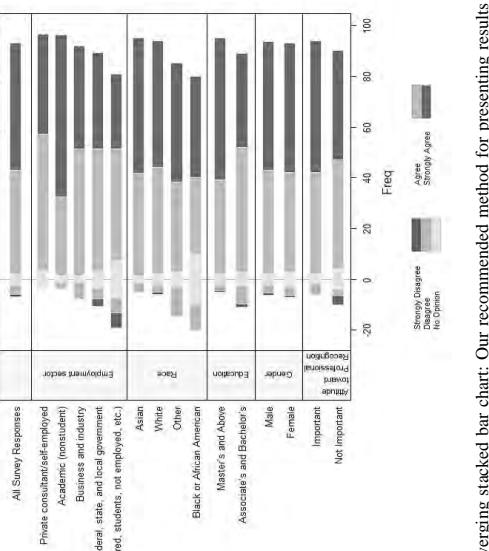


Figure 2: Diverging stacked bar chart: Our recommended method for presenting results of rating scales.

Diverging stacked bar charts make it easier to compare the attitudes of respondents in different demographic categories or who differ on the importance of increasing professional recognition than do any of the other figures discussed. Figure 2 contains the information of both Table 1 and Figure 1, yet it takes no more space than one of these. We have seen survey reports where each category is in a separate window at a Web site so that comparing categories is difficult. Figure 2 solves these problems. For these reasons, we recommend diverging stacked bar charts to present the results of surveys with rating scales.

1.4 Grouped Bar Charts
Now that we have shown our recommendation in Figure 2, we show and discuss many displays that we do not recommend, as indicated by the not recommended symbol. Figure 3 shows bar charts for the categories in the employment sector drawn with two-dimensional bar charts. Since graphs usually increase from left to right, we prefer having strongly agree on the right hand side. The format of this chart encourages comparisons within an employment sector; e.g., it is easy to see how strongly agree compares with agree within the academic sector. However, comparing the percentage of respondents who agree or disagree across employment sectors is a more interesting comparison, one that these charts do not facilitate well.

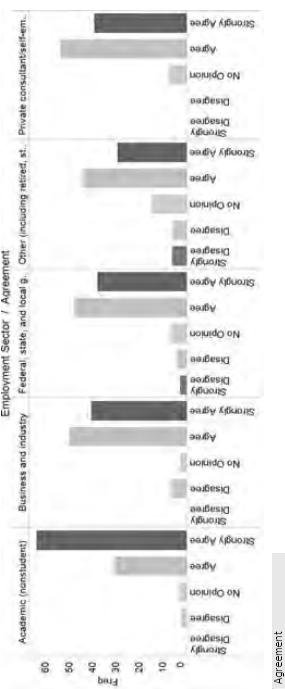


Figure 3: Bar charts showing agreement that their primary position was professionally challenging by employment sector.

1.5 Bar Charts of Means

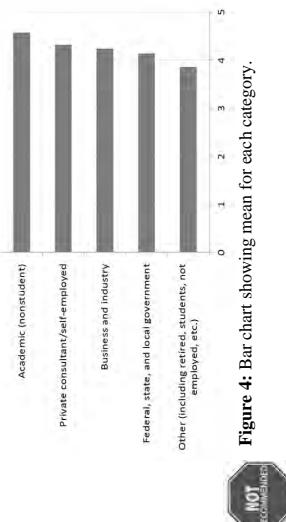


Figure 4: Bar chart showing mean for each category.

Assigning the value 5 to *strongly agree*, 4 to *agree*, and continuing down to 1 for *strongly disagree* and then taking means is a common practice. However, it is controversial since there is no assurance that there is even spacing between the descriptions of attitude. There is no reason to assume that the distance between *agree* and *strongly agree* is the same as the distance from *agree* to *neither agree nor disagree*. Even if it were acceptable to take means, it is not very useful. One hundred respondents giving a score of three tells a very different story from 50 respondents giving a score of five and 50 respondents giving a score of one, yet these two situations both have a mean of three.

1.6 Divided Bar Charts

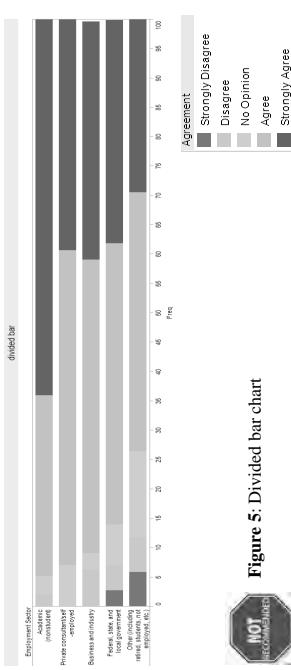


Figure 5: Divided bar chart

It is very difficult to compare lengths without a common baseline. The *Strongly Agree* segments have a common endpoint of 100 and the *Strongly Disagree* segments have a common baseline of zero. However, it is difficult to compare the *Agree* and other middle attitudes. Also, it is easier to compare the total percentage of those who agree or disagree with diverging stacked bar charts than with divided bar charts. Therefore, we do not recommend divided bar charts.

1.7 Multiple Pie Charts

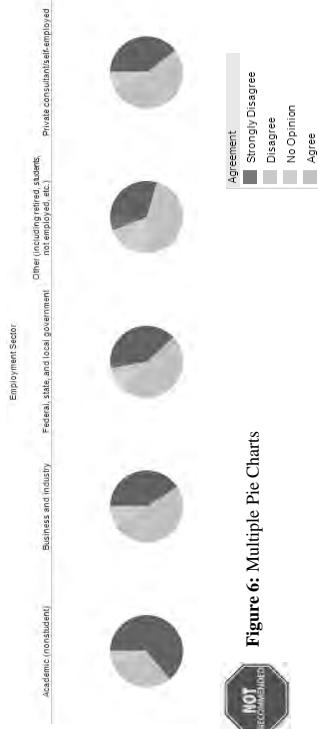


Figure 6: Multiple pie charts

Robbins (2005) shows that pie charts do not communicate very well. Comparing the size of wedges across different pie charts is even more difficult and is not recommended.

1.8 Waffle Charts

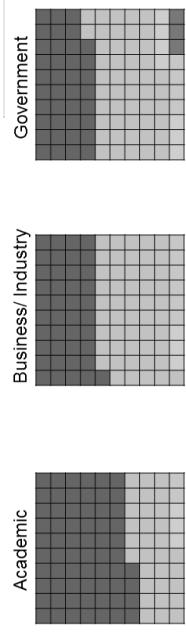


Figure 7: Waffle charts
NOT RECOMMENDED

Waffle charts, also called square pie charts, do not facilitate comparisons as well as some other charts do. The only property of them that matters is the number of squares of each color. The squares themselves have no meaning. Counting the number of squares of each color is a sequential task rather than a preattentive one. Waffle charts work better when there are two choices rather than five, and even then stacked bars would be much easier to read.

1.9 Ribbon Charts

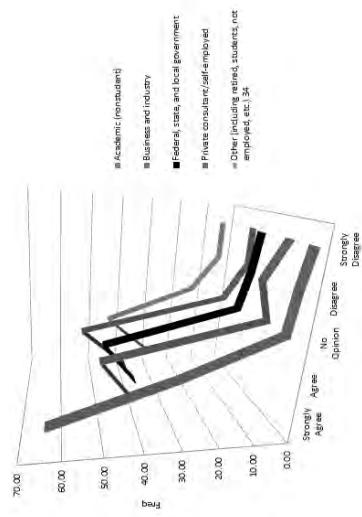


Figure 8: Ribbon chart drawn using Excel.
NOT RECOMMENDED

The ribbons imply continuity of the Agreement scale. In reality the Agreement scale represents discrete values on an ordered factor. In this example the (Agree, Agree) = 30 point is invisible as it looks like an interpolated point. The emphasis of this chart is attracting attention rather than communicating clearly.

1.10 Radar Charts

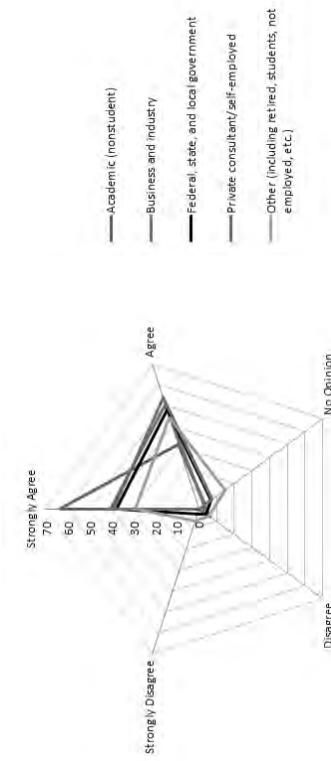


Figure 9: Radar chart drawn using Excel.
NOT RECOMMENDED

Radar charts are difficult to interpret. This chart implies that the Agreement scale is circular—that the Agree and Strongly Disagree categories are close to each other. There is no sense of a linear relationship among the labels and the endpoints are actually in opposition.

1.11 Diverging Stacked Bar Charts with Counts Added

Figure 10 shows an option for adding counts to the diverging stacked bar charts. We did this by appending two plots, one based on percentages within each category and one based on counts for the entire category.

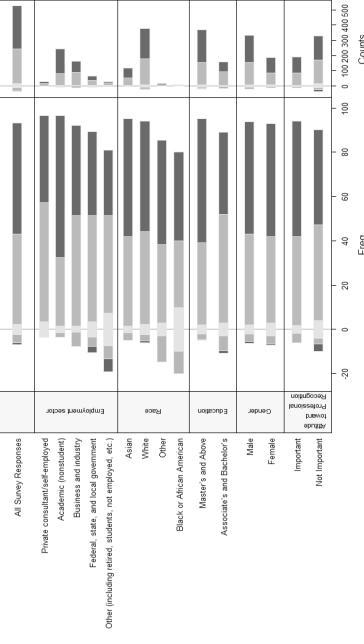


Figure 10: Diverging stacked bar chart with counts shown

2. Software for Computing Diverging Stacked Bar Charts

2.1 R

A set of new functions for producing diverging stacked bar charts will be available in the version of the HH package for R to be released in September 2011. The primary function takes a table of rows (groupings of respondents) by columns (levels of agreement)—for example the Employment Sector section of Table 1—and produces a single-panel diverging stacked bar chart—for example the Employment Sector panel in Figure 2—using the lattice plotting capabilities. Secondary functions, also to be in the HH package, take multiple single-panel charts and plot them with coordinated axes—the complete Figure 2—using functions in the latticeExtra package.

The functions for diverging stacked bar charts can be used from the command line, from a new menu item in Rcmdr for all versions of R (with the RcmdrPlugin.HH package), and in RExcel for R on Windows.

The diverging stacked bar charts are centered at zero with a reference line at zero. It is important that the reference line lie behind the bars; otherwise, the neither agree nor disagree group is split and appears to be two groups. Colors are chosen that are accessible to those with color vision deficiencies. We use a diverging color scheme from RColorBrewer. The name "diverging color scheme" motivated our name for the charts. In

this type of color scheme, the intensity of color increases with the intensity of attitude in each direction. The default sequence for presentation of the bars is determined by sorting by the percent positive, i.e., the right hand side.

As important as what we do is what we do not do. There are no pseudo-three-dimensional bar charts. There also is no inappropriate conflation of discrete and continuous variables as we saw in the ribbon chart.

2.2 Tableau

Readers who use Tableau should send an email to naomi@nbr-graphs.com for a copy of a worksheet with the calculated values shown.

3. History and Acknowledgment

Brinton (1939) describes bilateral bar charts which include population pyramids, charts with some bars to the left and some to the right of a common line (or above and below), as well as what we call diverging stacked bar charts. His examples do not include the results of survey data. Since his examples are taken from other documents, this was not the first use of these charts. Stouffer et al. (1949) make extensive use of both vertical and horizontal diverging stacked bar charts including examples with rating scales. They do not name the charts; Schmid (1983) includes horizontal and vertical diverging stacked bar charts in his classification of bar charts, calling the horizontal sliding bar charts and the vertical floating bar charts. Thanks to Nick Cox for helpful comments and alerting us to the early references.

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CHAPTER NINE

Graphics and Their Place

VISUAL LANGUAGE: SEPARATE BUT EQUAL

Modern science relies deeply upon illustration—graphs, charts, drawings, photographs, maps, models, and other forms. Technical knowledge today is inseparable from visual presentation, from its specific powers to order and convey information. Scientists, moreover, appreciate excellent graphics. Illustrations that offer data with clarity and elegance are a unique type of achievement—creative, efficient, even a source of delight.

Scientific illustration has an extremely rich and venerable history, reaching back to the written works of ancient Egypt, Greece, China, India, and medieval Islamic civilizations. Alloys between science, art, and craftsmanship, forged in the European Renaissance and after, are still evident in many aspects of contemporary image making—in drawings of specimens, attention paid to form and balance, three-dimensional effects, uses of color. Many of the most influential works in the history of science—Galileo's *Sidereus nuncius* or Vesalius's *De humani corporis fabrica*, for example—have been books of pictures as well as text.

That said, it should be stressed that the visual dimension to science forms a language all its own, a kind of pictorial rhetoric, if you will. By this I mean that graphics are often much more than a mere handmaiden to writing. They don't just restate the data or reduce the need for prose, but offer a kind of separate “text” for reading and interpretation. To assure yourself of this, take any well-illustrated article, copy the figures, and assemble them in order of appearance. You will

find that they tell their own story, in some manner parallel to that of the writing, but in other ways different, enriching, though also with notable gaps.

Illustrations serve a variety of functions. Charts summarize data and make comparisons. Graphs provide analysis by revealing patterns, relationships, or possible correlations. Images, meanwhile, offer different kinds of evidence, explain and explore information, demonstrate specific points, represent concepts or theories. All in all, this is an impressive array of service—and it certainly helps point up (and justify) why scientists often browse through articles by reading the abstract and looking at the illustrations.

Perhaps most fundamental of all, however, visual discourse adds variety for the eye and enhanced appeal for the mind. Does this seem trivial? It shouldn't: the psychology of reading is not a little complex. The living brain very much appreciates intelligence expressed in different forms.

SPECIFICITY AND CHANGE

As a scientist-author, fresh on the trail of publication, it's a good idea to become intimately familiar with graphic elements used in your field. This may seem obvious. But there are two factors that raise it beyond mere common sense.

First, many visuals are highly field specific. Even graphs, maps, or other presumably standard figures can change considerably in form and style, as well as content, between disciplines. Moreover, there is the “journal effect” to consider: even within your own field, different periodicals have their own demands for how they want articles to look, just as they have standards for written copy.

A second reason to get familiar with graphics in your area is that many types of visuals are undergoing change, due mainly to the advent of digital technology, and will continue to evolve as this technology does. Indeed, the digital age has introduced a fertile array of new visual possibilities: satellite imagery, three-dimensional modeling, ultrasound technology, tomography, magnetic resonance imaging, various types of electron microscopy, and a dozen others. Science is replete with new powers of vision, new means of making the informed eye the instrument of study, analysis, and discovery. Color, too, has found a new and expanding role in scientific imagery and continues to revise older forms. Those who grew up in science before the 1980s can testify to a former universe of black and white, where the tones of text and image were

identical. Since then, a great separation has taken place, with color now abloom in many fields, being much more easily and routinely achieved (though not cheaply, by any standard). More than ever, pictures today often demand and reward attentive study in themselves.

Becoming familiar with the graphics of your field is therefore essential—but it is not enough, in and of itself. The new sophistication in imagery depends upon software, which is also often designed for individual fields. Certainly, a number of generic programs exist to help scientists create graphs, charts, and tables. Most major software vendors offer programs that cover basic graphing capabilities, useful in many circumstances when simple plots will do (Microsoft Excel is one of the most widely used). For more complex demands, there are programs designed specifically for scientific uses (Sigma Plot and Axum are two popular choices). Beyond these general-purpose programs, software is likely to be specialized. Fields as diverse as molecular genetics, petroleum geology, climatology, and mechanical engineering now each have a large spectrum of dedicated graphics programs to use with particular types of data. This places new demands on the scientist, who often must learn at least some of these programs.

Finally, new visual possibilities are attached to Internet communication. Still very young, Internet science promises new types of nonwritten expression: real-time animation, interactive modeling, use of video and audio. In some areas, these capabilities have already been taken up—online journals in medicine and chemistry, for example, have included animated graphics, video, and interactive visuals of various types. Change is in the wind for scientific illustration, and on the ground.

All of which highlights, again, the need for the individual scientist to learn what is out there. Becoming an effective author means becoming literate in these forms of communication—learning how to read them, how to recognize good *and* bad examples, when and where to imitate the best.

CHOOSING MODELS: A HELP HERE, TOO

As with writing, you can learn a lot about producing good graphics by studying the admirable work done by others—and the opposite. Not only will this provide you with guiding examples to emulate and avoid, it will also help sharpen your critical faculty about what goes into such an image, what makes it effective, easily deciphered, informative, attractive. You can collect entire articles or only one or two illustrations from a paper. You might want to make a fairly large collection at first and

then whittle it down to the very best: the exercise of doing this will decidedly focus your attention on details of quality. You might try gathering several nice examples of a single type of image, compare them side-by-side, and choose from there. Any method that helps you scrutinize and evaluate the images of your field is valuable. Find out what frustrates or irritates you (Too much type? Text too small? Figure too busy? Poor labeling?). The best questions to ask, as always, are, Is this something I wish I had done? or What would I do to make this better?

For every one of your choices, or for any graphic you find particularly worthy (or the opposite), stop and ask yourself what it is that seems especially good (or poor) to you. The more you come to understand your own preferences, the more you can use them consciously in preparing your own articles. Here are a few categories to help you judge individual illustrations and analyze your impressions.

- *Neatness.* Is the image clean and sharp; does it invite attention, or repel it?
- *Readability.* Can the eye move over it and pick up information, either quickly or with concentrated attention, or is there too much confusion, too much data (a “crammed” feel), a lack of integration?
- *Use of Type.* Is the font easily readable, large enough; is it placed well, or does it invade and distract; is there too much of it (a common error)? Is there a proper hierarchy among type sizes—do the largest words refer to the most important items, the smallest to the least important?
- *Size.* Is the image too small to be fully visible; do you find yourself drawing the page nearer to your face? On the other hand, does it fill the rectangular space to the edges, as it should, or does it have too much white space?
- *Aesthetics.* Is the image balanced, or does it seem lopsided? What aspects or portions draw the eye most, and are these significant in terms of content? Are the thickest lines on the graph the most important; do the patterns in a bar chart highlight the differences you want to show?
- *Use of Color.* Does it help distinguish content, increase readability; are colors appropriately distributed (e.g. blue for depth, red for height); is text minimized yet visible; is the legend (if needed to differentiate the meaning of each color) simple and easy to use? Are colors consistently coded among different images?

- *Consistency.* Do similar images (maps, charts, graphs, photographs, etc.) carry the same stylistic scheme in terms of line width, type font and size, labeling, scales, and so forth?
- *Room for Improvement.* Are there any changes you yourself might make to improve the quality of this image?

EXPERIMENT, EXPERIMENT

I said earlier that writing involves experimentation—trial and error, revision, working things out. This is equally true for figures. It is true even for seemingly simple visuals, such as charts or graphs. We often construct these from our data as tools to help us in our analysis, to make comparisons, look for trends, discover relationships. When we initially draft our illustrations, we are frequently performing what are akin to visual trials—recasting our information in new forms to see if something important and unforeseen steps into the light.

The experienced scientist-author knows, moreover, that it can be very helpful to take a single data set and graph it in different ways. This means trying out distinct analytical versions in order to discover what form offers the most effective, meaningful presentation. Today this can often be done for charts and graphs, in particular, with a few clicks of a computer mouse: histograms can be changed to line graphs, pie charts, dot graphs, and other forms, with or without labels, error bars, means, and averages. Current software gives you the power to play with data in productive ways. As with text, the process of creating any specific image can reveal new aspects or relationships previously unnoticed.

So it is entirely normal—indeed it should be expected—that you'll often create more illustrations than you need, and that you'll need to revise the ones you keep. Sometimes a particular graphic, one you may have worked hard on, will be unnecessary; its message can be stated in a sentence or two of text—if so, please (for the sake of scientists everywhere) delete it, grieve briefly, and move on.

Experimenting with graphics also means making decisions about appearance. In a good scientific illustration, everything visual qualifies as content. Choices therefore need to be made about such things as, how much text should be used; what type font and size are best; what shadings or colors are appropriate; what kind of scale should be used; how far should each axis extend; how wide should the bars or lines be on a chart or graph; what patterns should be used; is a legend needed and where should it go; and so on. For more complex figures, the decisions are likely to be even more numerous.

- *Graphing.* Do you alter colors used in a model, graphing an added variable? Altering colors used in a model, graphing an added variable,

Luckily, the relevant answers to such questions are far from open-ended. There is much standardization in scientific imagery, and your models will help guide your choices. No example, however, is ever a final template. There will also be factors (let us hope) individual and original to your work, and these will require that you adapt particular graphical forms to your specific case. This may involve changing scales, think of each figure, therefore, as a draft in the beginning, a kind of visual audition. No time spent trying things out intelligently is ever wasted. It is sometimes necessary to discover what graphical forms might work best with your data, which types of illustrations you are most comfortable using. After all, this too is an area where authors develop a certain style, however subtly expressed. Don't berate yourself for any dead ends; be thankful when you find and overcome them. Experimentation, in both writing and illustration, is one of the most crucial processes in learning how to communicate well.

Many articles need (but often don't have) an introductory illustration to help orient the reader. Could your document benefit from such a graphic? The answer might be yes, no, or maybe, but it's usually worth asking and thinking about the question. An introductory graphic can serve many of the same purposes as the introduction itself—it can provide setting, such as can be done with a map, large-scale model, and so forth; it can offer essential background, for example, in the form of a flow chart that shows a sequence of relationships, a schematic diagram of apparatus, a time-based graph or chart outlining the relationship under study. Again, a guiding principle is to think of what might help usher your reader into the domain of your investigation. What would you use in an oral presentation to do this?

Try to make sure that any diagrams and drawings are relatively pleasant to look at. Use a type style that can be read very easily. Lowercase lettering is usually more pleasant to read than all uppercase. Many journals prefer a sans serif font for illustrations: Arial and Helvetica are common choices. Others prefer serif styles or are nonspecific. Check this out *before* you create your images—spare yourself (or your artist) the agonies of unnecessary revision.

As with text, different journals will have different specifications for many aspects of the illustrations they agree to publish. At a general level, this is likely to involve such aspects as software format (preferred programs), sizing, method of delivery (whether on disk, via the Internet, or as printouts). Some journals, however, are quite specific about the

detailed form your graphics should take, for example, type style and size, line thickness, use of borders and arrows, labeling (where and when), scale bars, and more. Be aware: certain periodicals spell all this out in their instructions to authors, but some do not. Some demand consistency of stylistic detail among articles, and some are less exacting. Thus, you really do need to take a close look at published examples in your journal of choice before spending the time to design and create your images.

SOME NECESSARY POINTERS

Keep text on your figures to a minimum. Use it mainly for labeling, not for explanation (leave this to the caption and main text). Also, be consistent from one figure to the next in the fonts you use, numbering and lettering style, and other such aspects.

Avoid any overly fanciful or arcane fonts for your images. They will distract the viewer (while drawing attention to yourself as the possible embodiment of bad or eccentric taste).

When needed, use different font sizes to indicate different levels of importance. Be consistent about your sizes and font styles from one graphic to the next. Alternatively, consider using boldface or italics as highlights or as a means to add a dash of visual interest. Be aware, however: too much variation is distracting, so keep your visual hierarchy simple, clean, efficient.

Design your figures so that they extend nearly to the edges of the frame: do not waste space. This will allow you to make each graphic as large as possible, which is very important, because—

Images in science are nearly always reduced considerably for printing, commonly 50% to 75% (one-half to one-quarter original size) or more. Therefore, *anticipate the effect of reduction* (not doing so is one of the most common errors made in scientific illustrations). Use a copy machine (or computer reduction, if the figure is a digital file) to reduce your images and test this out: make sure all text, lines, and details hold up. Another test is to take images that have been published and enlarge them to roughly the size of your own illustrations, then compare type size, line thickness, and so on.

Figures created for slide and computer presentations are almost *never* suitable for print journals, reports, or books. These presentation images must be translated, or even redone, for hard-copy debut. Frequent changes required include less text, smaller font sizes, thinner lines, and

removal of color (simple gray-scaling very often isn't enough). In general, presentation images are similar to cartoon versions of what should appear in print.

Make sure all digital illustrations, whether originals or scans, have a resolution of 300 dpi (dots per inch) or higher. This is the absolute minimum required for printing; 600 dpi is usually better. Provide high-quality laser printouts of every figure.

Use a simple, clear system for naming digital files of your artwork. Common schemes include your last name (lead author) + figure number (Montgomery.2); one or two keywords + figure number (Apoptosis.2); and simple abbreviation of keywords + figure number (CrysRNA.2).

True elegance in science resides in simplicity and restraint.

EXAMPLES

In the pages that follow, I've tried to present a series of good and bad examples of illustrations taken from the published literature. In each case, a brief commentary, and possibly a question or two, are given in order to help you evaluate the relevant image and thus further your own critical ventures.

Charts and graphs are particularly well represented in figures 9.1–9.10. This is because these graphics are surely the most ubiquitous in all of science. My own unofficial survey of more than 150 journals in 57 fields (from insect physiology to mathematical physics) shows that they occur almost twice as often as any other type of visual. Indeed, in some periodicals, they are the *only* graphical form to be found. Thus, their importance is rather high.

Tables present exact numerical data, whereas charts and graphs take these data and give them a form of visual analysis. Use tables when you need to show specific or precise values; use charts and graphs when you want to find and express meaningful relationships from these numbers. Very rarely will you ever need to show both.

Notice in the figures that follow that, in most cases, the horizontal axis plots an independent variable—the data set that we select—whereas the vertical axis gives the dependent variable—what we measure.

Bar Charts

Bar charts or graphs, particularly histograms, are extremely common. The essence of such charts is usually to make comparisons between data

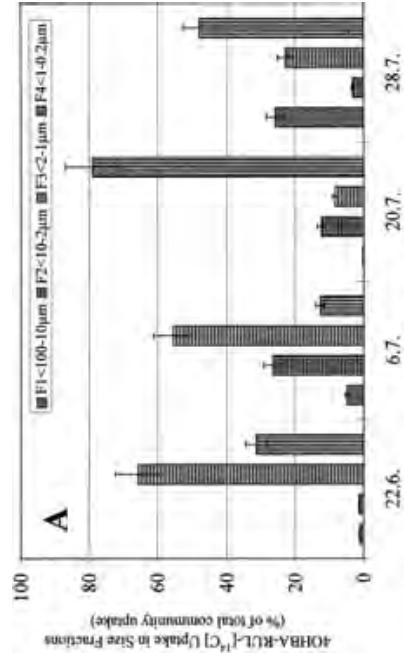


Figure 9.1 Example of a barchart (from Munster et al. 1999, 118; used with permission of Schweizerbart Publishers, www.schweizerbart.de)

sets. They are thus particularly useful for showing differences, and are less suited for revealing trends or relationships.

Take figure 9.1. This shows the uptake of a particular carbon-bearing chemical by a forest lake, during a series of sampling-day intervals. Several aspects of this chart seem well done. First, the axes are labeled in type large enough to easily read, and a legend is provided. Second, the bars are of adequate thickness (this is not trivial) and show appropriate error ranges. Third, the different data sets are properly separated. Fourth, each data set shows the same order of bar patterns.

What can be done better? The x-axis is improperly labeled: shown are sampling *dates* (day, month), not days. The patterns for individual bars are much too similar to be easily distinguished. Note, too, that the legend is too small and cramped. These problems leave the data difficult to decipher and thus interpret. Solutions to any and all of these problems are simple and straightforward.

Now examine figure 9.2. This box-and-whiskers chart is an attempt to show the effect of parasitism on weight gain in two species of butterfly (*Heliothis virescens* and *Trichoplusia ni*, abbreviated “Hv” and “Tn” in the figure). Nearly everything is clearly labeled on this figure; the type is large and welcoming. Bar patterns are easy to distinguish, the legend is neatly done, and the interpretation of the data is clear (parasitism halts growth at an early stage). Moreover, the author has nested the bars for each individual species to highlight the comparisons being made.

Could anything be improved? The whiskers sticking out of the top of each bar could be explained (error bars?). The intervals on the horizontal axis could be a bit wider, allowing for a widening of the bars, d10 could be placed in its rightful interval, rather than in d9—which suggests that perhaps two-day intervals (d2, d4, d6, . . . , d10) might have been a superior choice for sampling. Finally, there is a larger question: would the data be more revealingly shown in a line graph? If the authors’ point were to show only gross, overall patterns, then the answer would be no (or rather, not necessarily). But if ideas of developmental progress are at issue—ideas that depend on continuity through time—the answer would be yes, for discontinuous samplings would no longer suffice (why offer snapshots, when the entire movie is available at no extra charge?).

Now consider figure 9.3. This is a simple, vertically oriented chart, showing average measured porosity for petroleum-bearing rocks originally deposited in different settings. The data are averaged from a wide range of samplings and are thus quite generalized; the graph is meant to show only very large-scale comparisons. As a result, it probably doesn’t need either the detail given in the vertical scale or the related horizontal ruling. We do need to know what average porosity is measured in, however; what do the numbers along the y-axis represent? The bars are generous in width, but are not separated (as they should be), and the patterns are confusing—are we to assume some relation

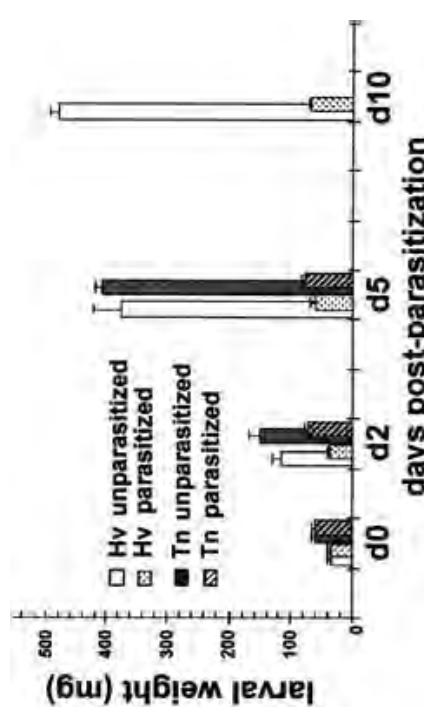


Figure 9.2 Example of a box-and-whiskers chart (reprinted from Cui, Soldevila, and Webb 2000, 140; copyright 2000 Elsevier Science; used with permission)

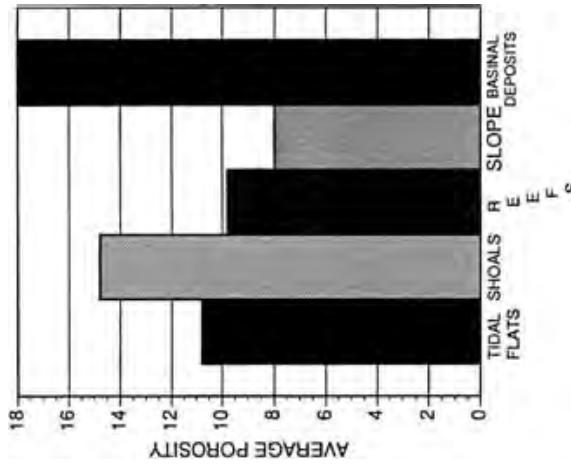


Figure 9.3 Example of a bar chart (from Jordan and Wilson 1994, 148)

between those similar patterns (e.g., shoals and slope)? Confusion is avoided if even a little space is added between each bar and a single pattern used. Note, too, the identifying text along the horizontal axis: again, are we being given clues that “Reefs” (written differently) and “Slope” (in larger type) merit particular attention? Uncertainty here can be averted in several ways, for example, by using different patterns for each bar and constructing a legend; by placing the respective label *above* each bar (which are at different heights) or even *within* it; or, again, separating the bars a little and making the type size a bit smaller and consistent.

Line Graphs

Nonbar graphs come in even more numerous varieties. With graphs you can show trends, correlations, and frequency distributions (various line graphs); rates of change (semilogarithmic graphs); changes in relative difference (area graphs); patterns among discrete random variables; and much more. The essence of a graph, however, in a majority of cases, is to show continuous relationships: data exist in some type of continuum defined by dependence between variables.

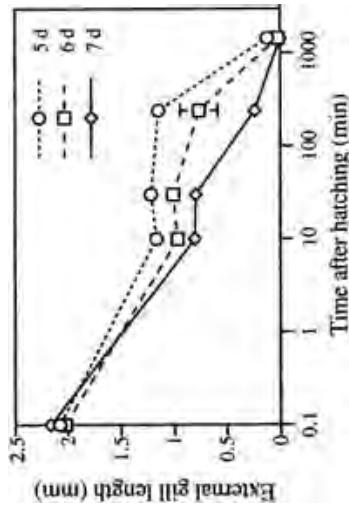


Figure 9.4 Example of a semilogarithmic graph (from Warkentin 2000, 559; used with permission)

Figure 9.4 presents a simple and wholly effective semilogarithmic graph, where time is the independent variable and is given in logarithmic scale. Nothing fancy is needed here; the graph compares changes in external gill length of tadpoles hatched at three different ages (5, 6, and 7 days). The text is clean, minimal, consistent. The axes are neatly labeled. The lines are clear and easily distinguished, and the data points are marked. Note that the logarithmic scale (x-axis) shows actual values (0.1, 1, 10, 100, etc.), not the logarithms (-1, 0, 1, 2, etc.). For much larger or smaller numbers, it is common to write in powers of ten, that is, 10^5 , 10^6 , 10^7 or 10^{-4} , 10^{-5} , 10^{-6} , and so on.

Compare this graph to figure 9.5, which includes three related plots, showing the concentrations of methane, carbon dioxide, and water in sediments of increasing depth below the sediment-water interface (marked as 0 on the vertical axis). Each graph carries six lines—six data sets—indicated by well-chosen standard symbols. There is some question as to whether the data for methane and carbon dioxide can be meaningfully distinguished and interpreted beyond general trends (which begs the question of why individual data lines are needed). In the graph for water content, meanwhile, this is less important, due to the tight clustering. How might the graph be improved? Here is a case where using color would make eminent sense. Possibly, the plots for methane and carbon dioxide would gain a bit of clarity (and meaning) if the intervals on the horizontal scale were widened. Finally, only one legend is really needed (it’s the same for all three graphs).

Deciding how many lines to plot, how many correlations to reveal, is obviously very important and can require experimentation. As figure

9.6 shows, it is sometimes possible to include many lines in an effective manner. Notice here how well-chosen the line patterns are in terms of the eye's ability to differentiate—an aspect that adds both clarity and visual appeal. At the same time, however, this is possible only because the lines do not cross each other very much. Were they to do so, it would be necessary to break the data out into two or three separate graphs.

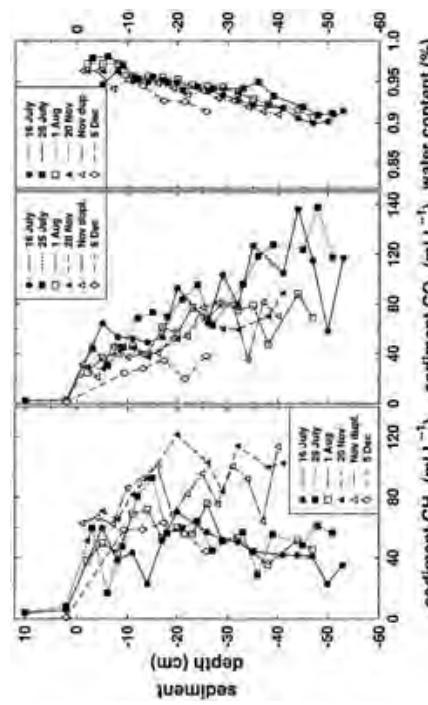


Figure 9.5 Example of a line graph (from Adams and Naguib 1999, 94; used with permission of Schweizerbart Publishers, www.schweizerbart.de)

9.6 shows, it is sometimes possible to include many lines in an effective manner. Notice here how well-chosen the line patterns are in terms of the eye's ability to differentiate—an aspect that adds both clarity and visual appeal. At the same time, however, this is possible only because the lines do not cross each other very much. Were they to do so, it would be necessary to break the data out into two or three separate graphs.

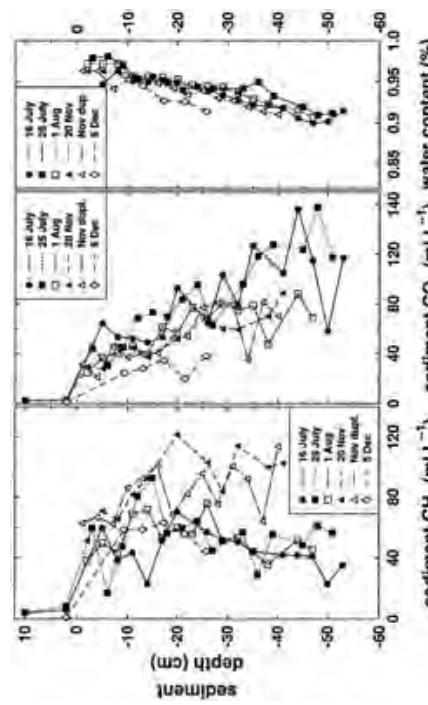


Figure 9.5 Example of a line graph (from Adams and Naguib 1999, 94; used with permission of Schweizerbart Publishers, www.schweizerbart.de)

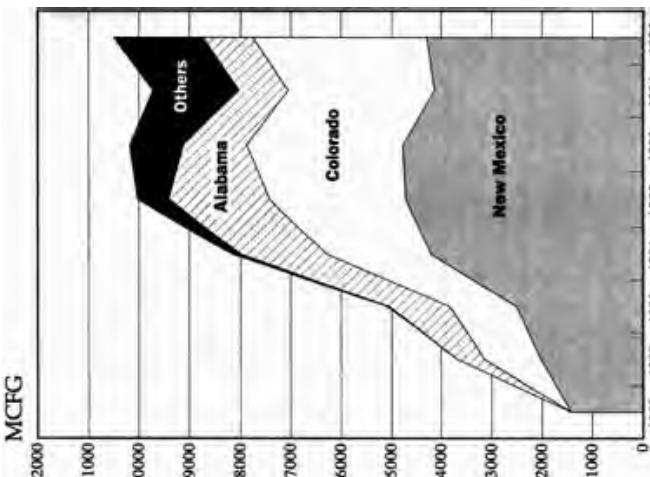


Figure 9.7 Example of an area graph (from Murray and Schwuchow 1997, 32; used with permission)

Visually speaking, moreover, not all lines are created equal: note how the thicker, solid plots, draw attention and imply importance, while the thinner, more broken ones carry much less psychological weight. Perhaps the only way to improve this example is to make the y-axis more consistent in interval labels, that is, 10^{-5} (we don't need the “1 ×”), 10^{-4} , and 10^{-3} .

Another type of line graph, sometimes called an area graph, appears in figure 9.7. This type of data display is used to show both progressive change and comparisons between different data fields. Note how important it is to use different and easily distinguished patterns within each data field. Color is not necessary here, but could be a help if a larger number of fields were plotted. Small improvements might be made: the axes might be better labeled (MCFCG might be written out along the y-axis, “Million Cubic Feet of Gas”); we might want to extend the data fields through dashes (projected) to the right margin of the graph. On the whole, however, this is an informative and well-done figure.

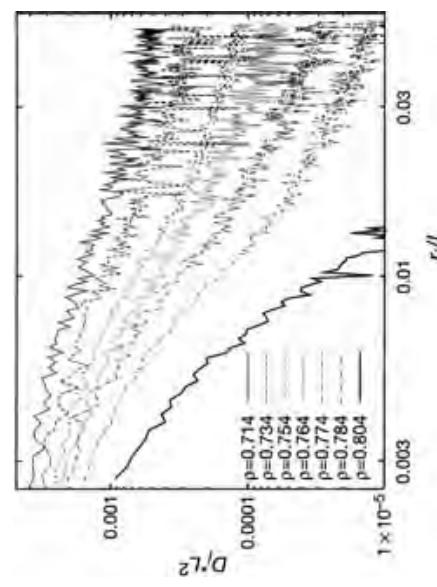


Figure 9.6 Example of a complex line graph (from Santen and Krauth 2000, 55; copyright 2000 *Nature*; used with permission)

Maps and Diagrams

Figures 9.8 and 9.9 show maps with a specific problem. Figure 9.8 is meant to compare precipitation levels associated with the 1997–1998 El Niño phenomenon, but the maps are far too small to read and interpret on any intelligent basis. In such cases, the editor of the journal and the authors of the article need to make a decision that favors their readers, not the data alone. If no more space could be allotted these images than is shown, they should have been deleted or else one map selected and shown at larger size. As it is, they provide more in the way of frustration than enlightenment.

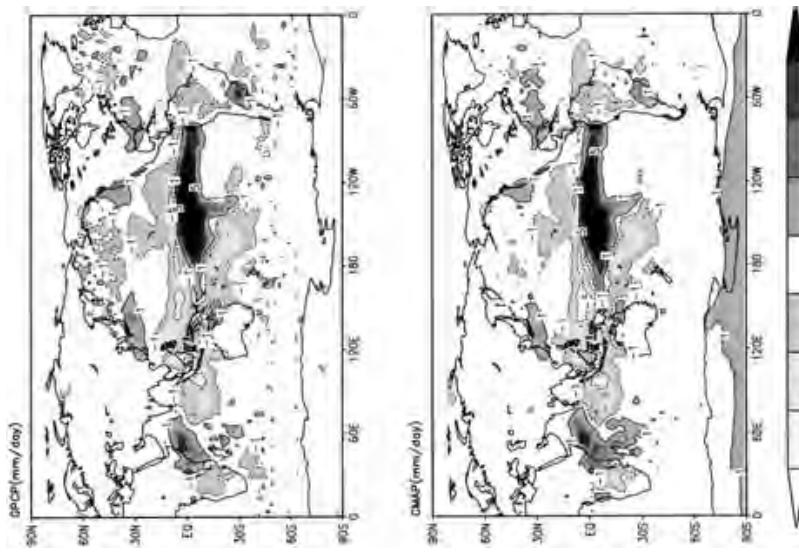


Figure 9.8 Example of maps that are too reduced to be easily read (from Guber et al. 2000, 264); copyright American Meteorological Society; used with permission)

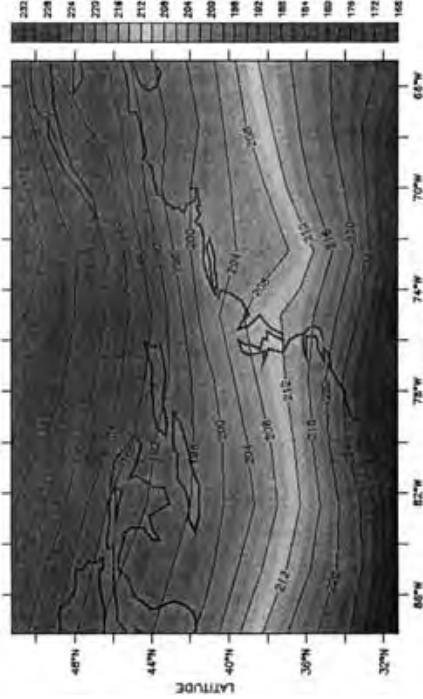


Figure 9.9 Example of a map that is difficult to read due to loss of color (from Bess et al. 2000, 2649; copyright American Meteorological Society; used with permission)

Figure 9.9, meanwhile, offers us another type of disappointment. Images originally drafted in color, for talks or poster presentations for example, do not always translate well into black and white or gray scale. Here, the data would be illegible if the contours weren't numerically labeled; certainly the scale on the right is of little help. The figure would have been clearer if it lacked shading altogether and merely offered its contours against a white background. Were color to be restored to this map, however, its message would be enhanced enormously, wellbeyond any black-and-white version. The power of color to reveal gradation and to highlight peaks and lows in such a data set is great indeed, and can offer the eye pleasure and the mind definite advantage. Such advantage, to be sure, must be weighed against cost. If color proves too expensive, yet is deeply integral to the meaning, the figure may need to be redrafted, as is the case here.

Which brings us to the example of figure 9.10. Let us admit, up front, that computer-generated presentations are a major advance for scientists. Indeed, they are far more simple, efficient, and (even) fun to create than the old, laborious, hand-drawn figures and typed-out tables we used to produce. But this new ease of creation comes with a price. In a great majority of cases, illustrations generated by computer for slide or other presentations do not make good visuals for published articles—unless revised with hard-copy standards in mind. Briefly put, we are

dealing here with two very different media, each with its own distinct needs and limits. A graphic like the top panel of figure 9.10, with its verbiage surrounding and inhabiting the data, plays very well up on the big screen, but looks clumsy and amateurish in print. Much of the writing here is interpretive and belongs in the main body of the article itself. To appear in a high-quality journal, the graphic would need to be revised as shown in the bottom panel of figure 9.10; title removed, interpretive text deleted, axis labels reduced in size, lines thinned.

Cook Inlet Desorption Data

Results:

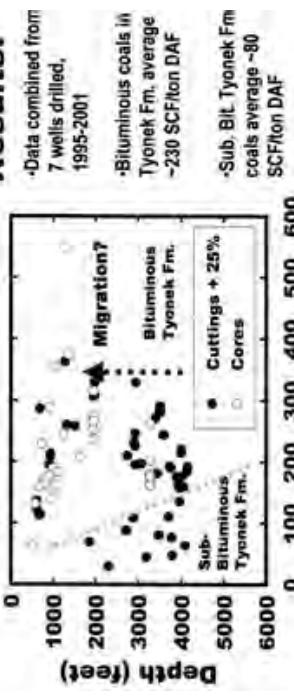


Figure 9.10 Example of computer-generated graphic. *Top*, unedited from use in oral presentation; *bottom*, properly edited for print

Schematic diagrams are quite common in science and, as their name implies, are usually most effective when kept as simple as possible. Figure 9.11 is an illustration of a dipolarization model that shows this very well. The image employs basic shapes and visual elements (circles, dots, arrows, different types and thicknesses of lines). It makes good use of space, being neither crowded nor too open. It includes a minimum of text; in fact, the use of words on the diagram is a good thing, since it gives us valuable orientation and prevents the figure as a whole from becoming a mosaic of single-letter symbols.

Another good example is figure 9.12, which depicts how a particular

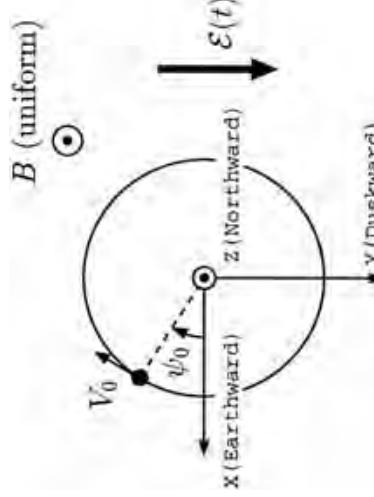


Figure 9.11 Example of a schematic diagram (from Nösé et al. 2000, 23283; copyright 2000 American Geophysical Union; reproduced with permission)

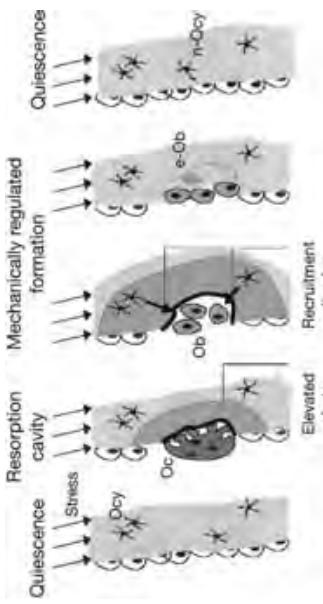


Figure 9.12 Example of a process diagram (from Huiskes et al. 2000, 705; copyright 2000 Nature; used with permission)

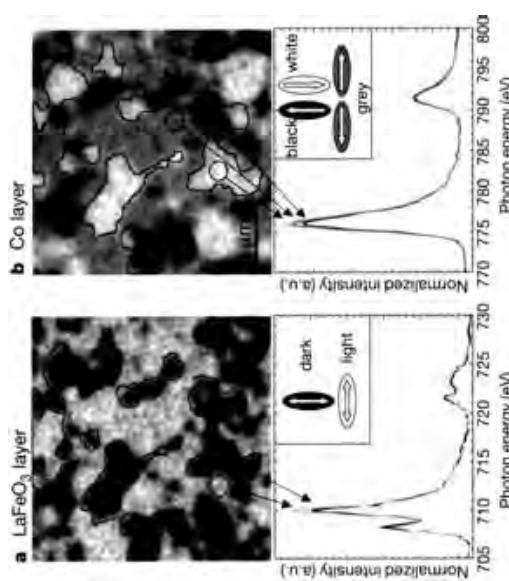


Figure 9.13 Example of a combination diagram, showing two types of images successfully integrated (from Nolting et al. 2000, 767; copyright 2000 *Nature*; used with permission)

type of bone responds to an applied stress. In this case, the diagram shows a cyclic progression of states, involving a temporary weakening of bone mass (through the formation of a cavity and resulting increase in strain) and its repair. A reader can follow the process easily, from left to right. Again, there is minimal text, just enough to identify crucial elements (all abbreviations are explained in the caption). Color is not needed here, since shading can accommodate everything shown. Is the figure perfect? No such phenomenon exists. Some scientists would find value in numbering each of the stages and using these to explain the process in the caption or main text; this would be efficient and effective and would not add overly to the information shown. Others might provide a legend explaining each of the shaded areas, as well as abbreviations.

Combination diagrams, in which two or more types of illustrations are grouped together, have become quite common in many scientific publications. This has led to many fertile blendings of visual information. In figure 9.13, images and spectral graphs are nicely juxtaposed to illustrate behavior of alternating ferromagnetic and antiferromagnetic layers within a given substance. This figure contains a large amount of information, but presents it clearly and even elegantly. Note, for exam-

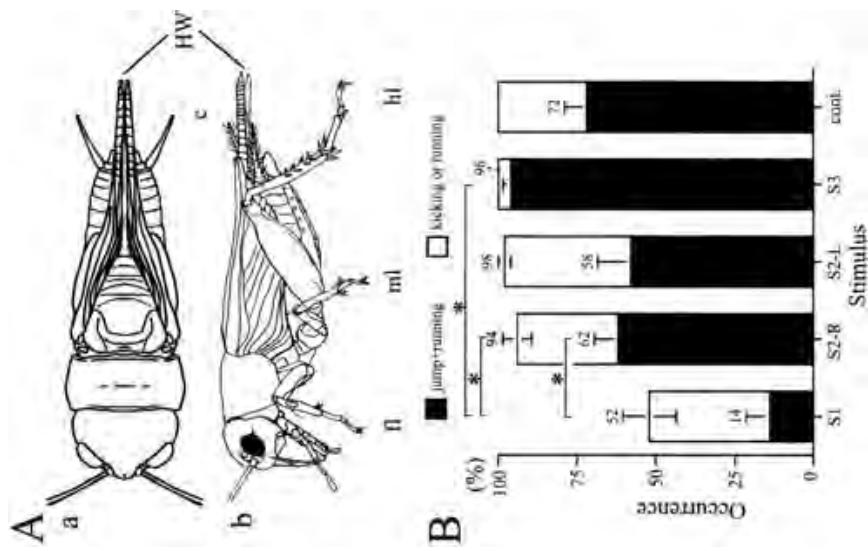


Figure 9.14 Example of a successful combination diagram (from Hiraguchi and Yamaguchi 2000, 1332; copyright 2000 Elsevier Science; used with permission)

ple, how each half of the total is visually balanced, with the legend inserted neatly into the upper right portion of the respective graph (which would otherwise show a lot of white space). Small arrows are used to point portions of each image to its respective position on the spectral graph. Though the overall size of the figure is small, the text and numbers are large enough and in an appropriate font to be easily legible. Another example is given in figure 9.14. Here a specimen drawing is combined with a histogram. The drawing indicates the few key ana-

tomical features of the cricket relevant to the experiments, with the most prominent of these (HW) shown in capital letters to emphasize their central importance. The histogram, meanwhile, plots two types of escape behavior for four different kinds of stimuli (plus a control group), each of which was applied to the HW (hindwing tip). At first, everything looks to be in good order. But when we examine the details of the figure, a few problems emerge. Notice that there are two sets of *a* and *b* images, one in uppercase, the other in lowercase, plus a *c* designation on the upper specimen drawing. Probably the lowercase *a* and *b* could be replaced with numbers or deleted altogether. It would also help, to avoid any confusion, to place the legend (black box, open box) at the bottom. There is also enough space on the figure to write out the words for the anatomical features indicated on the drawing, none of which is very long (foreleg, midleg, hindleg, circus, hindwing). This would reduce the burdens on the caption to list and explain a large number of symbols, a consideration worthy to be granted the reader. There is one other problem with this figure that we will leave aside for a moment.

As a final example, I turn to an illustration that reveals how far the combining impulse has been taken in recent times. Figure 9.15, from the premier journal *Cell*, shows six different types of images merged into a single visual conglomerate. These images include a schematic drawing, two line graphs, a scattergram, a histogram, and two tunneling electron micrographs. The caption, not surprisingly, reads like a head-line: “*Su(H)* Auto-Activation is Required for Normal Mechanoreceptor Function,” with the following explanation of each segment (A–G) requiring nearly half a page.

Many editors, I imagine, would go to war over this sort of thing. But the fact is that it has become an established and often-used *modus illustratis* in certain branches of science and serves a valuable function. Not only does it offer more data, often important data, than would be possible if each graphic were given individual space; it also creates something like a miniauticle within the larger paper or report, thereby providing a kind of added expressive dimension to the whole. Obviously this is an approach that can easily be taken too far; visual chaos and confusion are the inevitable result if too many dissimilar graphics are crammed into a single space. Figure 9.15 suggests the limit, though (in my opinion) does not approach it. Such a medley should never be done pell-mell. A clear progression and logic must be established between the individual images. Data dumping is an affront to the reader, no matter if done in images or in writing.

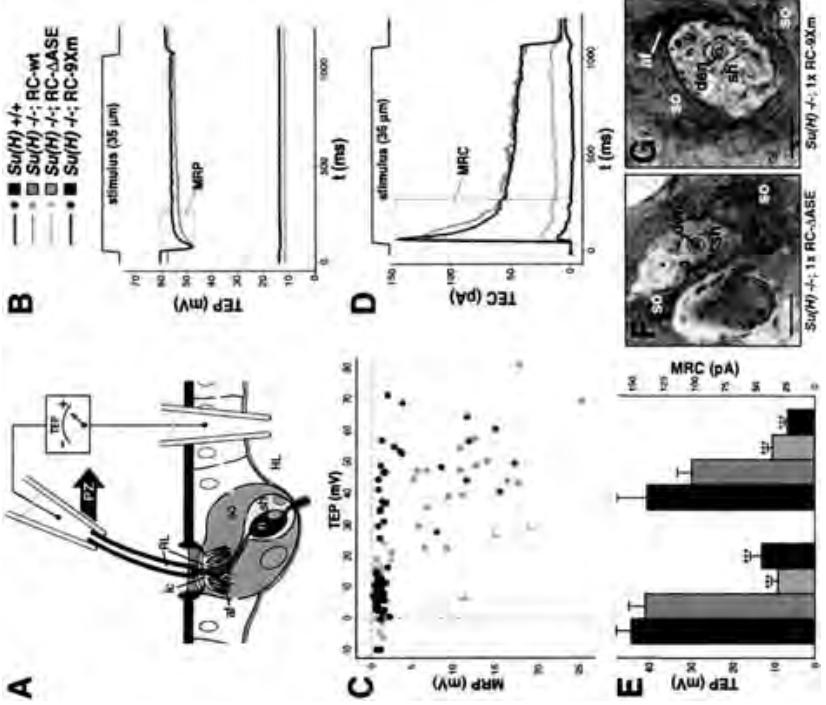


Figure 9.15 Example of a highly complex combination diagram, involving a wide range of image types (from Barolo et al. 2000, 964).

REFERRING TO ILLUSTRATIONS IN YOUR TEXT

Part of the craft (and sometimes art) of good scientific writing is knowing how to integrate graphical materials. Visually, illustrations are embedded in the text, like boulders in a stream, but you want them to be part of the flow as well. Perhaps a better metaphor is the quilt: graphics need to be sewn or woven into the larger pattern of meanings. The reader should be told their significance, why they are there and what they show, and this needs to be done at certain points in the narrative, and in certain ways. How and where you refer to your visuals can make

a subtle but very important impact on the reader's experience of your document.

There are two basic ways to refer to figures in the text. One is indirect, with the reference placed in parentheses, for example, (fig. 1.2); this is the most common form. The other approach is direct and makes the graphic a subject of discussion, for example, "Figure 1.2 shows . . ." Deciding which form is best often means choosing whether you want your reader to glance over a particular figure, or study it in extensive detail.

No hard-and-fast rules exist to guide you in your decision. But some commonsense precepts can be applied. If a particular graphic is used to demonstrate or establish an important finding or to suggest a central interpretation or conclusion, it is appropriate (though not necessary) to mention it directly, making it the subject of one or more sentences, even a paragraph. On the other hand, if you include a visual to illustrate a point made in the text, to give an example, or to sketch a piece of apparatus, then indirect reference is probably sufficient.

Among our examples, a few figures that might deserve direct discussion are 9.2, 9.11, and 9.12. Each shows information that is central to the narrative, representing a major result of the experiments performed. Indirect reference, meanwhile, seems more appropriate to graphics like 9.3, 9.7, and 9.10, which provide generalized data or schematic representations. In the end, such decisions can often be subjective. If you have doubts about how to handle a particular graphic, look at your models or check the recent literature to see how other authors have dealt with similar images.

Having made your choice as to direct or indirect reference, where should you place it? In what part of a sentence or paragraph? Too many authors, when it comes to indirect mention (in parentheses), jump the gun and insert the reference before the reader is really ready. Examples abound in the literature. Here's one:

The conventional structure of a bipolar transistor (Fig. 2A) requires three distinct material types: for example, a highly doped n-type layer . . . , a p-type base, and an n-type collector. (Cui and Lieber 2001, 852)

Note that the eye is told to abandon the sentence even before enough information is given for the figure to make sense. How are the authors using the figure? As written, they are emphasizing "conventional structure." But the actual message of the sentence and paragraph, and the figure too, focuses on the three parts of this structure, not its conventionality. Thus, it would be much better to place the figure reference either after the word "types" or, best of all, at the end of the sentence.

Another example relates to figure 9.7:

Proved [natural gas] reserves estimated by the U.S. Energy Information Administration have risen from 1.4 BCFG in 1988 to 10.5 BCFG in 1995 (Fig. 2 [our figure 9.7]), more than 70% of which occurs in Colorado and New Mexico. (Murray and Schwuchow 1997, 32)

Again, the reference belongs at the end of the sentence, after the pertinent information has been given. This cues the reader that *all* of the values mentioned are displayed on the figure, rather than reserves figures only. Note, too, that the reserve values given in the text are in BCFG (billion cubic feet of gas), rather than in thousand MCFG (million cubic feet of gas), as shown in the figure. This sort of discrepancy should be avoided. Using the same units in text and illustrations is needed to integrate the two.

Similarly, try to use phrases and terms in your captions that are picked up in the text. Much could be said (and has been) about how to write proper captions, what their length should be, whether to use full sentences or phrases, and so on. Standards here, as in so many other aspects, tend to change between fields and between journals. Make sure you're aware of any restrictions or rules given for your target journal or publisher. As always, where there is any doubt, use your model guides.

A FINAL POINT

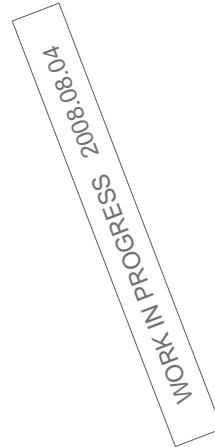
Scientific illustration, as it exists today in wondrous plenitude, can never be covered adequately by a single chapter such as this. Indeed, an abundance of volumes have been written on the topic, even on such seemingly humble forms as the chart or graph.⁹ I've tried to cover some of the more obvious and necessary aspects of creating good graphics, and of evaluating those of others.

Beginning authors, once familiar with the literature, may feel (and even be thankful) that the types of illustrations available to them for their own writing appear to comprise a set of fixed formulae. Closer inspection will show that this is rarely, if ever, true. For many early-career scientists, it is helpful to stick to the most common patterns. But experienced scientist-authors understand that illustrations are actually

⁹ A few sturdy works in this field include Wolff and Yeager 1993, Anholt 1994, Briscoe 1996, and, of course, the several well-known books by Tufte: *The Visual Display of Quantitative Information* (1983), *Envisioning Information* (1990), and *Visual Explanations* (1997).

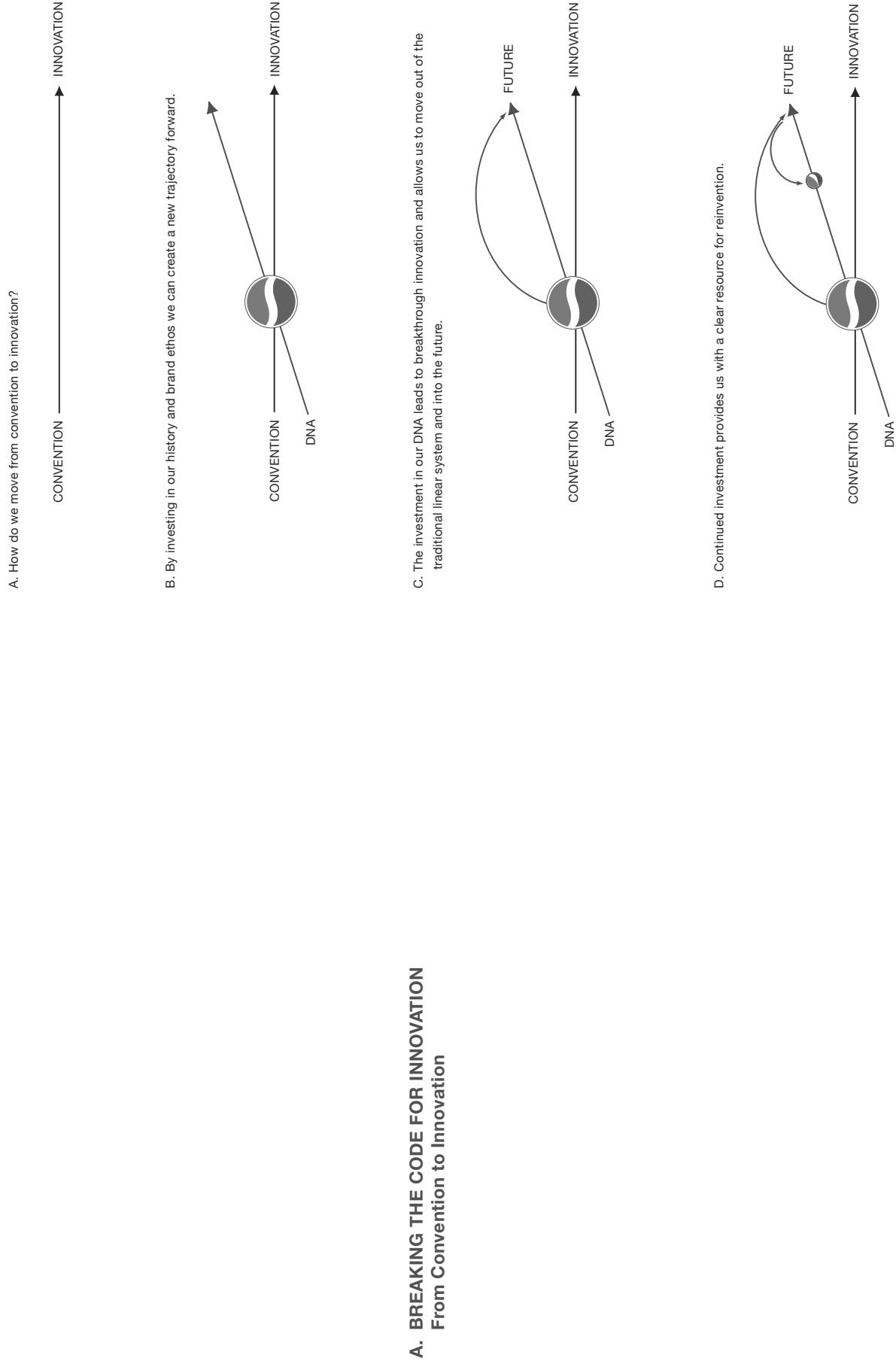
a flexible means of expression, and can be adapted, albeit conservatively, to individual cases. Close study of premier journals will prove this: different authors add modifications, sometimes small, sometimes significant, to what are otherwise standard graphical templates, and they do this in order to make their message a bit more efficient and elegant. Here, too, just as with writing itself, one can ultimately choose between functional and creative approaches.

BREATHTAKING
Design Strategy
2008.08.04
ARNEILL GROUP



BREATHTAKING

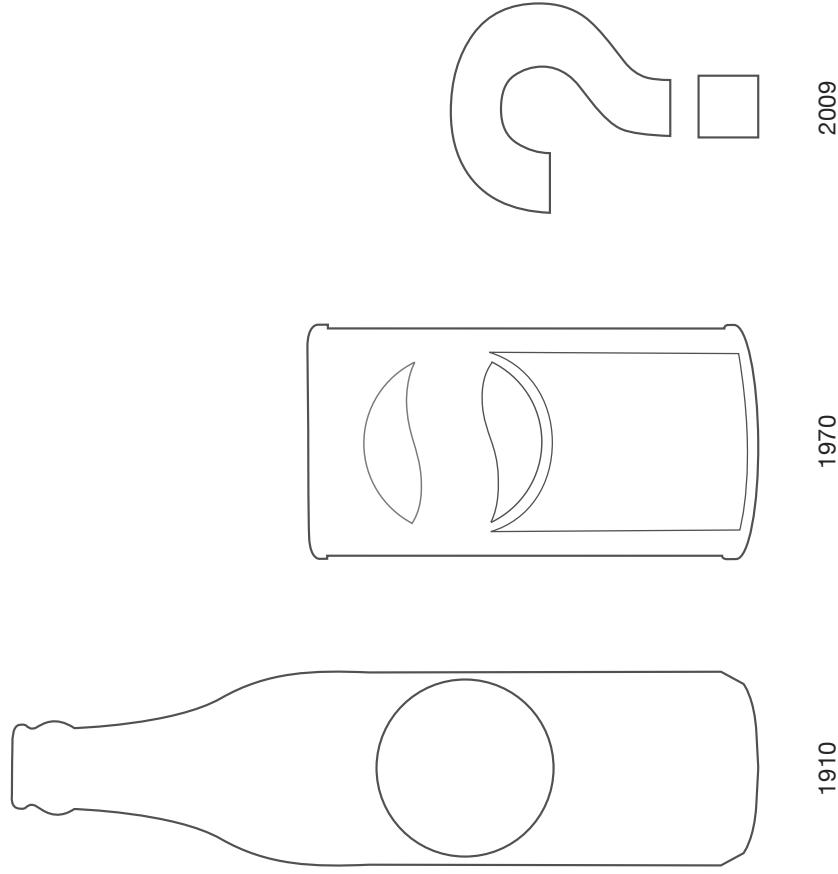
Trajectory of Innovation



BREATHTAKING

Brand Heritage and the Aesthetics of Simplicity

The Pepsi ethos has evolved over time. The vocabulary of truth and simplicity is a recurring phenomena in the brand's history. It communicates the brand in a timeless manner and with an expression of clarity. Pepsi BREATHTAKING builds on this knowledge. True innovation always begins by investigating the historic path. Going back-to-the-roots moves the brand forward as it changes the trajectory of the future.



B. THE ORIGINS OF CREATIVE ENDEAVORS

Universal Design Principles and PepsiCo's Brand Heritage

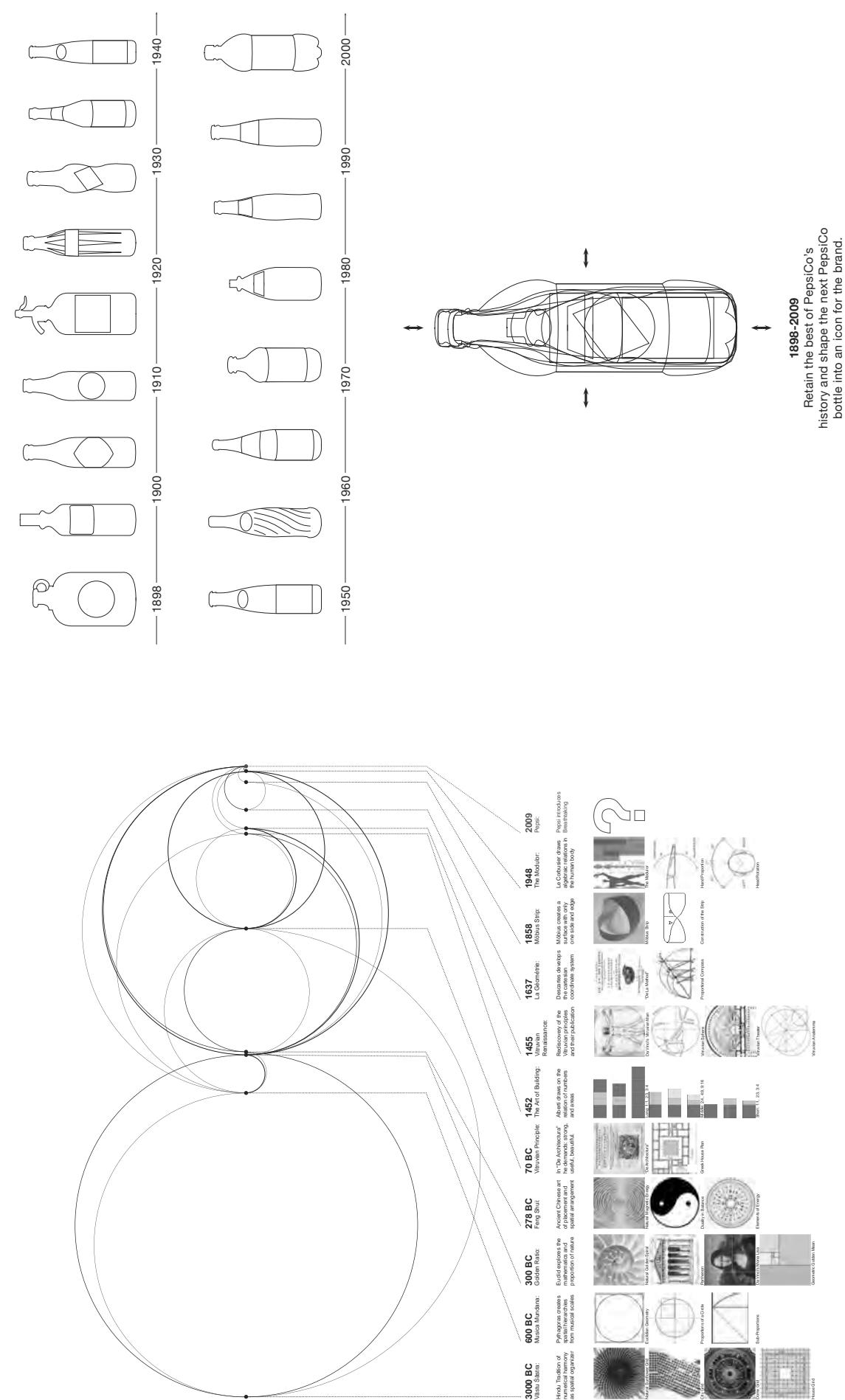
BREATHTAKING

Universal Design Principles

BREATHTAKING
Iconic Geometry

BREATHTAKING is a strategy based on the evolution of 5000+ years of shared ideas in design philosophy creating an authentic Constitution of Design. This chart documents the origin and evolution of intellectual property.

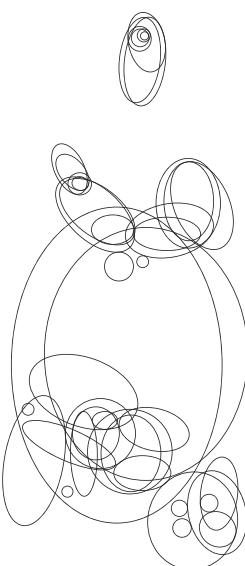
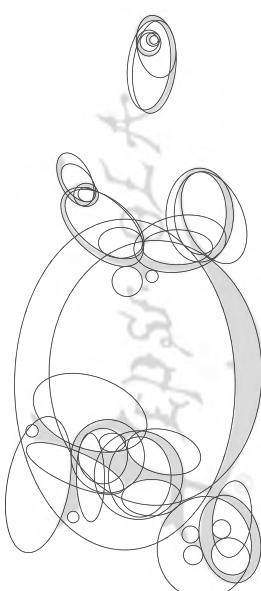
Derived from PepsiCo's rich packaging legacy and inspired by some of its earliest forms and proportions, **BREATHTAKING** revitalizes the essence of PepsiCo in creating an iconic shape for the brand.



BREATHTAKING
Tracing the Pepsi DNA - 1898

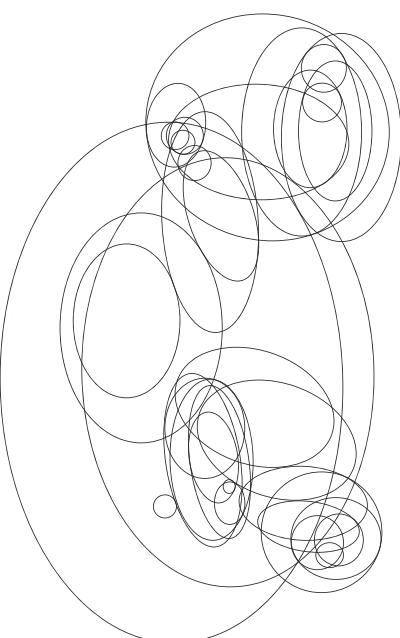
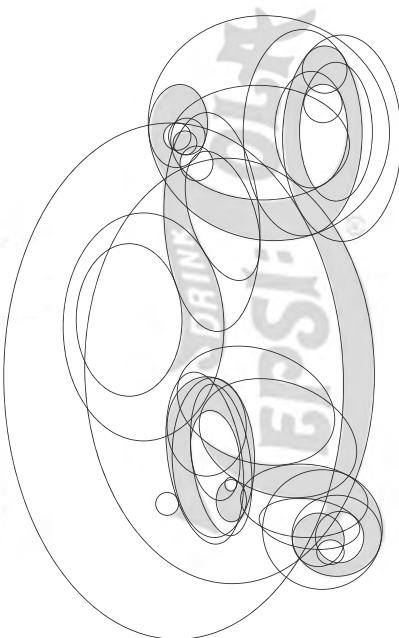
1896 Pepsi Geometries: Perimeter Oscillations

The Pepsi DNA finds its origin in the dynamic of perimeter oscillations. This new identity manifests itself in an authentic geometry that is to become proprietary to the Pepsi culture.



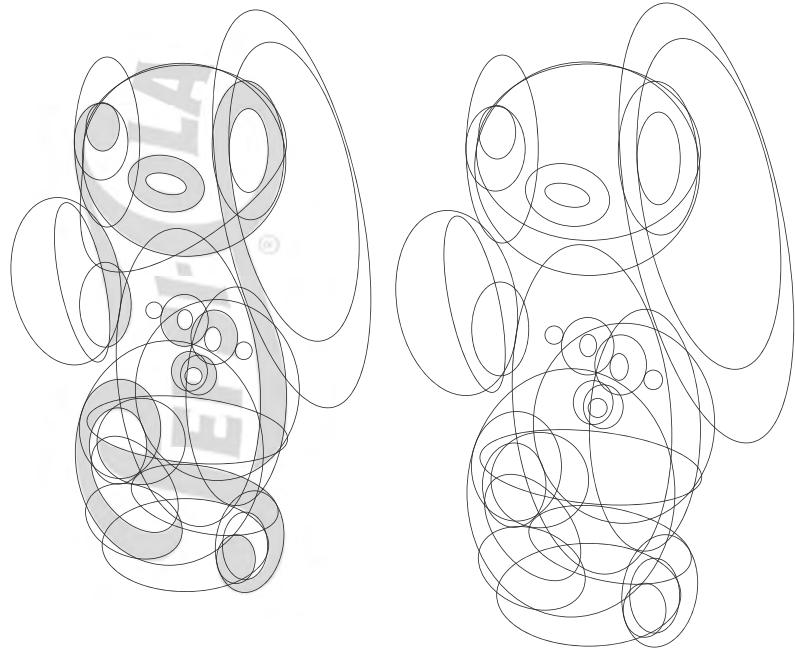
BREATHTAKING
Tracing the Pepsi DNA - 1905

1905 Pepsi Geometries: Perimeter Oscillations



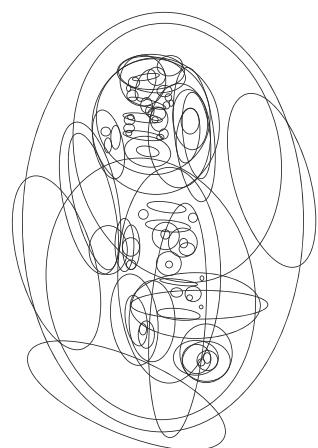
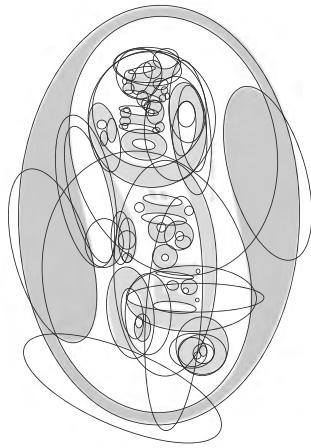
BREATHTAKING
Tracing the Pepsi DNA - 1906

1906 Pepsi Geometries: Perimeter Oscillations



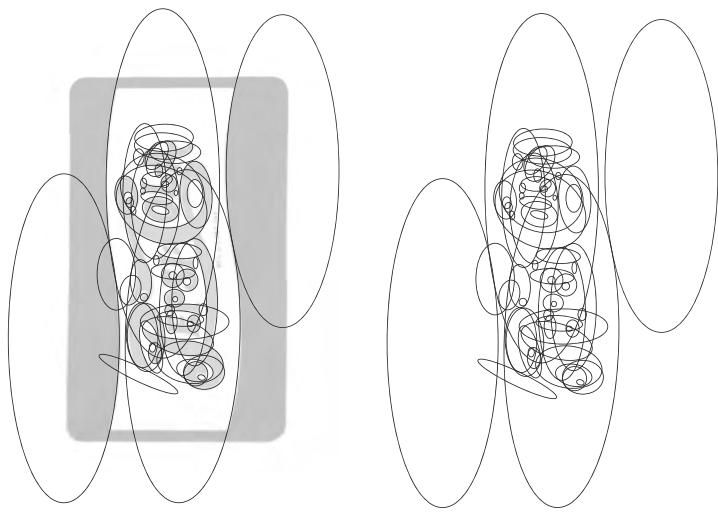
BREATHTAKING
Tracing the Pepsi DNA - 1929

1929 Pepsi Geometries: Perimeter Oscillations



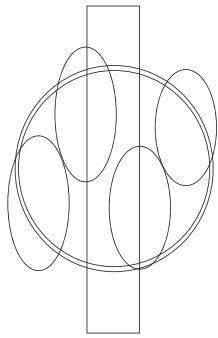
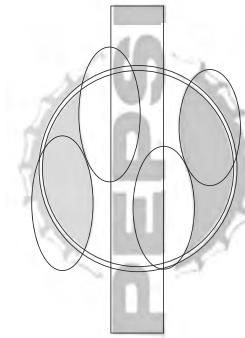
BREATHTAKING
Tracing the Pepsi DNA - 1930

1930 Pepsi Geometries: Perimeter Oscillations



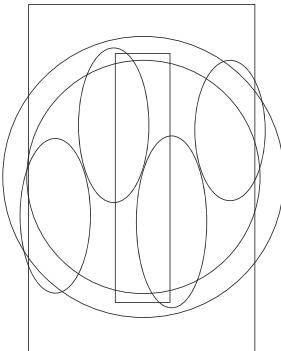
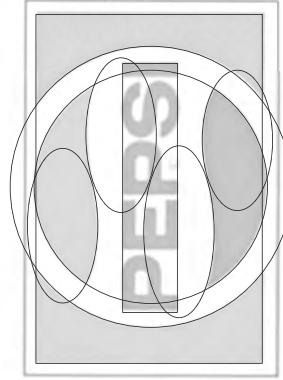
BREATHTAKING
Tracing the Pepsi DNA - 1962

1962 Pepsi Geometries: Perimeter Oscillations



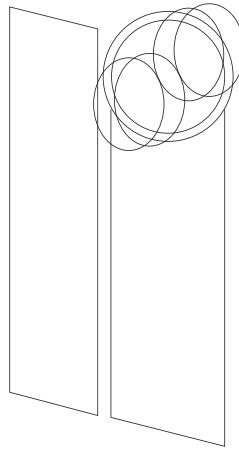
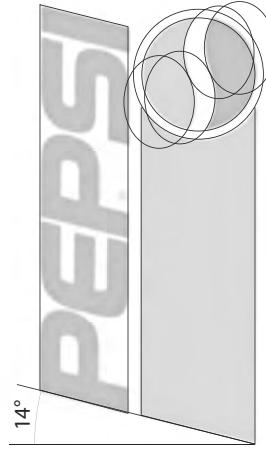
BREATHTAKING
Tracing the Pepsi DNA - 1971

1971 Pepsi Geometries: Perimeter Oscillations



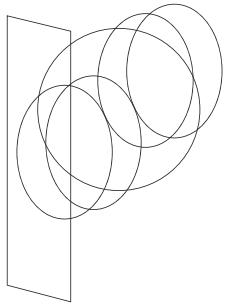
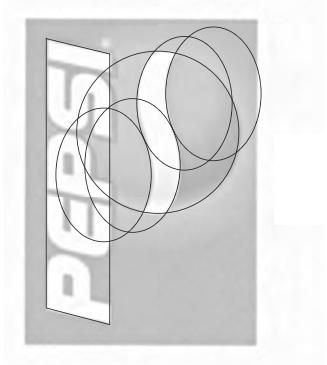
BREATHTAKING
Tracing the Pepsi DNA - 1991

1991 Pepsi Geometries: Perimeter Oscillations



BREATHTAKING
Tracing the Pepsi DNA - 1998

1998 Pepsi Geometries: Perimeter Oscillations



C. TOWARDS INNOVATION: PROJECTING PEPSI'S FUTURE
Applying Universal Laws to Establish a Blueprint for the Brand

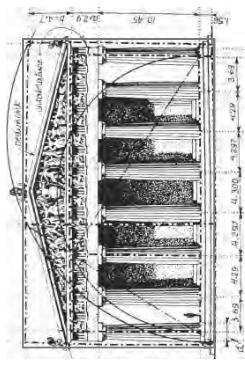
BREATHTAKING

Creation of Identity: Precedents

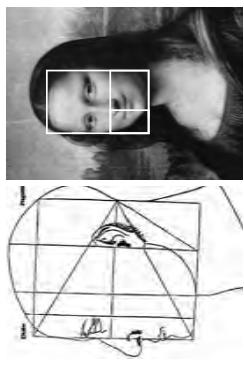
BREATHTAKING

Creation of Identity: A Blueprint for Proportions

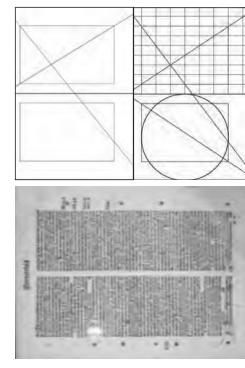
Artists and architects have proportioned their works to approximate the Golden Ratio, especially in the form of the Golden Rectangle, in which the ratio of the longer side to the shorter is the Golden Ratio. They believe this proportion to be universally and aesthetically pleasing. The Golden Ratio plays an essential role in human perception of beauty.



Height and width of the Parthenon is proportioned to yield a Golden Rectangle.



Leonardo Da Vinci studied the proportion of the human face and applied his findings in the Mona Lisa painting.

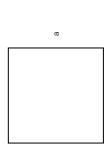


Book format and page layout are based on the Golden Proportion.

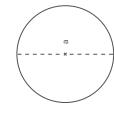


The diameter of the Nautilus Shell increases proportionally with the Golden Ratio.

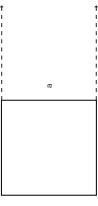
A. The Golden Ratio
It starts with a square.



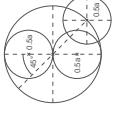
B. The Pepsi Ratio
It starts with a circle.



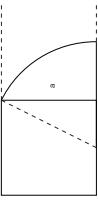
1. Draw a circle with diameter $d=a$.



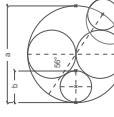
2. Find its center and draw two same size circles with diameter $d=0.5a$.



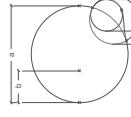
3. Rotate the centerline 45° . Copy one of the smaller circles. Place its center on the intersection of the larger circle and the rotated centerline.



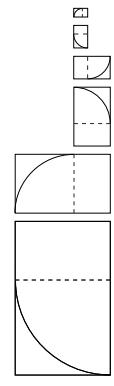
4. Draw a circle that lies within the larger one. Its diameter is such that it touches all three circles in exactly and only in one point.



5. Rotate the centerline by 56° . Place the smallest circle with its center on the intersection of the largest circle and the rotated centerline.



6. The Pepsi brand is created by intersecting circles with a set proportion to each other. The coordinates are marked (x).



7. The Pepsi Ratio is created by two simple circles that are in a set ratio to each other. The Golden ratio.



8. The Pepsi Ratio is aesthetic geometry.

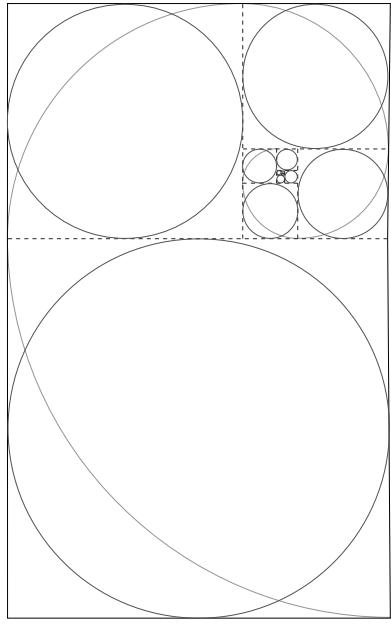
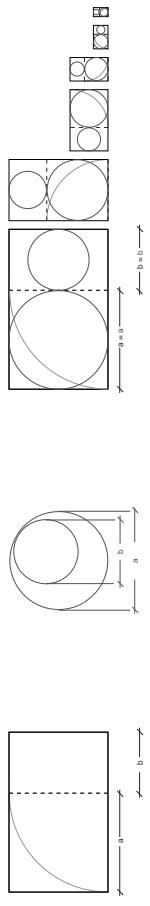
BREATHTAKING

Creation of Identity: Scales and Dynamic Relationships

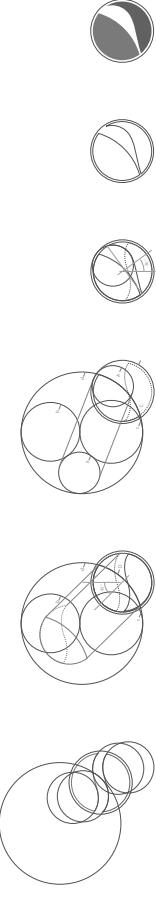
BREATHTAKING

Creation of Identity: Dynamic Forces

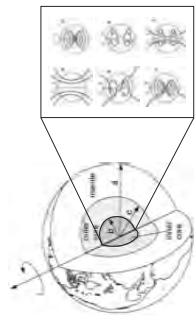
A. Geometry of Aesthetics: Proportion
 The Golden Ratio establishes a proportion of one part (a) relative to another (b). Playing by these rules produces an aestheticism that is universally accepted to be in balance and harmony. The Pepsi aesthetic respects these rules. The brand identity can be derived from two circles, that have a set relation to each other.



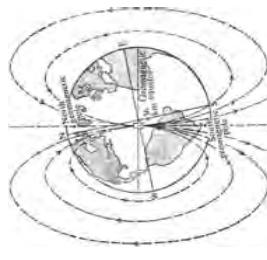
B. Geometry of Aesthetics: Dynamics



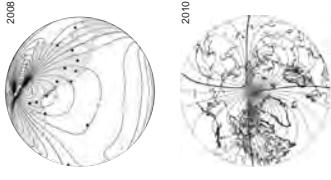
A. The Earth's Geodynamo
 A naturally occurring electric generator in fluid motion generates and sustains the Earth's magnetic field.



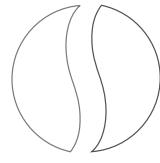
B. Magnetic Fields
 Magnetic fields exert forces on inner and outer surfaces of the Earth.



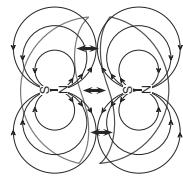
C. Magnetic Dynamics
 Magnetic fields are impacted by sun radiation and wind motion.



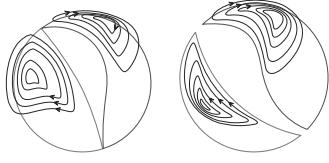
A. The Pepsi Globe



B. Pepsi Energy Fields
 Symmetrical energy fields are in balance.



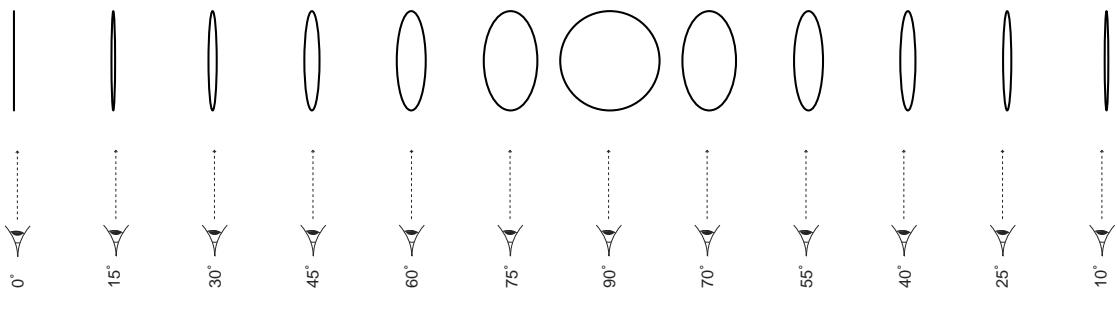
C. The Pepsi Globe Dynamics
 Asymmetrical forces shape the gestalt of the brand identity.



BREATHTAKING

Creation of Identity: Multiple Perspectives

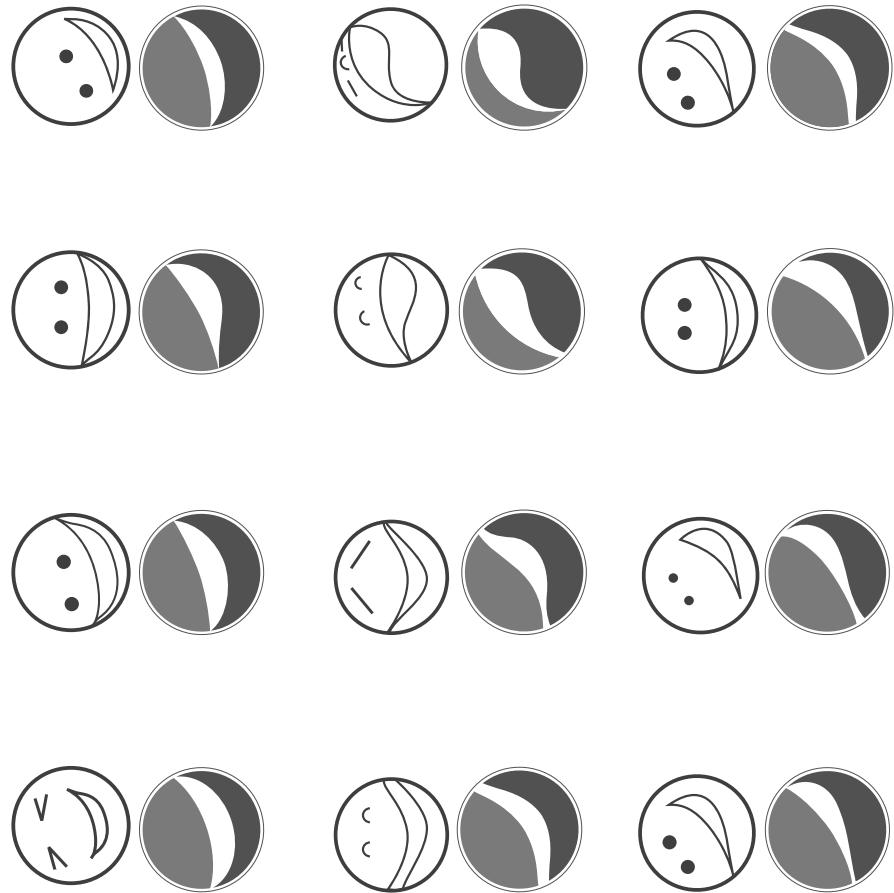
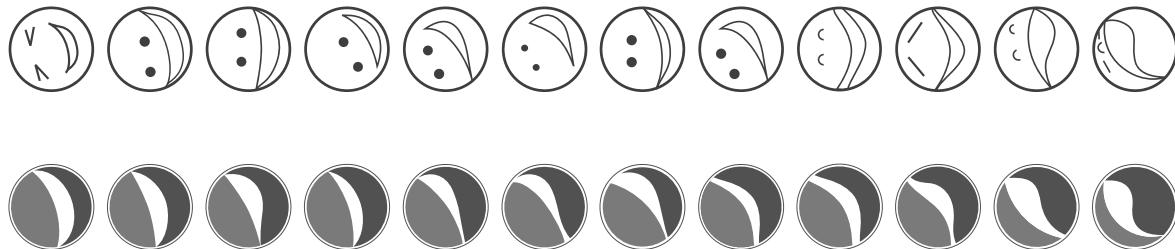
Multiple Point of views, One Object



BREATHTAKING

Creation of Identity: The Face of a New Generation

One Identity, Multiple Emotions



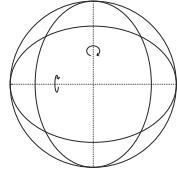
BREATHTAKING

Creation of Identity: A Multi-Dimensionalized Brand

BREATHTAKING

Creation of Identity: Color Theory

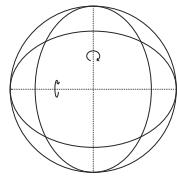
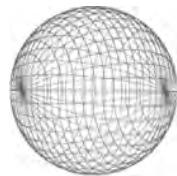
A. Motion Transforms 2D into 3D



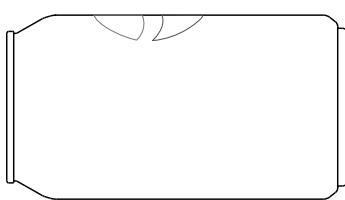
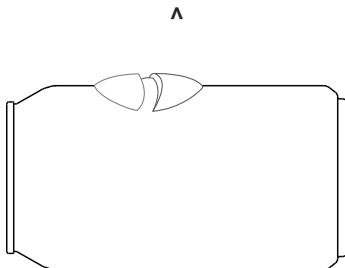
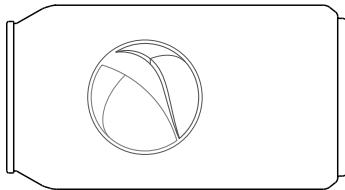
A. Objective Color / Subjective Emotion

Each color on the color wheel is associated with a subjective psychic and emotional value.
The Breathaking Color Palette is derived using a scientific method of color assignment based on the product's essence and primary features.

From 2D Circle to 3D Sphere
A sphere is defined as the surface formed by rotating a circle about any diameter.

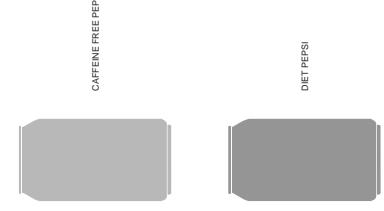
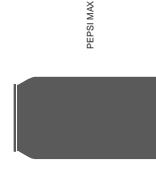
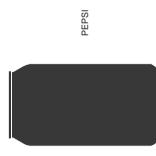


B. The Brand Identity is Dimensionalized through Motion



B. Breathaking Color Palette

The Breathaking Color Palette is derived using a scientific method of color assignment based on the product's essence and primary features.



▲

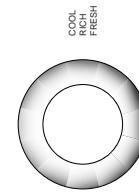
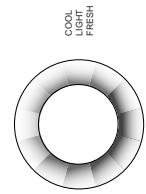
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CAFFEINE FREE DIET PEPSI



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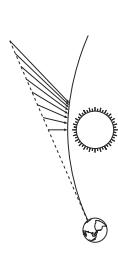
BREATHTAKING

Creation of Identity: Gravitational Pull

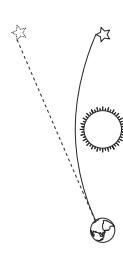
Attraction Theory: The Pepsi Proposition
Establishment of a gravitational pull to shift from a "transactional" experience to an "invitational" expression.



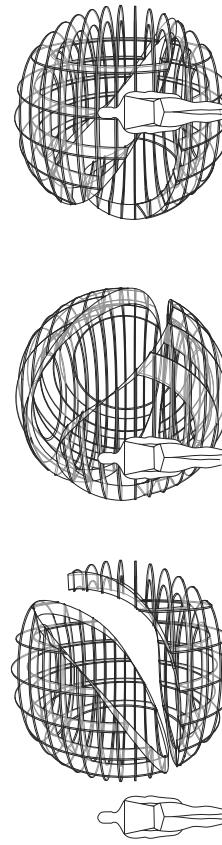
Typical Light Path



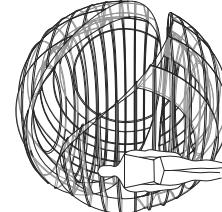
Light Path with Gravitational Pull



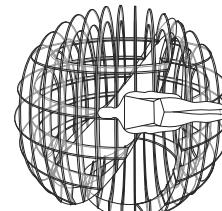
Relativity of Space and Time



Pepsi Aisle 60°



Pepsi Aisle 30°

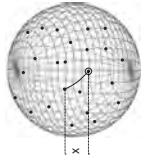


Pepsi Aisle 10°

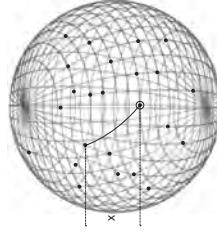
BREATHTAKING

Creation of Identity: The Pepsi Universe

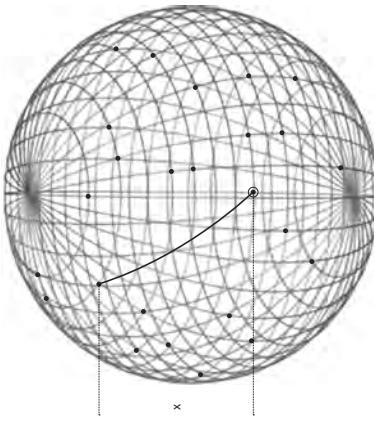
A. Universe Expansion
The universe expands exponentially with $f(x)=e^x$.
[1 light year = 671 million miles per hour].



$x=1$ light year

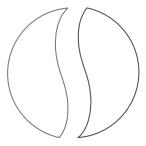


$x=2$ light year

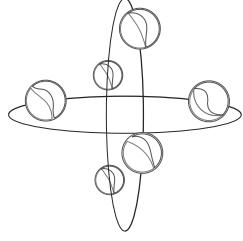


$x=8$ light year

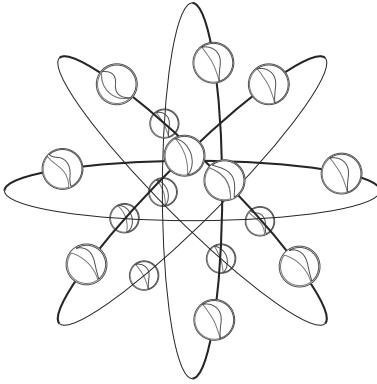
B. The Pepsi Orbits
Dimensionalize exponentially.



Pepsi Planet



Pepsi Galaxy



Pepsi Universe

Think digital marketing is all it takes to reach this group? Think again.

GEN Z: DECODING THE DIGITAL GENERATION

Think digital marketing is all it takes to reach this group? Think again.

When it comes to the latest in digital technology, Gen Z is on the leading edge. Born after 1997, this generation has been growing up side by side with the internet. Everything they do is digital, from connecting with friends, to learning at school, to gaming and entertainment—and it all depends on the gadgets they buy. For marketers that want to connect with this group, digital often feels like the only channel worth connecting on. Or is it?

A new survey in conjunction with global Student Affinity Network UNiDAYS finds Gen Zers are more complex than the marketing myths would have us believe—and also more unified, with respondents from the U.S., the U.K., Australia and New Zealand generally responding to survey questions similarly. Gen Zers, no matter where they live, take digital in stride—and for granted—as opposed to previous generations that find digital technology new and exciting. While certain digital items are essential life-savers for Zers (98 percent own a smartphone, 94 percent have laptops), many aren't. Only 14 percent own a smartwatch and only 18 percent use fitness trackers.

In other words, they're part cutting-edge and part traditionalist. They may love browsing online, but studies show they still enjoy shopping at brick-and-mortar stores. They may get news via social media but overwhelmingly prefer print books over digital ones.

For marketers, this kind of information is critical. Zers made up 26 percent of the U.S. population as of 2017—and control up to \$143 billion in U.S. spending power, as estimated

by Millennial Marketing. Given the growing power of Gen Z, marketers need to connect with them, stat.

Myth vs. reality

To find out more about this group, UNiDAYS surveyed 22,723 college-age respondents from the U.S., the U.K., Australia and New Zealand about their technology usage and purchasing habits. What it found reinforces the fact that marketers can no longer depend on the time-honored tactics that worked with Millennials, Gen Xers and Baby Boomers. A carefully balanced, omni-channel and personalized approach is needed to make a lasting connection with this highly influential consumer group.

To help marketers, we've identified five widespread misconceptions. We're countering those myths by giving you stats that accurately reflect college-age Gen Zers' tech habits.

1. You may think: Gen Zers—the so-called iGen—are "digital natives," so they'll respond better to digital messaging than any other form of media.

Here's the reality: It's more complex than an "it's Complicated" relationship status on Facebook. With their entire lives dominated by online activity and its constant stream of ads and messaging, they usually ignore digital noise unless it's relevant. For example:

- Sixty-four percent don't listen to podcasts.
- Fifty-six percent don't click on ads when browsing websites.
- Eighty-four percent pay attention to out-of-home advertising.

GEN Z: DECODING THE DIGITAL GENERATION

Engaging Gen Z digitally just isn't enough. Marketers need to dive not only into specific digital channels, but into specific digital platforms as well. For example, you might think Facebook Live would be a great place to reach Gen Zers. Wrong. Eh. Buzzer sound. Seventy-four percent of survey respondents said they don't watch Facebook Live shows or video streaming shows. Those who do opt for events, concerts and influencers.

Engaging Gen Z on "social media" is a generic, sure-to-fail strategy. It would be like saying "shopping malls" were a good way of engaging Baby Boomers or members of the Silent Generation. Nice recommendation and all, but can we please be more specific? With Gen Z, we see the same need for specificity come into play. They may not be keen about website ads, but 84 percent said they pay attention to digital ads in familiar media placements such as trains, malls, airports and taxis. **Key takeaway:** Whether they're online or off, Gen Z is all over the place when it comes to engagement with brands. Don't take a one-size-fits-all approach when speaking to their interests—odds are you'll be wasting valuable ad dollars speaking to a whole lot of empty air. What's more, do not depend on "cutting-edge technologies" as your go-to, fix-it-all savior when engaging Gen Zers. You need to make sure you're creating content tailored to Gen Z, and that you're using not only the channels but the actual platforms they frequent.

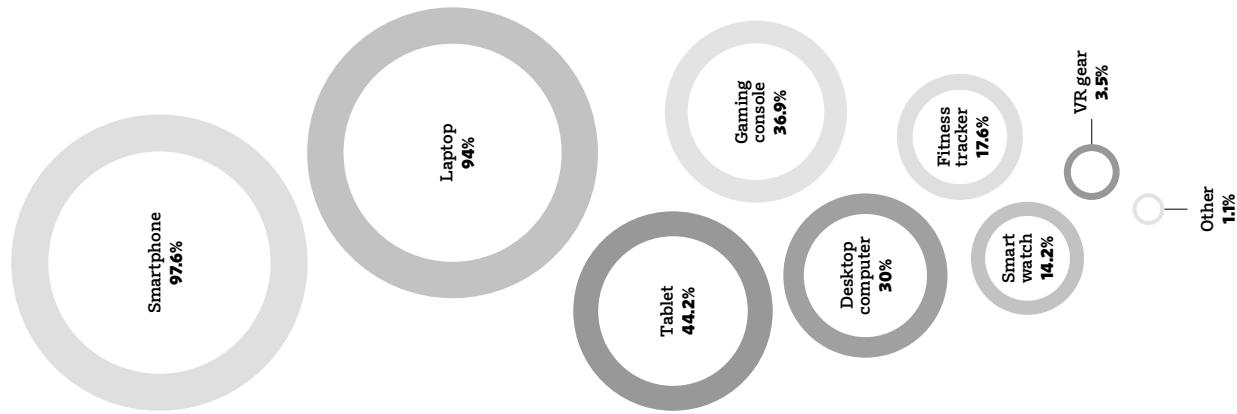
2. You may think: Gen Z won't pay for apps. **Reality:** Here's the thing: Gen Zers have their own money, and that's largely due to the fact that most college-age Zers have some form of employment and income. Since it's their money, it makes sense that they use it on things that offer them something they value—including apps.

Overall, 89 percent of survey respondents said they use one to 10 apps per day. But which ones are they willing to pay for?

- Sixty-six percent of Gen Zers will pay for music apps.
- Thirty-one percent will pay for game and entertainment apps.
- Twenty-four percent are willing to pay for health apps.

Gen Z's digital connections

Which devices do you own?



Source: UNIDAYS 2018 Tech Survey, answers multi-selected, all respondents.

Finally, 18 percent said they'll pay for apps that help them with utility and productivity. These practical apps—the type that help them navigate college—are prime examples of the kind of value they're looking for.

Key takeaway: Don't assume Gen Z won't pay for apps they value. They're willing to click "Purchase" if your app will help them achieve personal goals and pursue passions (and/or unlock higher levels).

3. You may think: Gen Z is slowly forgetting about traditional media formats like TV sets and paperback books.

Reality: In certain cases, Gen Zers' preferred tech and media choices have been around for a very long time.

This generation has been connected nearly since the cradle. That said, they easily straddle that line between digital and nondigital, embracing aspects of life earlier generations have always known.

Television may be the most common ground they have with their parents. According to the UNIDAYS survey, 61 percent of Zs have fully switched to streaming services as opposed to 28 percent who watch cable TV.

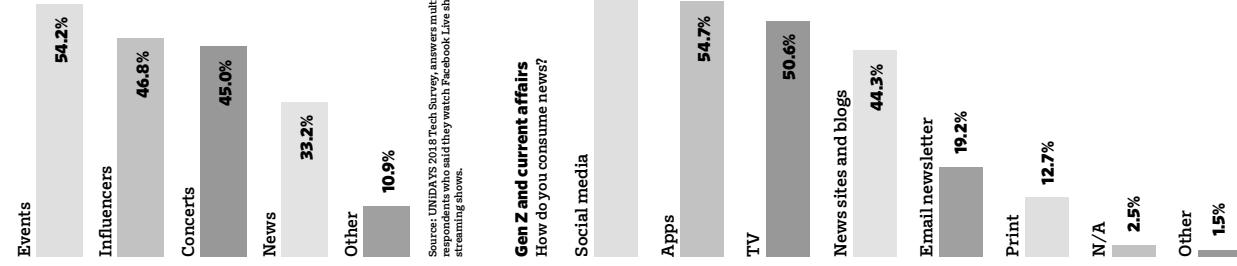
Yet the streaming services they prefer are in line with those watched by Gen Xers and Millennials, with 83 percent of Gen Z watching Netflix, 22 percent choosing Amazon Instant Video and 18 percent opting for YouTube TV.

Furthermore, 48 percent of Gen Zers report watching these services on their laptops versus only 32 percent watching them on TVs. At the same time, only 10 percent prefer to watch via mobile. Viewing habits for the U.S. and U.K. were similar as far as watching TV on laptop, at 41 percent and 43 percent, respectively, versus only 38 percent and 34 percent for standard television. In Australia and New Zealand, Gen Zers watched primarily via laptop at 55 percent and 69 percent, respectively.

When it comes to news, this generation receives most of its information from social media (80 percent) and apps (55 percent). In the U.K., Australia and New Zealand, even though the majority get their news from social media, around 51 percent still watch TV. However, 74 percent of global respondents do not watch live-streaming shows. Digital news

Gen Z and streaming video

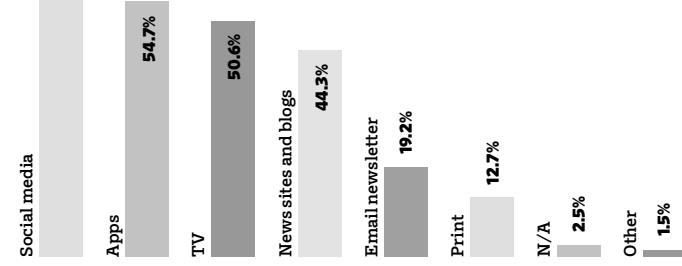
What type of live streaming shows do you watch?



Source: UNIDAYS 2018 Tech Survey, answers multi-selected, based on 4,984 respondents who said they watch Facebook Live shows and/or live-video streaming shows.

Gen Z and current affairs

How do you consume news?



Source: UNIDAYS 2018 Tech Survey, answers multi-selected, all respondents.

shows and entertainment sites need to take this into consideration as time goes on.

Perhaps the biggest surprise of all? In this supposedly all-digital, always-on crowd, 77 percent read printed books—a surprisingly large number, given all the Kindles, Nooks and tablets out there.

Key takeaway: Many brands find it hard to engage this younger demographic. Some might even go so far as to believe that a mobile-only, digital-only, virtual reality-only drone-delivery strategy is the one true path forward. But don't believe (all of) the hype. The fact is Gen Zers still read printed books and shop at brick-and-mortar stores—even if 58 percent check online product reviews and 59 percent compare prices online before hitting the mall. Brands need to be cognizant of the nuances of Gen Z—and do their marketing research omnivorously.

4. You may think: Gen Z doesn't care about data privacy. They're all about sharing and selfies and Instagram.

Reality: While a slight majority of marketers believe Gen Zers value their digital

privacy, there's a strong and vocal minority who don't. But as the survey results show, the facts couldn't be more clear: Gen Zers value their basic online privacy by an overwhelming margin.

Consider these stats:

- Fifty-eight percent don't trust Facebook with their personal data.
- Seventy-eight percent let only certain apps (but not all) know their geo-location.

Gen Zers favor Snapchat because of its ability to make messages disappear instantly once seen, using this app roughly 11 times per day to keep up with their friends. This is very different from earlier generations who still prefer Facebook and Twitter, which are far less anonymous.

Key takeaway: If Gen Zers find themselves flooded with unwanted spam, they'll quickly figure out who's selling their data—and they'll cut you out of their lives. Respect their data privacy like you'd respect their living rooms: Be cautious of how and where you're using their information. That goes tenfold in

regards to third parties you're sharing their data with.

5. You may think: Gen Z is mobile-first—or even mobile-only—when it comes to shopping.

Reality: This generation is mobile-first in a whole bunch of ways—but buying things by smartphone alone isn't one of them.

Of those who said they use their mobile device for shopping, most meant they use their smartphones for all sorts of shopping-related activities:

- Sixty-four percent use them for browsing only.
- Fifty-nine percent do price comparisons.
- Fifty-eight percent look up product reviews.
- Fifty-two percent check item availability.

When it comes to actually buying, 60 percent of all respondents prefer using a desktop when making purchases online versus 22 percent using a mobile browser, 15 percent using a mobile app and only 3 percent using a tablet. Overall, U.S. and U.K. respondents broke down along these lines—while Australian and New Zealand respondents were overwhelmingly (72 percent) desktop shoppers.

When contacting a brand, Zers revert to their traditional side. Their preferred method for reaching out, believe it or not, is trusty old email (40 percent) followed by speaking face to face in-store (21 percent). It's imperative that you respond to their demands promptly: A study by Marchex reveals Gen Zers are "60 percent more likely than the average consumer to hang up if the phone is not answered within 45 seconds."

Key takeaway: A mobile-first strategy is extremely important for marketers. But marketers should still ensure they're covering all their bases—including mobile, desktop, in-store and customer phone support—when creating consumer touch points.

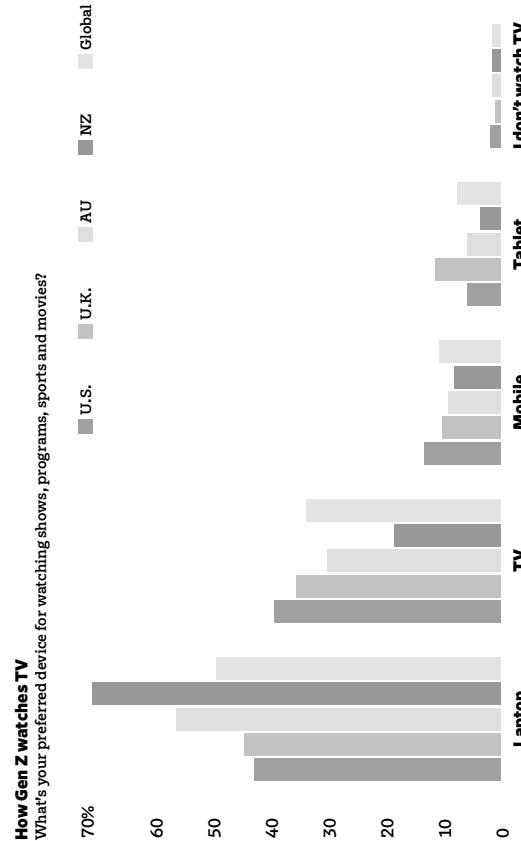
Summary
For Gen Z, a one-size approach definitely does not fit all. Marketers trying to lump all Gen Zers into the same digital "black box" will find themselves blindsided by their competitors.

Generation Z is a digital generation, but only in the sense that it's just another routine in their daily lives. The internet is merely another room in the house, a function of how they live and what they do.

Unlike earlier generations who might still be dumbfounded by the ease of accessing information or shopping online or tracking their exercise and health info digitally, Gen Zers consider online shopping and tracking their calories via smart devices as normal, but the same applies to their love for print books and shopping in brick-and-mortar stores with friends.

Connecting with these college-age consumers may be complex, but it's also rewarding. After all, they're accessible through more channels than previous generations and, if given prompt attention and real privacy considerations, can be reached in the moment more easily than their elders. And we're not talking about just one set of Gen Zs in one country. These are macro trends that appear consistently no matter where Zers live—providing more evidence that this is the first truly global generation. Gen Z offers marketers a promising—and lucrative—relationship for brands that do the legwork necessary to reach them.

More than previous generations, Gen Z cares about the world and what brands stand for. Marketers that want to reach this influential generation face a balancing act of tailoring messaging to the medium it appears on while also ensuring that information incorporates what matters to Gen Z. In this era of fragmented media, connecting your marketing messaging matters.



Source: UNIDAYS 2018 Tech Survey, all respondents.



“You are too friendly!” The negative effects of social media marketing on value perceptions of luxury fashion brands

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ABSTRACT

In light of the growing concern about brand dilution of luxury brands on social media, the purpose of this research was to examine the impact of brand-consumer engagement on value perceptions of luxury fashion brands within the context of social media marketing. The result of Study 1 demonstrated that luxury brands were inherently psychologically distant from mainstream brands. The result of Study 2 and Study 3 showed that a luxury brand with a high level (vs. low level) of brand-consumer engagement resulted lower value perceptions (i.e., social, uniqueness, and quality value perceptions) of the brand, and such relationships were mediated by decreased psychological distance. This research provides important implications for luxury brand managers and scholars that luxury fashion brands should maintain psychological distance on social media to protect the core value perceptions of the brands.

Keywords:

Luxury brands
Social media marketing
Psychological distance
Consumer engagement
Value perceptions
Brand dilution

1. Introduction

Social media refers to Internet-based platforms which aim to enable user interactions such as creating and sharing information and discussing ideas (Kaplan & Haenlein, 2010). Social media has become a powerful marketing tool for brand managers because of its interactive nature. Brands engage with consumers on social media by responding to consumers' posts and encouraging user participation. According to a report by Schneider (2015), leading brands respond to about 60% of consumers' tweets on Twitter. Luxury brands also have increasingly utilized social media to engage in two-way communications with consumers (Kim & Ko, 2012). Among luxury brands, Coach and Karen Millen encourage consumers to upload photos of their products with hashtag on social media and feature consumer photos on their websites. Also, Cartier actively responds to consumers' questions and engages in conversations with consumers on its Facebook brand page.

A growing number of general brand studies have documented positive outcomes of brand-consumer engagement on social media. For example, Schilvinski and Dabrowski (2016) found that user-generated social media brand communications positively influenced brand loyalty and perceived brand quality. Similarly, Labrecque (2014) found that brand-user engagement increased loyalty intentions and willingness to provide information to the brand.

Despite the positive outcomes of brand-consumer engagement on social media documented in the literature, an important question still remains: Is a high level of brand-consumer engagement always beneficial to luxury brands? It is clear that the fundamental concepts of social media and luxury contradict each other: social media is inclusive, interactive, accessible, and designed for the masses, while luxury is exclusive, controlled, and intended for a selected group of wealthy consumers (Uebel, 2016; Reed, 2015). Therefore, social media, characterized by interactivity and accessibility, may damage the core meaning of exclusivity inherently embedded in a luxury brand. In line with this perspective, previous researchers have raised concern about the risks of brand dilution of luxury brands on social media (Uebel, Arcus, Holmstrom, & Viguerie, 2016; Tungate, 2009).

However, most of empirical studies have focused on the positive effects of social media on luxury brands (e.g., Chu, Kamal, & Kim, 2013; Kim & Ko, 2012), and the critical issue of how social media may backfire in the context of luxury brands has received little attention.

Considering the possible long-term impact of brand dilution, it is imperative to investigate the possible negative impact of social media marketing on value perceptions of luxury brands and the underlying mechanism of the effect. This information could deepen our understanding of the factors that influence luxury brands on social media and generate strategic guidelines for luxury brand managers to protect their brand reputation while taking advantage of social media marketing.

The current study builds on the contention that active brand-

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consumer engagement on social media may damage the core value perceptions (i.e., social, uniqueness, and quality value perceptions) of luxury brands because the brands feel too close and accessible to general consumers. As mentioned earlier, luxury brands are intended to cater to only a privileged class of consumers, and they should maintain distance from the masses to stay desirable and valuable (Fuchs, Pandelli, Schreier, & Dahl, 2013; Kapferer & Bastien, 2012). Drawing upon construal level theory of psychological distance, this study aims to illustrate maintaining psychological distance to the masses on social media is essential for luxury brands to protect their important value perceptions. In the current research, psychological distance is defined as consumers' subjective perception about the distance between a luxury brand and the mass market consumers.

2. Literature review and hypotheses

2.1. Construal level theory of psychological distance

Construal level theory of psychological distance (CLT) (Liberman & Trope, 2008) is a theory that explains the relationship between a person's subjective experience of distance and the person's way of thinking. CLT posits that the more distant vs. closer an object is from the self, the more abstractly (vs. concretely) the object is construed, leading to high-level constraints (vs. low-level constraints). Therefore, CLT posits that as the distance between an object and the self increases (vs. decreases), people perceive the object at high-level constraints (vs. low-level constraints).

According to CLT, psychological distance can be determined by four dimensions: 1) temporal distance (i.e., the perceived distance in time between the perceivers' present time and the event); 2) spatial distance (i.e., the perceived distance in physical space between a person's location and the object); 3) social distance (i.e., the extent to which a target person or object is related to the self); and 4) hypothetical distance (i.e., the extent to which an object is perceived to be real or imaginary) (Liberman & Trope, 2008). An event is perceived as psychologically distant if it happens in the far future (vs. near future), occurs in physically remote places (vs. near places), is less (vs. more) related to the self, and is less (vs. more) likely to occur.

Research has shown that the four dimensions of psychological distance are interrelated and can be integrated into a single psychological distance (Oba, Brady, Benetkauskas, & Wilson, 2013; Kim, Zhang, & Li, 2008; Trope & Liberman, 2010). According to Trope and Liberman (2010), although each dimension of psychological distance is not directly related, people regard these dimensions as having a common meaning and able to access all dimensions automatically. As a result, one dimension of distance affects other dimensions of distance. For example, Darken et al. (2016) found that physical distance of a retailer influences the overall psychological distance of the retailer which subsequently affects trust and purchase intentions.

2.2. Psychological distance of luxury brands

According to a widely accepted definition in consumer research, a luxury brand refers to a brand that is characterized by a set of unique factors including exclusivity, high price, quality, and symbolic attributes (Gfeller, 2012; Riley, Lomax, & Blunden, 2004). One of the core principles of luxury brand management is creating psychological distance between luxury brands and the mass-market (Kapferer, 1997; Kapferer & Bastien, 2012; Wiedmann, Henning, & Stiebel, 2009). In the current research, psychological distance of a luxury brand is defined as consumers' subjective perception of the distance between a luxury brand and the mass-market consumers. Luxury brand consumption is driven by the desire to enhance one's social status and to own an exclusive product that only a small number of people can possess (Kapferer & Bastien, 2012; Wiedmann et al., 2009).

Luxury brands evoke perceptions of rarity and exclusivity due to the

difficulty of attaining them (Miyazaki, Grewal, & Goodstein, 2005), which enlarges the perception of psychological distance between the luxury brands and the average consumers. Luxury brands strategically limit attainability of the brand by tightly controlling many aspects of their business practices, such as the price of products, distribution channels, aesthetic dimensions of products (Kapferer, 1997) to maintain the perception of exclusivity among consumers. In addition, luxury brand advertisements communicate superiority, exclusivity, and distance by invoking social segregation, and exclusion (Hing, Gao, Huang, DeWall, & Zhou, 2014). Therefore, the following hypothesis is proposed.

2.3. Luxury brand-consumer engagement on social media

Social media often becomes a place for socialization and building potential friendship through repeated conversations and exchanges among users (Tsimoni & Dimitriadis, 2014). Similarly, brands often build relationships with consumers on social media by engaging with them. In this study, brand-consumer engagement is defined as a brand's motivational state to connect and build social relationships with all consumers. For example, brands engage with consumers through responding to consumer comments, publishing user-generated contents on the brands' social media page (Petersson, 2015), and posting interactive content such as clickable icons or a quiz that consumers can take (Heavey, 2017).

An engagement level between a brand and consumers on social media can range from high to low (Gilbert & Karahalios, 2009). An active, high level of brand-consumer engagement will focus more on building an intimate, close relationship between a brand and all consumers. For instance, luxury brands may actively engage with consumers by responding to all consumers' comments in a friendly way or encouraging them to engage in the brand's social media events. On the contrary, luxury brands with a low level of brand-consumer engagement may selectively respond to consumers' comments and just focus on communicating their brand messages on social media.

This study argues that a level of brand-consumer engagement is an important determinant of psychological distance, specifically social distance of luxury brands. According to Akeroff's (1997) model of social distance, socially closer individuals are more likely to interact with each other while those who are distant have little interaction. Likewise, Bourdieu (1980) argues that social distance represents a symbolic space between status groups with different lifestyles, and people who are socially distant rarely interact. Therefore, an extensive engagement between a brand and consumers can lead to greater intimacy and closeness between the brand and the consumers (Hudson, Hwang, Roth, & Madden, 2016) and give consumers feelings of friendship (Gummesson, Liljander, Wenman, & Philström, 2012). In this sense, a high level of brand-consumer engagement on social media is likely to reduce psychological distance of luxury brands. Therefore, the following hypothesis is proposed.

H2. A luxury brand with a high (vs. low) level of brand-consumer engagement on social media, will be perceived as less (vs. more) psychologically distant.

H1. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

H3. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

H4. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

Fig. 1. The research model.

luxury brands; social, uniqueness, and quality value perceptions. These key value dimensions should be ensured to create a lasting luxury brand character of the brands.

Recent studies provide supports for the negative effects of reduced psychological distance on luxury brand perceptions (e.g., De Barneville, Falot, & Valente-Florence, 2012; Fuchs et al., 2013). For example, Fuchs et al. (2013) found that user-designed luxury products, compared to company-designed products, decreased consumer demands for the products. When products were designed by users who were average consumers not by the luxury brands' elite experts, the brand was perceived to be close to mass market consumers which undermined perceived social value. Similarly, De Barneville et al. (2012) found that accessible luxury brands, which are psychologically closer to mass-marketed consumers than other luxury brands, were associated with lower perceived social value.

In line with this finding, this research argues that reduced psychological distance prompted by a high level of brand-consumer engagement may make an impression that the luxury brand is for every day consumers rather than a selective group of people. In turn, it will undermine the core value perceptions of luxury brands. Therefore, the following hypotheses are formulated.

H3. A luxury brand with a high level of brand-consumer engagement on social media, compared to one with a low level of brand-consumer engagement, will be perceived as more psychologically distant.

The Fig. 1 illustrates the research model.

3. Study 1

The study used a 2 (brand category: luxury vs. mainstream) \times 2 (brand replicates) mixed-model design in which their brand category was a between-subject factor and the brand replicates were a within-subject factor. Following previous research on categorizing apparel brands based on brand associations (Daw & Kwon, 2010; Fuchs et al., 2013), Versace and Prada were used as the luxury brand replicates and American Eagle and Old Navy were used as the mainstream brand replicates.

3.1. Study design

This research proposes that one important determinant of value perceptions of luxury brands (i.e., social perception, uniqueness, performance (Wiedmann et al., 2009)). Luxury brands are made of the best materials and hand-finished to ensure high quality (Fjorand, & Moore, 2009). Consumers regard this superior quality as a fundamental aspect of a luxury brand (Quelch, 1987). In addition, because high price is often linked to high quality (Rao & Monroe, 1989), consumers expect expensive luxury brands to have a high perceived quality value (Shukla & Purani, 2012).

This research proposes that three key dimensions that create value perceptions of luxury brands (i.e., social perception, uniqueness, performance) is psychological distance of the brands. As discussed earlier, luxury brands are built on the concept of distance, meaning not everyone can own or have access to the brands. Researchers demonstrate that the core perceptions of luxury brands can be diluted when the brands become close to undesirable groups of consumers (e.g., mass market consumers) and when overdiffused into the mass market (Bellezza & Kehm, 1997; Kapferer & Johnson, 2004). That is, consumers seek multifaceted values through consumption of luxury brands (Henning et al., 2013). The consensus is that there are three key dimensions that create value perceptions of

luxury brands: social, uniqueness, and quality value perceptions. These key value dimensions should be ensured to create a lasting luxury brand character of the brands.

Social value perception refers to the perceived utility of a luxury brand for enhancing social status (Vigueron & Johnson, 2004; Wiedmann et al., 2009). This social value dimension is an outer-directed value which aims to create a favorable social image within consumers' social groups or fit into groups consumer aspire to through the acquisition of conspicuous products (Park, Rabolt, & Jeon, 2008; Wiedmann et al., 2009). Consumers use products to integrate the symbolic meanings of the products into their identities and to communicate how they define themselves to others (Troll, 1995). Because luxury brands symbolize an affluent lifestyle (Wiedmann et al., 1994), consumers use luxury brands as an important tool to signal wealth, high status, and a group membership to upper socio-economic class.

Uniqueness perception is concerned with the perceived exclusivity and rarity of a luxury brand (Wiedmann et al., 2009). Scarcity is an important aspect of luxury brands as it helps consumers feel unique and special (Tsai, Yang, & Lin, 2013) and increases their value and dream of the brands (Broek, 1968; Dubois & Paternault, 1995). Empirical evidence confirmed that consumers regarded a scarce luxury brand as being valuable and desirable because it could enhance their image by signifying that they are unique and different from the rest of the others (Verhagen, 1992; Verhagen & Robben, 1994; Vigueron & Johnson, 2004). Thus, when a luxury product becomes available to everyone, it would no longer be regarded as luxury because it loses exclusive value (Wiedmann et al., 2009).

Lastly, quality value perception is defined as a consumer's subjective perception that products of a luxury brand are of superior quality and high performance (Wiedmann et al., 2009). Luxury brands are made of the best materials and hand-finished to ensure high quality (Fjorand, & Moore, 2009). Consumers regard this superior quality as a fundamental aspect of a luxury brand (Quelch, 1987). In addition, because high price is often linked to high quality (Rao & Monroe, 1989), consumers expect expensive luxury brands to have a high perceived quality value (Shukla & Purani, 2012).

2.4. Psychological distance and value perceptions of luxury brands

Researchers have proposed that there are multiple dimensions that constitute consumers' value perceptions of luxury brands (Henning, Wiedmann, Behrens, & Klarmann, 2013; Kapferer, 1997; Vigueron & Johnson, 2004). That is, consumers seek multifaceted values through consumption of luxury brands (Henning et al., 2013). The consensus is that there are three key dimensions that create value perceptions of

luxury brands because the brands feel too close and accessible to general consumers. As mentioned earlier, luxury brands are intended to cater to only a privileged class of consumers, and they should maintain the perception of exclusivity among consumers. In addition, luxury brand advertisements communicate superiority, exclusivity, and distance by invoking social segregation, and exclusion (Hing, Gao, Huang, DeWall, & Zhou, 2014). Therefore, the following hypothesis is proposed.

H1. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

H2. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

H3. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

H4. luxury brands, compared to casual brands, will be perceived as more psychologically distant.

brands, which subsequently damages the high-status, symbolic character of the brands.

Recent studies provide supports for the negative effects of reduced psychological distance on luxury brand perceptions (e.g., De Barneville, Falot, & Valente-Florence, 2012; Fuchs et al., 2013). For example, Fuchs et al. (2013) found that user-designed luxury products, compared to company-designed products, decreased consumer demands for the products. When products were designed by users who were average consumers not by the luxury brands' elite experts, the brand was perceived to be close to mass market consumers which undermined perceived social value. Similarly, De Barneville et al. (2012) found that accessible luxury brands, which are psychologically closer to mass-marketed consumers than other luxury brands, were associated with lower perceived social value.

In line with this finding, this research argues that reduced psychological distance prompted by a high level of brand-consumer engagement may make an impression that the luxury brand is for every day consumers rather than a selective group of people. In turn, it will undermine the core value perceptions of luxury brands. Therefore, the following hypotheses are formulated.

H3. A luxury brand with a high level of brand-consumer engagement on social media, will be perceived as more psychologically distant.

The Fig. 1 illustrates the research model.

3.2. Instruments

The measurement items of psychological distance and brand awareness were adopted from previous research. The measures of psychological distance were adapted from Darke et al. (2016). There were a three-item semantic differential scale that measure various dimensions of psychological distance (i.e., when I think about brand X and its characteristics I think it is... social close/distant, temporally close/distant, physically close/distant).

In order to rule out the possible confounding effects of brand awareness on the results of the study, a three-item scale of brand awareness adopted from Asker (1996) was included (e.g., I have heard of this brand; 1 = Strongly disagree to 7 = Strongly agree).

3.3. Data collection and experimental procedure

Participants were recruited from Amazon MTurk. The study was advertised as a consumer brand perception study. Participants were told that the researcher was interested in their perception of two apparel brands. Next, participants were randomly assigned to one of the two brand category conditions (i.e., luxury vs. mainstream) in which two different brands for each category were presented in a random order. The participants were provided with the name of each brand and then asked to complete the measures of psychological distance and brand awareness. Lastly, they answered questions related to demographic information such as gender and income.

3.4. Results

3.4.1. Participant characteristics

Fifty-nine MTurk workers (male = 65%, mean age = 28 years) participated in this study. The median household income of participants ranged from \$50,000 to \$49,999.

3.4.2. Hypotheses testing

Prior to testing H1, the mean score of brand awareness for each of the four stimuli brands was compared using an independent sample t-test. The results revealed that there were no significant mean differences among the four brands ($p > .05$). Therefore, the data across the brand replicates were collapsed. The results of independent sample t-test showed that luxury brands, compared to mainstream brands, were perceived as more psychologically distant, as predicted in H1 ($M_{Luxury} = 4.66$ vs. $M_{Mainstream} = 3.63$; $t(116) = 4.58$, $p = .00$). Therefore, hypothesis 1 was supported.

3.5. Discussion

The results of Study 2 provide supports for our initial prediction that luxury brands are inherently psychologically distant than mainstream brands (H1). This was a condition that needed to be met to continue with other hypotheses, as the research is built on the argument that luxury brands need to maintain psychological distance from the mass market consumers. Also, the results rule out the possible effect of brand awareness, as there were no significant mean differences among the four stimuli brands.

4. Study 2

4.1. Study design and stimuli development

The objectives of study 2 were to test the effect of brand-consumer engagement on psychological distance of luxury brands (H2) and the mediating role of psychological distance (H4).

4.2. Participant characteristics

A total of 74 participants (male = 59.5%) were recruited from Amazon MTurk to a luxury brand evaluation study. The median annual

Table 1
Measurement items of variables in Study 2.

Variables	Items	Scale
Psychological distance	When I think about the brand and its characteristics I think it is... Atriable – unattractive To what extent can this brand indicate a person's social status? To what extent is this brand a symbol of achievement? To what extent is this brand a symbol of wealth? To what extent is this brand a symbol of prestige? To what extent does this brand attract attention? To what extent can this brand impress people? This brand's products are rare This brand's products are exclusive. This brand's products has the best quality. This brand's products is crafted. I know what this brand stands for. I have an opinion about this brand. I have heard of this brand. The brand I just saw actively interacts with consumers on Facebook.	7-Point semantic differential scale Causal – formal 1 = not at all, 7 = very much
Social value perception	Quality value perception Quality value perception	1 = strongly disagree, 7 = strongly agree
Brand awareness	Uniqueness value perception Manipulation check	1 = strongly disagree, 7 = strongly agree
	household income of participants was \$30,000–49,999.	uniqueness, and quality value perceptions) of the luxury brand ($p \leq .01$) (see Fig. 2).

Furthermore, a mediation analysis was conducted to examine the mediating role of psychological distance on the relationships between brand-consumer engagement on brand perceptions (H4). The procedure followed by Zhao, Lynch, and Chen (2016) was followed, using the Preacher and Hayes (2008) macro for mediation analysis. Brand awareness was entered as a covariate to control possible confounding effects. The results showed that formality (psychological distance) partially mediated the relationships between brand-consumer engagement and social and quality perceptions, but not for uniqueness perception. Specifically, when social perception was regressed on brand-consumer engagement, including formality decreased the beta weight of brand-consumer engagement from 0.92 ($t(70) = 3.49$, $p < .01$) to 0.70 ($t(70) = 2.72$, $p < .01$) (see Fig. 3). The bootstrapping technique also supported the proposed mediation relationship. When 1000 bootstrap samples were used, 95% BCa bias was corrected and accelerated) bootstrap confidence interval did not include zero (indirect effect: $\beta = 0.22$, SE = 0.13, 95% CI = 0.02 to 0.51). Similarly, when quality perception was regressed on brand-consumer engagement, including formality decreased the beta weight for brand-consumer engagement from 0.87 ($t(70) = 3.25$, $p < .05$) to 0.64 ($t(70) = 2.46$, $p < .05$) (see

4.4.3. Hypothesis testing

To test the effect of brand-consumer engagement on psychological distance of luxury brands (H2) and the value perceptions of luxury brands (H3), a one-way MANCOVA analysis was performed. Brand awareness was entered as a covariate to prevent possible confounding effects. As predicted, the results showed that the participants in the high brand-consumer engagement condition (vs. low) indicated lower psychological distance of the brand (formality: $M_{High} = 4.62$ vs. $M_{Low} = 5.51$; $F = 3.96$, $p = .05$, unattainability: $M_{High} = 3.32$ vs. $M_{Low} = 4.30$; $F = 6.67$, $p < .05$), thereby supporting H2. Also, as predicted in H3, the results revealed that the participants in the high brand-consumer engagement condition (vs. low brand-consumer engagement condition) showed lower value perceptions (i.e., social, uniqueness and quality) (see Table 1).

Social value perception was measured with six items that assess conspicuousness and status of the brand (e.g., To what extent can this brand indicate a person's social status? 1 = Not at all, 7 = Very much) adopted by Truong, Simmons, McCall, and Kitchen (2008). Quality of the brand product quality (e.g., This brand's product has the best quality; 1 = Strongly disagree, 7 = Strongly agree (Tennings et al., 2013; Hung et al., 2011)), and uniqueness value perception was measured by four items that assess perception of the brand's product quality (Hung et al., 2011). The results revealed that there were no significant mean differences among the four brands ($p > .05$). Therefore, the data across the brand replicates were collapsed. The results of independent sample t-test showed that luxury brands, compared to mainstream brands, were perceived as more psychologically distant, as predicted in H1 ($M_{Luxury} = 4.66$ vs. $M_{Mainstream} = 3.63$; $t(116) = 4.58$, $p = .00$). Therefore, hypothesis 1 was supported.

The manipulation of brand-consumer engagement level was checked by one item, "The brand I just saw actively interacts with consumers on Facebook; 1 = Strongly disagree, 7 = Strongly agree".

4.3. Data collection and experimental procedure

Participants were recruited from Amazon MTurk. The study was advertised as a study about a luxury brands' social media pages. Participants were randomly assigned to one of the two brand-consumer engagement conditions. They first viewed the corresponding Facebook pages for their condition and then responded on questionnaire items measuring brand perceptions (i.e., social, uniqueness, quality value perceptions), psychological distance of the brand (i.e., formality and unattainability), brand-consumer engagement level (manipulation check item), brand awareness to control for previous knowledge and perception, and demographic information.

4.4. Results

4.4.1. Participant characteristics

A total of 74 participants (male = 59.5%) were recruited from Amazon MTurk to a luxury brand evaluation study. The median annual

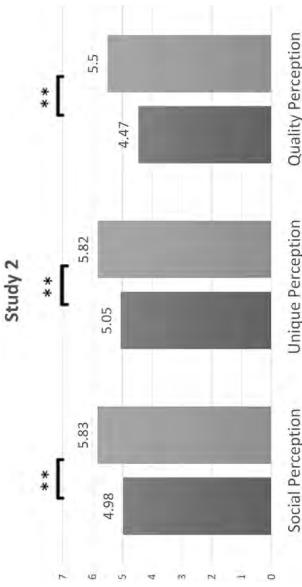


Fig. 2. The mean differences in the outcome variables (Study 2). Note: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

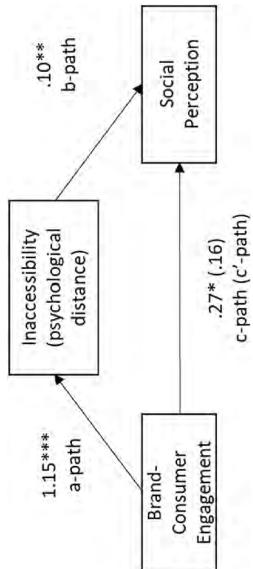


Fig. 6. The mediation effect of inaccessibility on social perception
Note: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

luxury brands, and to the theory of psychological distance. To date, the brand dilution literature has been dominantly examined from the aspects of brand extension strategies (e.g., Shin et al., 2017). On the other hand, this research demonstrates that brand-consumer engagement of luxury brands on social media can also dilute brand value perceptions. Therefore, this research's view on social media marketing as a source of brand dilution provides important insights and adds a new perspective to the literature on brand dilution.

Also, while most of literature in social media marketing of luxury brands has documented positive aspects of social media on luxury brands (e.g., Kim & Ko, 2012), the current research contributes to the literature by uncovering negative aspects of social media marketing on luxury brands. Specifically, this study provides empirical evidence that a high level of brand-consumer engagement on social media can damage perceptions of luxury brands by revealing the underlying mechanism. Through a mediation analysis, it was found that this effect is partly due to the decrease of psychological distance of luxury brands.

In regard to the theory, psychological distance has been examined and proved as a meaningful construct that is linked to strong consumer behavior outcomes such as product evaluations (Kim et al., 2008) and self-control (Civiero & Simmons, 2002). This study also provides further support that psychological distance is an important construct that influences consumers' value perceptions of luxury brands on social media. While previous research has found that reducing psychological distance of online retailers is important for building trust (Dabke et al., 2016; Edwards, Lee, & Ferlie, 2009), the current study shows that, for luxury brands, it is vital to maintain the social distance dimension of psychological distance to protect value perceptions. Thus, this study offers insights concerning the applicability of the construal level theory of psychological distance to luxury brand perceptions on social media.

6.2. Practical implications

With regards to managing luxury brands, one of the most important goals is to sustain the myth and dream of luxury (Kapferer & Bastien, 2012). This research provides a strong warning for luxury brands who may stray from the goal due to their social media strategies. The findings suggest that luxury brands should maintain sacred psychological distance on social media; otherwise it will undermine important value perceptions of the luxury brands such as exclusivity, status signaling, and quality, which eventually damages the luxury dream. Specifically, overly active and friendly brand-consumer engagement on social media may backfire luxury brands because consumers may perceive the brands to be too accessible and approachable to everyday consumers. Therefore, it may be more beneficial for luxury brands to selectively engage with consumers and only follow a certain group of consumers (e.g., high-profile celebrities or artists) on social media to demonstrate that it is maintaining psychological distance to mass market consumers. Moreover, as evidenced in Study 3, consumers' positive attitude toward the high level of brand-consumer engagement on social media

across the experimental studies, this research highlights the impact of psychological distance of luxury brands triggered by a level of consumer-brand engagement on value perceptions of luxury brands. This research yields both theoretical and practical implications in the following ways.

6.1. Theoretical implications

From a theoretical point of view, this study contributes to a body of literature concerning brand dilution and social media marketing of

luxury brands, and to the theory of psychological distance. To date, the brand dilution literature has been dominantly examined from the aspects of brand extension strategies (e.g., Shin et al., 2017). On the other hand, this research demonstrates that brand-consumer engagement of luxury brands on social media can also dilute brand value perceptions. Therefore, this research's view on social media marketing as a source of brand dilution provides important insights and adds a new perspective to the literature on brand dilution.

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However, this social media marketing tactic may be another factor that negatively influences perceptions of luxury brands because it may reduce perceived spatial distance of the brands. In other words, because an online store symbolizes increased accessibility of products and brands due to its ubiquity (Okamoto, 2009), consumers may perceive the luxury brands as being close, accessible, and within reach, which subsequently undermines exclusivity perceptions of the brands.

Moreover, future studies could investigate variables that may moderate the relationship between psychological distance and evaluations of luxury brands to show boundary conditions. Consumer-related variables such as power, social goals (i.e., competition, assimilation), and need for status may moderate such relationship because of the fit between the symbolism of luxury brands and consumers' needs. For example, consumers with high need for status may evaluate psychologically distant luxury brands more favorably than consumers with low need for status because such brands are perceived to be more conspicuous.

Lastly, the current research measured psychological distance of luxury brands using measures that are more focused on social distance aspects. Although previous research has confirmed that social distance is an indicator of psychological distance, future research could further develop and test other measures of psychological distance. For example, developing measures that assess temporal distance and spatial distance relevant to the luxury brands context will create more comprehensive measures of psychological distance of luxury brands.

does not necessarily translate into higher value perceptions of luxury brands. That is, highly active brand-consumer engagement which may appear as potentially negative consequences on how the brand is perceived. As managers of luxury brands attempt to increase brand-consumer engagement on social media extensively, they must be mindful of the potential negative consequences on how the brand is perceived. However, it is possible that a high level of brand-consumer engagement may offer other potential positive outcomes (e.g., WOM, higher brand awareness) for luxury brands. Therefore, luxury brands must weigh the benefits of actively engaging with consumers against the cost of reducing core value perceptions of the brands.

6.3. Suggestions for future research

Among various dimensions of psychological distance, this study particularly focused on social distance of luxury brands in the context of social media marketing. Specifically, this study demonstrated that active brand-consumer engagement is an important antecedent of social distance of luxury brands that can damage important perceptions of the brands. Along with a social distance dimension, future studies should investigate other factors that may influence other dimensions of psychological distance of luxury brands, such as temporal and spatial distance. For example, some luxury brands on social media frequently provide direct links to their online stores along with product photos to increase both sales and consumer shopping convenience.

However, this social media marketing tactic may be another factor that negatively influences perceptions of luxury brands because it may reduce perceived spatial distance of the brands. In other words, because an online store symbolizes increased accessibility of products and brands due to its ubiquity (Okamoto, 2009), consumers may perceive the luxury brands as being close, accessible, and within reach, which subsequently undermines exclusivity perceptions of the brands. Moreover, future studies could investigate variables that may moderate the relationship between psychological distance and evaluations of luxury brands to show boundary conditions. Consumer-related variables such as power, social goals (i.e., competition, assimilation), and need for status may moderate such relationship because of the fit between the symbolism of luxury brands and consumers' needs. For example, consumers with high need for status may evaluate psychologically distant luxury brands more favorably than consumers with low need for status because such brands are perceived to be more conspicuous.

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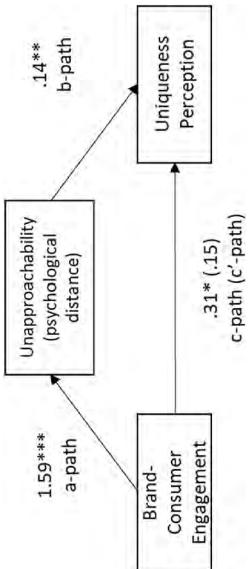
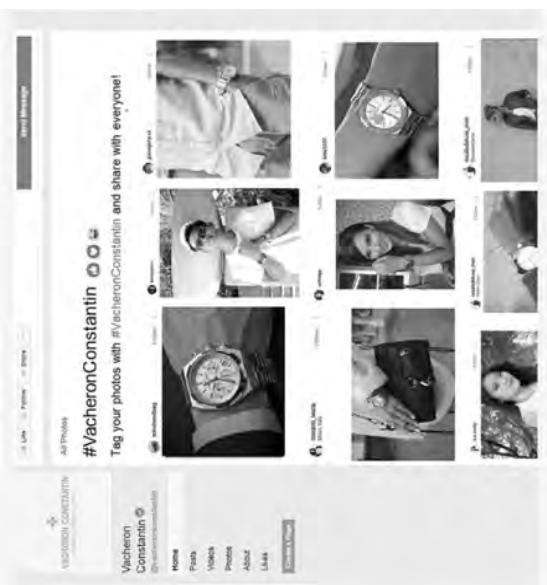


Fig. 7. The mediation effect of unapproachability on uniqueness perception
Note: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Appendix A. Manipulations in Study 2

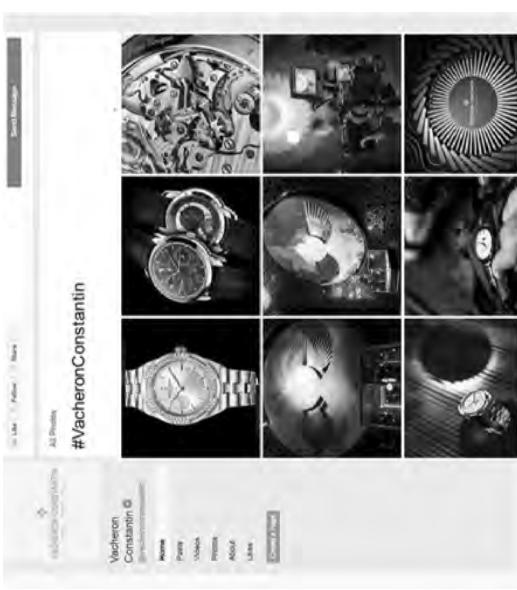
High brand-consumer engagement manipulation



Low brand-consumer engagement manipulation



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Appendix B: Scenarios and manipulations in Study 3

Suisse Maestät is a leading luxury watch brand founded by watch artisan Marco Müller in 1921 in Switzerland. Suisse Maestät produces one of the world's most finely crafted timepieces and its watches are the symbols of excellence and performance. Please imagine that you are financially well-off, and won't have the need to Suisse Maestät watches.

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As a social media strategy, Suisse Majestät has decided to increase engagement with all social media users. Specifically, Suisse Majestät will follow back every social media user who follows or likes Suisse Majestät on social media. Also, Suisse Majestät will reach out to social media users who follow the brand every 10 days. A friendly comment on the user's post is usually enough to keep the user engaged.

As a social media strategy, Suisei Majestät has decided to maintain the current level of engagement with social media users. Specifically, Suisei Majestät will only follow social media users who are celebrities or brand ambassadors. Also, Suisei Majestät will selectively respond to few social media users and consumers, e.g., [engagement management](#).

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Writing, in the sense of placing letters and other marks one after another, appears to have little or no future. Information is now more effectively transmitted by codes other than those of written signs. What was once written can now be conveyed more effectively on tapes, records, films, videotapes, videodisks, or computer disks, and a great deal that could not be written until now can be noted down in these new codes. Information coded by these means is easier to produce, to transmit, to receive, and to store than written texts. Future correspondence, science, politics, poetry, and philosophy will be pursued more effectively through the use of these codes than through the alphabet or Arabic numerals. It really looks as though written codes will be set aside, like Egyptian hieroglyphs or Indian knots. Only historians and other specialists will be obliged to learn reading and writing in the future.

Many people deny this, mainly out of laziness. They have already learned to write, and they are too old to learn the new codes. We surround this, our laziness, with an aura of grandeur and nobility. If we were to lose writing, we say, we would lose everything we owe to such people as Homer, Aristotle, and Goethe, to say nothing of the Holy Bible. Only how do we really know that these great writers, including the Author of the Bible, would not have preferred to speak into a microphone or to film?

But laziness doesn't explain everything. There are people, and I count myself among them, who believe that they could not live without writing. And this is not because they want to imitate Homer, for they know that no one can write as he did anymore, even a second

Homer; rather they believe that writing is a necessity because their being is expressed in, and only in, the gesture of writing.

Of course, they could be wrong. But even assuming that they are right and that the production of video clips does not suit their being, their *forma mentis*, it would not prove that their form of being has become obsolete, that such people have become dinosaurs. It's true that not everything obsolete is necessarily expendable. What is called progress is not necessarily the same thing as improvement. Dinosaurs were very nice animals in their way, after all. And yet the insistence on writing is becoming questionable today.

The question is, What is distinctive about writing? What sets it apart from comparable gestures of the past and future—from painting, from pressing on computer keys? Is there anything specific at all that is shared by all kinds of gestures of writing—from the chiseling of Latin letters in marble to the brushing of Chinese ideograms on silk, the scratching of equations on boards, or the pounding on the keys of typewriters? What sort of life did people have before they began to write? And how would their lives look if they abandoned writing? All these and many more questions would obviously concern not only writing itself but also the reading of what is written.

These are simple questions only at first glance. A comprehensive book would be required just to grasp them all. But the crux of the matter is that such a book would be a book. Instead of what? That is the question.

Instructions

One way to anticipate the kind of thinking that characterized the informatic revolution is to observe those who manipulate the apparatus, setting the new signs into electromagnetic fields. The word *program* is the Greek equivalent of the Latin *praescriptio* and the German *Vorschrift*. Are these people continuing to write or starting again? Are contemporary reactionaries on the mark when they assert that nothing has changed fundamentally, that the essential always stays the same? To whom are these people writing? For they are not writing past a conclusion to another human being. Rather they write with and for apparatuses. Didn't the earlier discussion show that writing to other people was the essential thing about writing? So the essence of writing has changed for these people; it is another writing, in need of another name: programming. For reactionaries, this is not just uncomfortable; it is terrifying.

From a certain angle, such terror in the face of the new appears harmless. So people don't write alphabetically anymore but rather use other, so-called binary codes. Artificial intelligences are too stupid (perhaps only for the time being) to be able to decode letters. The new computer codes are in fact extraordinarily simple (as simple as artificial intelligences), but it is not simple to use them. They are structurally simple and functionally complex systems. Most of us have not mastered them; on the other hand, we have all learned the alphabet, and print has resulted in a comprehensive, democratizing literacy. The new computer codes have made us all illiterate again. A new literate caste has arisen. For most of us, the new writing (computer programs) is suffused with that kind of

mystery that surrounded alphabetic writing before the invention of print. What cannot be decoded is a frightening secret. People fall to their knees (*supplex turba*) and try to appease it (the Golden Calf before the two tablets). Of course, nothing could be easier than to penetrate the mystery. One has only to learn the secret codes (in the case of the Romans and Jews, the alphabet; in our case, computer codes). But that is exactly what our fear of the new makes impossible. Learning it is child's play only for our fearless children. We have to try other things. We have to try to use a typographic way of thinking to get to grips with post-typographic "writing." Since this essay is literal, it will try to dispel a terror of programs.

If a *program* is to be understood as writing directed not toward human beings but toward apparatuses, then people have been programming since writing was invented—before there were any apparatuses. One wrote to human beings as though they were apparatuses. One prescribed models of human behavior, and these instructions constitute a prominent thread in the advancing discursive mesh we call Western literature. Using this thread to guide us in a survey of Western history, the development can be represented as follows: at the beginning, since the Stele of Hammurabi, these instructions were called "commandments"; then, with the Twelve Tablets, they became "laws," which later branched out into decrees, regulations, and other forms of instruction; during the Industrial Revolution, instructions were added that pertained to people's behavior toward machines, or "user's manuals"; until finally, since the informatic revolutions, the program discussed earlier—namely, instructions to machines—completed this development. Programs are not only a completely new way of writing, they are also the culmination of a pattern established when writing began.

The thread of instructions just described (and with it the history of the West that is articulated in it) can be understood in various ways, for example, as a tendency toward desacralization. The commandments (say, the Ten Commandments) were holy. They had a heavenly author. It was a superhuman authority that made human

beings into marionettes (apparatuses). The laws (say, constitutional law) had, if not a heavenly, at least a mythical author (e.g., the people), and this mythical authority manipulated the people's behavior. It became more and more clear subsequently that instructions were made by people manipulating other people. User's manuals revealed that all instruction seeks machine-like, automatic human behavior. This is why user's guides are shorter the more automated the machine, until, with fully automatic machines, they become superfluous. In their place are the programs. Here no human beings require instruction. Instructions can instead be issued to apparatuses. In this way, it becomes clear that the goal of instructions (and of Western history) has been completely profane behavior and that, when this goal is achieved, it is superfluous to instruct people at all or to manipulate them. They behave as they should automatically.

The thread of instructions can be read equally well as a tendency to devalue behavior, to reduce it to an object of scientific study (should "science" be understood as value-free thinking and action). The commandments prescribe behavior according to eternal values, the laws, behavior consistent with high values. Subsequent instructions tend to become value-free, until finally, user's manuals apply to functional behavior only. So it concerns a depoliticization and functionalization of behavior, which can be read from the syntactical construction of instructions. They change from imperative propositions ("thou shalt") to functional *if-then* propositions. The commandment "thou shalt honor thy father and mother" becomes advice for use: "If you want to eat chicken soup, do this and this with the tin of chicken soup." This steady devaluing of behavior concludes with programs. In logically constructed computer programs, there is no symbol for *should*. Accordingly, it becomes clear that the tendency of instructions (and of Western history as a whole) is toward a complete depoliticization of all behavior and that when this goal is achieved, human beings and their society will steer themselves automatically, like a cybernetic system.

These two readings of the tendency inherent in instructions convey some sense of the rising functional way of thinking. It is a profane, value-free thought. It can no longer be grasped in historical, political, or ethical categories. Other cybernetic, computable, functional categories must be applied to it. For this reason, programming cannot actually be called writing. It is a gesture that expresses a different kind of thought.

The question remains whether the effort undertaken earlier to demystify programming has dispelled the terror. Of course, the matter can be approached from an optimistic point of view. Because programs instruct apparatuses, the burden of instruction shifts from human beings to inanimate objects, and human beings become free to behave as they like. From this standpoint, the tendency inherent in instructions and culminating in programs is aimed at freedom. Apparatuses behave better and faster than human beings: they assemble automobiles better, they sew better, dig better, and soon will be able to do their cherry-picking more efficiently. And they think better too: they calculate, draw, and make decisions faster. (They are, curiously, better at calculation than they are at cherry-picking.) From now on, people can concentrate on programming apparatuses. Could that not be the freedom we have sought since history began?

Two quite different kinds of objections come to mind. The first one, close at hand, is fairly easy to dismiss. It is concerned that some behavior cannot be taken over by apparatuses and that the sort of behavior that cannot be automated is exactly the sort that constitutes human dignity, for example, the commandment to "honor thy father and mother." That is an error. All modes of behavior, of any sort, can be programmed and automated. It is a matter of breaking the behavior down into its constituent elements, into actemes, and then computing them back together again. Just such breaking down and recalculating is what programming is. The commandment mentioned earlier can be broken down into actemes

such as "feed your bedridden mother rice pudding." Apparatuses will obey this commandment better, more quickly, and more precisely than human beings do.

The second hesitation to be optimistic weighs more heavily. It is concerned that freeing people from the obligation to behave in particular ways will result in a complete lack of freedom. If there is no necessity to act in a particular way (to work, to walk, to sit, to calculate, to draw), then all behavior will revert to an *acte gratuit*, a meaningless, absurd gesture. This objection assumes that freedom can open up only in the struggle against necessity. Completely unconditioned behavior is no more free than completely conditioned behavior. At this point, an optimist might object that any human behavior, whether compliant with instructions, is absurd in the face of death (the inevitability of death) and that the underlying intention of all instruction was always to give this absurdity a meaning. When instructions are shifted from human beings to apparatuses, human beings are free to give meaning to the absurd behavior of apparatuses (and in so doing, to their own behavior as a function of the apparatuses). Accordingly, to program is to give meaning, and the intention behind programming is to free human beings to give the world meaning and to make their lives in it free.

Maintaining an optimism that dispels our fear of programming, one could claim that with the demise of writing through programming, the goal of history is achieved. All behavior has become profane, scientific, functional, apolitical, and people are free to give such behavior meaning. History, and the mode of thought that produces history, is over. A new, posthistorical mode of thought is arising that assigns meaning to absurdity. Let us leave aside the question whether this optimism actually satisfies all conditions. Even if we do accept it, the question whether programming will render all writing obsolete remains open. All instructions can be programmed, but things other than instructions will be written. Literature does not consist wholly of commandments, laws, and

user's manuals, after all. And these other threads in the literary mesh may well not be programmable. So writing will continue after all. And by means of this sustained writing, historical, political, ethical, and aesthetic modes of thought will be preserved.

This (reactionary) objection proves to be an error. It is true that literature does not consist exclusively of instruction, of models of behavior. There are also models of knowledge (e.g., scientific and philosophical texts) and models of experience (e.g., poetry and everything understood by belles lettres). Dividing literature into models for behavior, knowledge, and experience follows the classical division of ideals into good, true, and beautiful, a division that has been insupportable since the Industrial Revolution. Today we have a way of reducing models of knowledge and experience to models of behavior by tracing all propositions back to *if-then* propositions. Propositional calculus permits all statements of whatever kind to be translated into functions. All literature becomes programmable.

A programmed literature would take all texts back to instructions so as to then be computed by artificial intelligences. Even judging by the synthetic images that are already available now, it is clear that exceptionally effective models of knowledge and experience can be produced in this way. As binarily, digitally coded models of knowledge illuminate the screen, from simple statistical curves to complex representations of whole theories, they put all scientific, alphanumerically coded texts in the shade. So-called computer art is just beginning to generate models of experience (fantastic, impossible configurations) that are in fact images, but images that rely on digitally coded programs that are themselves transcodings of alphanumerically coded texts. These remarkably powerful models of experience should be seen in the first instance as programmed poetry and fiction, and only then as "visual art." In this way, an optimistic perspective on the programming of all writing seems justified: if alphabetic writing is to be replaced by digital programming, then all the messages, texts, behavior,

knowledge, and experience that were once mediated by texts will be transmitted more effectively and more creatively through the new informatic media.

But we should not let ourselves be swept up by this optimism.

Much would be gained by the programming of everything that has been written alphanumerically until now, but the terror of reactionaries cannot be dismissed so lightly. For in the recoding from alphanumeric into digital codes, something would be lost that not only reactionaries may acknowledge as the critical value of writing. For spoken language would lose its position as mediator between thinking and writing. Digital codes are ideographic in the sense of making concepts (ideas) visible. They differ from the alphabet in signifying no spoken sounds. In programming what was formerly alphabetically written, thought will have detached itself from language. And that is terrifying.

Writing, as we learned it in school, is a gesture of historical consciousness. Programming, as our children are beginning to learn it, is a gesture of a different sort, a gesture better compared to a mathematical than to a literary consciousness. The codes it uses are as ideographic as numbers. Wittgenstein, in his remark on the meaninglessness of saying "two and two is four at six o'clock in the afternoon," showed that mathematical thought is unhistorical. But until now, mathematical thought has been organically immersed in alphanumeric code and swept along in the flow of historical thought. Now programming is rising up from alphanumeric code, becoming independent and separating itself from spoken language. That justifies a degree of pessimism.

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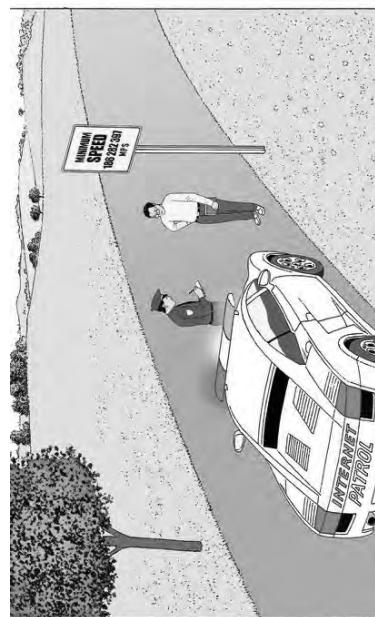
What the Internet is doing to our brains NICHOLAS CARR JULY/AUGUST 2008 ISSUE

I can feel it, too. Over the past few years I've had an uncomfortable sense

that someone, or something, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory. My mind isn't going—so far as I can tell—but it's changing. I'm not thinking the way I used to think. I can feel it most strongly when I'm reading. Immersing myself in a book or a lengthy article used to be easy. My mind would get caught up in the narrative or the turns of the argument, and I'd spend hours strolling through long stretches of prose. That's rarely the case anymore. Now my concentration often starts to drift after two or three pages. I get fidgety, lose the thread, begin looking for something else to do. I feel as if I'm always dragging my wayward brain back to the text. The deep reading that used to come naturally has become a struggle.

I think I know what's going on. For more than a decade now, I've been spending a lot of time online, searching and surfing and sometimes adding to the great databases of the Internet. The Web has been a godsend to me as a writer. Research that once required days in the stacks or periodical rooms of libraries can now be done in minutes. A few Google searches, some quick clicks on hyperlinks, and I've got the telltale fact or pithy quote I was after. Even when I'm not working, I'm as likely as not to be foraging in the Web's info-thickets—reading and writing e-mails, scanning headlines and blog posts, watching videos and listening to podcasts, or just tripping from link to link to link. (Unlike footnotes, to which they're sometimes likened, hyperlinks don't merely point to related works; they propel you toward them.)

For me, as for others, the Net is becoming a universal medium, the conduit for most of the information that flows through my eyes and ears and into my mind. The advantages of having immediate access to such an incredibly rich store of information are many, and they've been widely described and duly applauded. "The perfect recall of silicon memory," Wired's Clive Thompson has written, "can be an enormous boon to thinking." But that boon comes at a price. As the media theorist Marshall McLuhan pointed out in the 1960s, media are not just passive channels of information. They supply the stuff of thought, but they also shape the process of thought. And what the Net seems to be doing is chipping away my capacity for concentration and contemplation. My mind now expects to take in information the way the Net distributes it: in a swiftly moving stream of particles. Once I was a scuba diver in the sea of words. Now I zip along the surface like a guy on a Jet Ski.



GUY BILLOUT

"Dave, stop. Stop, will you? Stop, Dave. Will you stop, Dave?" So the

I'm not the only one. When I mention my troubles with reading to friends and acquaintances—literary types, most of them—many say they're having similar experiences. The more they use the Web, the more they have to fight to stay focused on long pieces of writing. Some of the bloggers I follow have also begun mentioning the phenomenon. Scott Karp, who writes a blog about online media, recently confessed that he has stopped reading books altogether. "I was a lit major in college, and used to be [a] voracious book reader," he wrote. "What happened?" He speculates on the answer: "What if I do all my reading on the web not so much because the way I read has changed, i.e. I'm just seeking convenience, but because the way I THINK has changed?"

Bruce Friedman, who blogs regularly about the use of computers in medicine, also has described how the Internet has altered his mental habits. "I now have almost totally lost the ability to read and absorb a longish article on the web or in print," he wrote earlier this year. A pathologist who has long been on the faculty of the University of Michigan Medical School, Friedman elaborated on his comment in a telephone conversation with me. His thinking, he said, has taken on a "staccato" quality, reflecting the way he quickly scans short passages of text from many sources online. "I can't read War and Peace anymore," he admitted. "I've lost the ability to do that. Even a blog post of more than three or four paragraphs is too much to absorb. I skim it."

Anecdotes alone don't prove much. And we still await the long-term neurological and psychological experiments that will provide a definitive picture of how Internet use affects cognition. But a recently published study of online research habits, conducted by scholars from University College London, suggests that we may well be in the midst of a sea change in the way we read and think. As part of the five-year research program, the scholars examined computer logs documenting the behavior of visitors to two popular research sites, one operated by the British Library and one by a U.K. educational consortium, that provide access to journal articles, e-books, and other sources of written information. They found that people using the sites exhibited "a form of skimming activity," hopping from one source to another and rarely returning to any source they'd already visited. They typically read no more than one or two pages of an article or book before they would "bounce" out to another site. Sometimes they'd save a long article, but there's no evidence that they ever went back and actually read it. The authors of the study report:

It is clear that users are not reading online in the traditional sense; indeed there are signs that new forms of "reading" are emerging as users "power browse" horizontally through titles, contents pages and abstracts going for quick wins. It almost seems that they go online to avoid reading in the traditional

sense.

Thanks to the ubiquity of text on the Internet, not to mention the popularity of text-messaging on cell phones, we may well be reading more today than we did in the 1970s or 1980s, when television was our medium of choice. But it's a different kind of reading, and behind it lies a different kind of thinking—perhaps even a new sense of the self. "We are not only what we read," says Maryanne Wolf, a developmental psychologist at Tufts University and the author of *Proust and the Squid: The Story and Science of the Reading Brain*. "We are how we read." Wolf worries that the style of reading promoted by the Net, a style that puts "efficiency" and

"immediacy" above all else, may be weakening our capacity for the kind of deep reading that emerged when an earlier technology, the printing press, made long and complex works of prose commonplace. When we read online, she says, we tend to become "mere decoders of information." Our ability to interpret text, to make the rich mental connections that form when we read deeply and without distraction, remains largely disengaged.

Reading, explains Wolf, is not an instinctive skill for human beings. It's not etched into our genes the way speech is. We have to teach our minds how to translate the symbolic characters we see into the language we understand. And the media or other technologies we use in learning and practicing the craft of reading play an important part in shaping the neural circuits inside our brains. Experiments demonstrate that readers of ideograms, such as the Chinese, develop a mental circuitry for reading that is very different from the circuitry found in those of us whose written language employs an alphabet. The variations extend across many regions of the brain, including those that govern such essential cognitive functions as memory and the interpretation of visual and auditory stimuli. We can expect as well that the circuits woven by our use of the Net will be different from those woven by our reading of books and other printed works.

Sometime in 1882, Friedrich Nietzsche bought a typewriter—a Malling-Hansen Writing Ball, to be precise. His vision was failing, and keeping his eyes focused on a page had become exhausting and painful, often bringing on crushing headaches. He had been forced to curtail his writing, and he feared that he would soon have to give it up. The typewriter rescued him, at least for a time. Once he had mastered touch-typing, he was able to write with his eyes closed, using only the tips of his fingers. Words could once again flow from his mind to the page.

But the machine had a subtler effect on his work. One of Nietzsche's friends, a composer, noticed a change in the style of his writing. His already terse prose had become even tighter, more telegraphic. "Perhaps you will through this instrument even take to a new idiom," the friend wrote in a letter, noting that, in his own work, his "thoughts" in music and language often depend on the quality of pen and paper."

"You are right," Nietzsche replied, "our writing equipment takes part in the forming of our thoughts." Under the sway of the machine, writes the German media scholar Friedrich A. Kittler, Nietzsche's prose "changed from arguments to aphorisms, from thoughts to puns, from rhetoric to telegram style."

The human brain is almost infinitely malleable. People used to think that our mental meshwork, the dense connections formed among the 100 billion or so neurons inside our skulls, was largely fixed by the time we reached adulthood. But brain researchers have discovered that that's not the case. James Olds, a professor of neuroscience who directs the Krasnow Institute for Advanced Study at George Mason University, says that even the adult mind "is very plastic." Nerve cells routinely break old connections and form new ones. "The brain," according to Olds, "has the ability to reprogram itself on the fly, altering the way it functions."

As we use what the sociologist Daniel Bell has called our "intellectual technologies"—the tools that extend our mental rather than our physical capacities—we inevitably begin to take on the qualities of those technologies. The mechanical clock, which came into common use in the 14th century, provides a compelling example. In *Technics and Civilization*, the historian and cultural critic Lewis Mumford described how the clock "disassociated time from human events and helped create the belief in an independent world of mathematically measurable sequences." The "abstract framework of divided time" became "the point of reference for both action and thought."

The clock's methodical ticking helped bring into being the scientific mind and the scientific man. But it also took something away. As the late MIT computer scientist Joseph Weizenbaum observed in his 1976 book, *Computer Power and Human Reason: From Judgment to Calculation*, the conception of the world that emerged from the widespread use of timekeeping instruments "remains an impoverished version of the older one, for it rests on a rejection of those direct experiences that formed the basis for, and indeed constituted, the old reality." In deciding when to eat, to work, to sleep, to rise, we stopped listening to our senses and started obeying the clock.

The process of adapting to new intellectual technologies is reflected in the changing metaphors we use to explain ourselves to ourselves. When the mechanical clock arrived, people began thinking of their brains as operating "like clockwork." Today, in the age of software, we have come to think of them as operating "like computers." But the changes, neuroscience tells us, go much deeper than metaphor. Thanks to our brain's plasticity, the adaptation occurs also at a biological level.

The Internet promises to have particularly far-reaching effects on

cognition. In a paper published in 1936, the British mathematician Alan Turing proved that a digital computer, which at the time existed only as a theoretical machine, could be programmed to perform the function of any other information-processing device. And that's what we're seeing today. The Internet, an immeasurably powerful computing system, is subsuming most of our other intellectual technologies. It's becoming our map and our clock, our printing press and our typewriter, our calculator and our telephone, and our radio and TV.

When the Net absorbs a medium, that medium is re-created in the Net's image. It injects the medium's content with hyperlinks, blinking ads, and other digital gewgaws, and it surrounds the content with the content of all the other media it has absorbed. A new e-mail message, for instance, may announce its arrival as we're glancing over the latest headlines at a newspaper's site. The result is to scatter our attention and diffuse our concentration.

The Net's influence doesn't end at the edges of a computer screen, either. As people's minds become attuned to the crazy quilt of Internet media, traditional media have to adapt to the audience's new expectations. Television programs add text crawls and pop-up ads, and magazines and newspapers shorten their articles, introduce capsule summaries, and crowd their pages with easy-to-browse info-snippets. When, in March of this year, The New York Times decided to devote the second and third pages of every edition to article abstracts, its design director, Tom Bodkin, explained that the "shortcuts" would give harried readers a quick "taste" of the day's news, sparing them the "less efficient" method of actually turning the pages and reading the articles. Old media have little choice but to play by the new-media rules.

Never has a communications system played so many roles in our lives—or exerted such broad influence over our thoughts—as the Internet does today. Yet, for all that's been written about the Net, there's been little consideration of how, exactly, it's reprogramming us. The Net's intellectual ethic remains obscure.

About the same time that Nietzsche started using his typewriter, an earnest young man named Frederick Winslow Taylor carried a stopwatch into the Midvale Steel plant in Philadelphia and began a historic series of experiments aimed at improving the efficiency of the plant's machinists. With the approval of Midvale's owners, he recruited a group of factory hands, set them to work on various metalworking machines, and recorded and timed their every movement as well as the operations of the machines. By breaking down every job into a sequence of small, discrete steps and then testing different ways of performing each one, Taylor created a set of precise instructions—an "algorithm," we might say today—for how each worker should work. Midvale's employees grumbled about the strict new

regime, claiming that it turned them into little more than automations, but the factory's productivity soared.

More than a hundred years after the invention of the steam engine, the Industrial Revolution had at last found its philosophy and its philosopher. Taylor's tight industrial choreography—his 'system,' as he liked to call it—was embraced by manufacturers throughout the country and, in time, around the world. Seeking maximum speed, maximum efficiency, and maximum output, factory owners used time-and-motion studies to organize their work and configure the jobs of their workers. The goal, as Taylor defined it in his celebrated 1911 treatise, *The Principles of Scientific Management*, was to identify and adopt, for every job, the "one best method" of work and thereby to effect "the gradual substitution of science for rule of thumb throughout the mechanic arts." Once his system was applied to all acts of manual labor, Taylor assured his followers, it would bring about a restructuring not only of industry but of society, creating an utopia of perfect efficiency. "In the past, the man has been first," he declared; "in the future the system must be first."

Taylor's system is still very much with us; it remains the ethic of industrial manufacturing. And now, thanks to the growing power that computer engineers and software coders wield over our intellectual lives, Taylor's ethic is beginning to govern the realm of the mind as well. The Internet is a machine designed for the efficient and automated collection, transmission, and manipulation of information, and its legions of programmers are intent on finding the 'one best method'—the perfect algorithm—to carry out every mental movement of what we've come to describe as 'knowledge work.'

Google's headquarters, in Mountain View, California—the Googleplex—is the Internet's high church, and the religion practiced inside its walls is Taylorism. Google, says its chief executive, Eric Schmidt, is "a company that's founded around the science of measurement," and it is striving to "systematize everything" it does. Drawing on the terabytes of behavioral data it collects through its search engine and other sites, it carries out thousands of experiments a day, according to the Harvard Business Review, and it uses the results to refine the algorithms that increasingly control how people find information and extract meaning from it. What Taylor did for the work of the hand, Google is doing for the work of the mind.

The company has declared that its mission is "to organize the world's information and make it universally accessible and useful." It seeks to develop "the perfect search engine," which it defines as something that "understands exactly what you mean and gives you back exactly what you want." In Google's view, information is a kind of commodity, a utilitarian resource that can be mined and processed with industrial efficiency. The

more pieces of information we can "access" and the faster we can extract their gist, the more productive we become as thinkers.

Where does it end? Sergey Brin and Larry Page, the gifted young men who founded Google while pursuing doctoral degrees in computer science at Stanford, speak frequently of their desire to turn their search engine into an artificial intelligence, a HAL-like machine that might be connected directly to our brains. "The ultimate search engine is something as smart as people—or smarter," Page said in a speech a few years back. "For us, working on search is a way to work on artificial intelligence." In a 2004 interview with *Newsweek*, Brin said: "Certainly if you had all the world's information directly attached to your brain, or an artificial brain that was smarter than your brain, you'd be better off." Last year, Page told a convention of scientists that Google is "really trying to build artificial intelligence and to do it on a large scale."

Such an ambition is a natural one, even an admirable one, for a pair of math whizzes with vast quantities of cash at their disposal and a small army of computer scientists in their employ. A fundamentally scientific enterprise, Google is motivated by a desire to use technology, in Eric Schmidt's words, "to solve problems that have never been solved before," and artificial intelligence is the hardest problem out there. Why wouldn't Brin and Page want to be the ones to crack it?

Still, their easy assumption that we'd all "be better off" if our brains were supplemented, or even replaced, by an artificial intelligence is unsettling. It suggests a belief that intelligence is the output of a mechanical process, a series of discrete steps that can be isolated, measured, and optimized. In Google's world, the world we enter when we go online, there's little place for the fuzziness of contemplation. Ambiguity is not an opening for insight but a bug to be fixed. The human brain is just an outdated computer that needs a faster processor and a bigger hard drive.

The idea that our minds should operate as high-speed data-processing machines is not only built into the workings of the Internet, it is the network's reigning business model as well. The faster we surf across the Web—the more links we click and pages we view—the more opportunities Google and other companies gain to collect information about us and to feed us advertisements. Most of the proprietors of the commercial Internet have a financial stake in collecting the crumbs of data we leave behind as we flit from link to link—the more crumbs, the better. The last thing these companies want is to encourage leisurely reading or slow, concentrated thought. It's in their economic interest to drive us to distraction.

Maybe I'm just a worrywart. Just as there's a tendency to glorify technological progress, there's a counter-tendency to expect the worst of every new tool or machine. In Plato's *Phaedrus*, Socrates bemoaned the

development of writing. He feared that, as people came to rely on the written words as a substitute for the knowledge they used to carry inside their heads, they would, in the words of one of the dialogue's characters, "cease to exercise their memory and become forgetful." And because they would be able to "receive a quantity of information without proper instruction," they would "be thought very knowledgeable when they are for the most part quite ignorant." They would be "filled with the conceit of wisdom instead of real wisdom." Socrates wasn't wrong—the new technology did often have the effects he feared—but he was shortsighted. He couldn't foresee the many ways that writing and reading would serve to spread information, spur fresh ideas, and expand human knowledge (if not wisdom).

The arrival of Gutenberg's printing press, in the 15th century, set off another round of teeth gnashing. The Italian humanist Hieronimo Squarcialfico worried that the easy availability of books would lead to intellectual laziness, making men "less studious" and weakening their minds. Others argued that cheaply printed books and broadsheets would undermine religious authority, demean the work of scholars and scribes, and spread sedition and debauchery. As New York University professor Clay Shirky notes, "Most of the arguments made against the printing press were correct, even prescient." But, again, the doomsayers were unable to imagine the myriad blessings that the printed word would deliver.

So, yes, you should be skeptical of my skepticism. Perhaps those who dismiss critics of the Internet as Luddites or nostalgists will be proved correct, and from our hyperactive, data-stoked minds will spring a golden age of intellectual discovery and universal wisdom. Then again, the Net isn't the alphabet, and although it may replace the printing press, it produces something altogether different. The kind of deep reading that a sequence of printed pages promotes is valuable not just for the knowledge we acquire from the author's words but for the intellectual vibrations those words set off within our own minds. In the quiet spaces opened up by the sustained, undistracted reading of a book, or by any other act of contemplation, for that matter, we make our own associations, draw our own inferences and analogies, foster our own ideas. Deep reading, as Maryanne Wolf argues, is indistinguishable from deep thinking.

If we lose those quiet spaces, or fill them up with "content," we will sacrifice something important not only in our selves but in our culture. In a recent essay, the playwright Richard Foreman eloquently described what's at stake:

I come from a tradition of Western culture, in which the ideal (my ideal) was the complex, dense and "cathedral-like" structure of the highly educated and articulate personality—a man or woman who carried inside themselves a personally constructed

and unique version of the entire heritage of the West. [But now] I see within us all (myself included) the replacement of complex inner density with a new kind of self—evolving under the pressure of information overload and the technology of the "instantly available."

As we are drained of our "inner repertory of dense cultural inheritance," Foreman concluded, we risk turning into "pancake people"—spread wide and thin as we connect with that vast network of information accessed by the mere touch of a button.

I'm haunted by that scene in 2001. What makes it so poignant, and so weird, is the computer's emotional response to the disassembly of its mind: its despair as one circuit after another goes dark, its childlike pleading with the astronaut—"I can feel it. I can feel it. I'm afraid"—and its final reversion to what can only be called a state of innocence. HAL's outpouring of feeling contrasts with the emotionlessness that characterizes the human figures in the film, who go about their business with an almost robotic efficiency. Their thoughts and actions feel scripted, as if they're following the steps of an algorithm. In the world of 2001, people have become so machine-like that the most human character turns out to be a machine. That's the essence of Kubrick's dark prophecy: as we come to rely on computers to mediate our understanding of the world, it is our own intelligence that flattens into artificial intelligence.

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ePortfolio as pedagogy: Threshold concepts for curriculum design

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Abstract

The ePortfolio has been used in initial teacher education for its storage and presentation functions; however, its use as a pedagogic tool to enhance learning outcomes is less common. This study explored students' perceptions of ePortfolio and their learning in a Bachelor of Education (primary) programme at a New Zealand university. The research sought to identify courses in which learning had been enhanced by ePortfolio use and the related reasons. Data were collected through document analysis, a survey questionnaire and a focus group discussion. The findings indicate a relationship between students' perceptions of their enhanced learning through ePortfolio and a number of threshold concepts in curriculum design. These ePortfolio-related concepts include its purpose for learning, design of constructivist learning activities, social pedagogy for co-construction of knowledge and the constructive alignment of ePortfolio concepts for enhanced learning outcomes. An argument is made for course designers and developers to deeply understand the nature of these threshold concepts when planning to incorporate ePortfolio into curriculum processes.

Keywords

ePortfolio, threshold concept, initial teacher education, student perspectives, curriculum processes

Electronic portfolios (ePortfolio) are increasingly being used in higher education institutions. This digital tool has been described as "the next great innovation in education" (Gatherecoal et al., 2007: p. 641) and it has been linked to transformational learning (Stefani et al., 2007). The Joint Information Systems Committee (Joint Information Systems Committee, 2008) describes the ePortfolio as a 21st-century tool for supporting learning, teaching and assessment. Its purposes are well suited to develop attributes which have been listed as essential for the workplace of the future: graduates who can be flexible, adaptive, integrative, reflexive and critically engaged life-long learners (Peet et al., 2011). The ePortfolio is identified

as a digital pedagogic tool which can trigger and support these kinds of learning (Bass, 2014; Eynon et al., 2014); however, Joyes et al. (2010) caution that this does not happen without intentional planning, as ePortfolio is disruptive in that it does not fit with existing systems and processes. The purpose of this research study was to seek undergraduate students' understanding of ways in which ePortfolio enhanced (or not) their learning in a Bachelor of Education (primary) programme at a New Zealand university with a view to inform curriculum design with ePortfolio as a pedagogical tool for enhanced learning outcomes.

The purpose and use of ePortfolio for learning

ePortfolios involve a constructivist perspective of learning (Barrett, 2005; Stefani et al., 2007) with associated pedagogies such as reflective and evaluative approaches to learning (Lin, 2008), self-regulation of professional learning through standards-based achievement (Blackburn and Hakel, 2006; Ring and Foti, 2006) and social learning (Bass, 2014; Baxter Magolda, 2014). In addition, integrative learning through ePortfolio draws on meaning-making from formal and informal learning experiences across different contexts and time (Peet et al., 2011).

It follows that identifying the learning purpose of an ePortfolio in the curriculum is fundamental to the design of authentic learning activities. The assumption that the ePortfolio is one discrete thing belies the complexity and potential of the technology to be used for both its tool and pedagogic purposes. In this article, the definition by the Joint Information Systems Committee (2008) will be used:

An eportfolio is the product, created by the learner, a collection of digital artefacts articulating experiences, achievements and learning. Behind any product or presentation, lie rich and complex processes of planning, synthesising, sharing, discussing, reflecting, giving, receiving and responding to feedback. These processes referred to here as 'eportfolio-based learning' are the focus of increasing attention, since the process of learning can be as important as the end product (p. 6).

An ePortfolio can be used as both a product and process; however, the purpose and dimensions of the ePortfolio will look different depending on where the focus is placed. In courses where the ePortfolio is conceptualized as a product, it functions as a digital repository or storehouse. In this case, an individual will construct a *documentation* or *directed* portfolio (Matthews-DeNatale, 2013) in which a view of selected artefacts is assembled to articulate learning, often around summative assessment of course outcomes or professional standards. The focus at this level is on content, digital conversion and collection (Barrett, 2010) with the ePortfolio being used mainly as a tool.

The view of the ePortfolio as a process focuses on ePortfolio-based learning around self-appraisal and reflection across time and often involves formative assessment for learning (Barrett and Wilkerson, 2004). An individual in this case will construct an *integrated learning* or *development* portfolio (Matthews-DeNatale, 2013) which may be associated with the notion of the ePortfolio as a tool of social pedagogy: engaging users in iterative cycles of creating, reflecting, seeking feedback, reviewing and 'integrating revised work within a larger context of professional or learning identity formation' (p. 2). The focus is on the pedagogical capabilities of the ePortfolio. Such a portfolio has also been described as a *working* (Barrett, 2010) or *learning* (Gerbic and Lewis, 2011) portfolio, supporting the process of powerful personalized learning often through reflective blogging, and with a strong developmental focus over a period of time.

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Using the ePortfolio as both product and process involves the construction of a *showcase* (Matthews-DeNatale, 2013) or *presentation* (Barrett, 2010) portfolio. This type of ePortfolio contains a selection of evidence of integrative knowledge drawn from diverse sources and usually accompanied with reflective comment on learning, growth and professional capabilities (Zeichner and Wray, 2001) and can be useful for employment purposes and as a pre-interview tool (Cambridge, 2008). While such a portfolio reflects the tool aspects of ePortfolio, these are subsumed within its pedagogical capability to support integrative learning (Peet et al., 2011).

Joyes et al. (2010) contend that the ePortfolio can effectively be used as a pedagogic tool through its inclusion in teaching and learning activities. Reporting on an evaluation of 21 ePortfolio projects by the Joint Information Systems Committee in the United Kingdom, which sought to identify factors influencing ePortfolio practice, they argue that while evidence reveals ‘tangible benefits for users’ (p. 16) such as time efficiency and the enhancement of skills, misconceptions held by those implementing the ePortfolio reveal a lack of understanding of the complex impact of the technology on curriculum decisions. Joyes et al. (2010) have identified the following threshold concepts around the role of ePortfolio in curriculum: the purpose for its use, learning activity design, processes involved in its use, and ownership of the ePortfolio. They contend that unless these threshold concepts are understood as disruptive in terms of new ways of ePortfolio learning, the technology will simply remain an add-on with misalignment of purpose, rather than opening up a new space for learning. The first two concepts relate to a course level while the final two involve an institutional response.

This research study draws on, and develops further, the argument made by Joyes et al. (2010) that an understanding of specific threshold concepts is required for effective ePortfolio practice at a course level. An argument is made for course designers and developers to understand a number of critical threshold concepts which relate to enhanced learning experiences described by research participants. This will be of interest to educators who are involved in implementing or already use ePortfolio in initial teacher education curriculum.

Theoretical framework

Threshold concept theory was proposed by Meyer and Land (2006) as a way of understanding learning experiences related to key discipline concepts (core concepts) considered essential for deep subject knowledge. Understanding a threshold concept results in a transformed way of viewing or appreciating the concept (described as a portal experience) which opens up a new and previously inaccessible way of knowing. This is different from the liminal (pre-threshold) state many learners may achieve as a result of rote learning or mimicry without full understanding of the concept. For example, to grasp the threshold concept of *opportunity cost* in Economics a student must accept the idea that *opportunity cost* involves the comparing of choices and the rejection of alternatives. Such understanding moves thinking about choice as predetermined towards an appreciation of “two sides to every choice. . . Thus, if ‘accepted’ by the individual student as a valid way of interpreting the world, it fundamentally changes their way of thinking about their own choices” (Meyer and Land, 2006: p. 6, emphasis in original). The student has thus moved through a portal experience and is open to further concepts which may depend on the fundamental

understanding of *opportunity cost*. Scott (2014) argues this transformational experience involves an epistemological and ontological shift in the learner. According to Meyer and Land (2006) threshold concepts have the following characteristics: *transformative* (leading to a significant shift in perception); *irreversible* (difficult to unlearn); *integrative* (exposes previously hidden integrative understandings); potentially *troublesome* (can be counter-intuitive) and sometimes *bounded*. While research using threshold concept theory has mainly focussed on the identification of concepts within an academic discipline, there are examples of research which has followed the suggestion by Meyer and Land that “ways of *thinking* and *practising* within a discipline constitutes a critical threshold function” (p. 15). Tucker et al. (2014) conducted a study on the process of learning-to-search in Library and Information Studies to identify threshold concepts that novices needed in order to develop expertise, and Joyes et al. (2010) have similarly applied threshold concept theory to the effective practice of ePortfolio in teaching and learning. This research study uses threshold concept theory as a lens through which to view student perceptions of their learning using ePortfolio.

Methodology

This qualitative study is based on an interpretivist paradigm (Crotty, 1998) with an ontological perspective that truth is subjective and multiple realities exist. My related epistemological perspective holds that cognitive meaning-making is constructed by an individual, based on experiences and often in a social context. Thus, reporting the student voice, as in this project, aligns with a social constructivist approach in which students are seen as active participants in their learning and meaning-making (Tosh et al., 2006). I support Cousin’s (2009) view that threshold concept research does not involve a specific method for inquiry, but offers an analytical framework for exploring difficulties in learning and teaching in order to support curriculum design.

I acknowledge my insider research perspective in that I have been a lecturer and developer of ePortfolio in the Bachelor of Education (primary) programme. In addition to being informed by the literature, my interpretation flows from my personal beliefs and experiences regarding the potential for learning through ePortfolio. Being sensitive to my potential power position in relation to the participants, I employed a research assistant to communicate with participants, collect data and enter such data into electronic formats. The project received ethical approval through the university ethics process and participants gave informed consent.

Context of the ePortfolio within the Bachelor of Education (BEd) courses

The ePortfolio was first introduced into the BEd programme in 2009 and by 2013 it was being used by eight different courses. Students first encounter the ePortfolio in the Professional Inquiry and Practice 2 (PIP) course when time is allocated for introduction to the concept of ePortfolio as well as workshop sessions.

Participant characteristics

Participants were drawn from a third-year cohort studying a BEd (primary) programme. The composition of the group was predominantly female (80%). Age varied within the

group, with 64% in the younger age group (18–24 years) and 36% in the more mature age group (25–50 years). These demographics are representative of initial teacher education programmes in New Zealand, with more females entering the profession than males and a large number returning to study as mature students. The research project was conducted during August 2013 when the students had used an ePortfolio over a period of five semesters. Forty-eight participants (85% of the group) had used their ePortfolio in seven or more courses. They were therefore able to draw on their ePortfolio experiences based in a range of curricula as well as the different approaches adopted by their lecturers. Recognising the level of exposure to ePortfolio, the student voice was valued in assessing the impact of ePortfolio on their learning.

Methods of data collection and analysis

The aim of the study was to answer the research question: how is the use of an ePortfolio in courses within the BEd programme impacting student learning? In order to focus the participants on the value of ePortfolio in each specific course, the following sub-question was designed: in which courses has the use of ePortfolio enhanced your learning and why?

Three tools were selected as most appropriate to collect the data. Firstly, document analysis of study guides aimed to provide the context for ePortfolio use in a course and represented the official communication from lecturer to student on the purpose and use of ePortfolio. Secondly, in order to survey the views of the whole participant group and gather data in a standardized way so as to provide a picture at a cohort level, a questionnaire was designed comprising closed and open responses (Appendix A). The quantitative data collected through the questionnaire were statistically analysed using simple calculations for reporting purposes (Bell, 2005) while open-ended questionnaire data were collated at a course level to seek patterns and trends. Thirdly, the use of a focus group aimed to collect rich data by providing an opportunity for participants to explore, in greater depth, ideas linked to the questionnaire survey. The set of focus questions is detailed in Appendix B. Qualitative data collected from the survey and focus group were analysed using an inductive approach with coding to reduce and categorize the data into themes (Miles and Huberman, 1994). Analysis of focus group data was specifically at a cohort level for the purpose of seeking relationships (or not) with data collected through the questionnaire.

The full cohort of 106 students was approached by the research assistant for their participation in the project. Of these, 56 consented to complete the survey questionnaire. The sample size of the questionnaire group is sufficient and representative enough of the student cohort to draw tentative conclusions from the research. From the participant group, six consented to participate in a one-hour focus group; however, only three took up the opportunity. The focus group sample size, while small, provides rich data and the decision was made to use the participants' comments to illuminate the survey data and give specific examples of experiences where appropriate.

Results

Question 1 of the survey questionnaire asked participants to identify courses in which they had experienced ePortfolio and for each of these courses to state how the ePortfolio had affected their learning. Questions 2 and 3 of the survey questionnaire, as well as the focus

group discussion, provided explanation for choices made in Question 1. The courses identified by the respondents were:

- Teaching the Arts
- Teaching Technology
- Professional Inquiry and Practice (PIP) (five individual papers over five semesters)
- Teaching Social Sciences
- Teaching Children from Diverse Ethnicities

Table 1 provides detail on the numbers of participants in each course and the responses related to the perceived effect of the ePortfolio on learning in that course.

In the section that follows, results for each of these courses are considered, drawing on the document analysis and participant data. As the students were surveyed in their third year of study, the study guide dates reflect the year in which the ePortfolio was experienced. While it could be argued that this range of dates might influence the results due to increasing familiarity with the ePortfolio in each course, this is only evident in the case of the PIP courses which ran across five semesters. In the other courses, the purpose for using ePortfolio appears to exceed an increasing familiarity in using the technology. This is further elaborated in the discussion of results for each of the courses.

Teaching the Arts

The ePortfolio was named in the study guide (2013) for the Teaching the Arts course as the required presentation tool for a summative assessment task. This purpose for the ePortfolio meets the description of a *documentation* or *directed* portfolio (Mathews-DeNatale, 2013) for a product of learning which evidences achievement of learning. However, such a specific purpose was not made clear to students in the documentation.

The survey data showed that more than half of the participants felt that the use of the ePortfolio in the Teaching the Arts course did not add to their learning, while 10% stated

Table 1. ePortfolio impact on learning in eight Bachelor of Education courses.

Course	Effect of ePortfolio on learning (%)			
	Total N	Enhanced	Not affected	Negatively affected
Teaching the Arts	39	35	55	10
PIP 2	42	45	55	0
Teaching Technology	49	60	36	4
PIP 3	48	64	36	0
PIP 4	49	68	32	0
PIP 5	49	72	28	0
Teaching Social Sciences	48	71	29	0
Teaching Children from Diverse Ethnicities	43	79	19	0

Total N: total number of responses; PIP: Professional Inquiry and Practice.
Courses are ordered from least to most reported learning enhancement through use of ePortfolio.

that the ePortfolio had a negative impact on their learning. One focus group participant commented that the focus was “not a critical piece of work, just pictures of you doing art”. Little explicit connection was made by participants to their learning.

Teaching Technology

The Teaching Technology study guide (2012) specifically listed the use of the ePortfolio in the session schedule, where it was linked to the *Design, Make & Appraise* technology process. A summative assessment required students to include artefacts and commentary on the application of theory to practice. Such a use of ePortfolio meets the description of a *showcase* (Matthews-DeNatale, 2013) or *presentation* (Barrett, 2010) portfolio as it includes both product and process learning.

While almost two thirds of participants responded that the ePortfolio enhanced their learning in the Teaching Technology course, one third felt it made no impact and there was unanimous agreement in the three-person focus group that this course would have been better off without the ePortfolio as: “it was an essay that was just put up on a page” and “it felt just a little bit meaningless... just uploading for no reason.” The survey participants who responded positively showed their awareness of learning through the ePortfolio as a digital pedagogy with comments such as: “a record of learning”, “a showcase of work” and “presenting my learning progression”. The new ways of presenting their learning (such as visual images, sound files and video) were perceived to stimulate creativity and ‘made learning fun’.

Professional Inquiry and Practice (PIP)

The study guide for PIP 2 (2011) had a session dedicated to student teaching goals and building the ePortfolio page for the forthcoming teaching experience. The design and contents of the page were dictated with a visual example provided of a completed ePortfolio page detailing practicum goals, weekly reflections and selected Graduating Teacher Standards (Education Council, 2007). The subsequent four PIP study guides (2012, 2013) repeated the identical ePortfolio expectations except for the inclusion of different Standards. The purpose of ePortfolio in these courses was made very clear to participants and this aligned with a *documentation or directed* portfolio (Matthews-DeNatale, 2013) as it was used as a product for the storage of learning artefacts. Only in the case of the weekly practicum reflections, which involved formative feedback, was the ePortfolio purpose for a *learning* (Gerbic and Lewis, 2011) portfolio.

Over the course of the five PIP experiences, participants demonstrated an increased awareness of the ePortfolio enhancing their learning (from 45% in PIP 2 to 72% in PIP 5). This is an interesting trend considering that the requirements for the ePortfolio use and its purpose were identical in each iteration of the course. Those participants who selected to explore PIP more fully in survey question 2 cited reasons for their enhanced learning related to using ePortfolio for its tool functions, such as its convenience for electronic submission purposes and its value for storage and organization of documents. There was limited reference to ePortfolio being used as a digital pedagogy, with only one participant noting its capability to represent the progression of learning over time: “I just always like to go back to it and see how I have grown and changed”. Another comment hinted at the ePortfolio being used as a social pedagogy through “sharing knowledge” with peers.

Teaching Social Sciences

ePortfolio was mentioned in the study guide (2011) for the Teaching Social Sciences course as part of the content themes, and an ePoster (a visual narrative) was named as the presentation format for a community-based, collaborative group learning activity. Using an ePoster would suggest an *integrated learning* portfolio (Peet et al., 2011); however, such a purpose was not made explicit to the student readers.

ePortfolio was perceived by 71% of survey participants as enhancing their learning in Teaching Social Sciences, and more than a third of survey participants chose to explore their reasons. Members of the three-person focus group unanimously agreed that this was the course in which the use of an ePortfolio significantly enhanced their learning, with one commenting: “I learnt to interpret and create meaning through a selection of pictures”, while another noted that documenting the experience in visuals “allowed more time to be spent on analysing and reflecting on the group learning experience”. Another declared: “you get the best features of ePortfolio to showcase your learning”. One survey participant noted that the integrative nature of the assessment was “ideal to synthesise the wide array of learning and evidence from the group” while another commented on the ePortfolio as a tool of social pedagogy as a “great way to bring everyone’s work together”.

Teaching Children from Diverse Ethnicities

The study guide (2013) for the course Teaching Children from Diverse Ethnicities contained a specific section on using the ePortfolio for weekly journaling for the purpose of reflecting on a provocative statement related to the session topic as a way to examine assumptions and to increase awareness of beliefs and behaviours. The purpose of the ePortfolio in this course aligns with a *working* (Barrett, 2010) or *learning* (Gerbic and Lewis, 2011) portfolio, which focusses on personalized learning and formative feedback.

The Teaching Children from Diverse Ethnicities course received the highest positive support from the survey and focus group, with just under 80% of respondents claiming that the ePortfolio enhanced their learning. One participant observed that the ePortfolio reflected a change in learning over time, while another appreciated the feedback on blog entries from peers, noting it “allowed for a collaboration of ideas”.

Discussion

The discussion section will elaborate on a set of ePortfolio pedagogies and practices based on threshold concepts which, it will be argued, can enhance student learning if course designers and developers grasp and optimize the capabilities of ePortfolio as a pedagogy.

Meyer and Land (2006) contend that threshold concepts are an important consideration in the design of effective learning environments. An analysis of the courses in which participants identified ePortfolio as enhancing their learning reveals a number of such threshold concepts which fit Meyer and Land’s (2006) framework of characteristics in terms of being *transformative, irreversible* and *integrative*. The characteristic of *transformative*, in that the concept is counter-intuitive, alien or incoherent (Perkins, 2006), is not deemed to apply in this case. Course designers and developers who wish to use the capabilities of ePortfolio for learning are recommended to consider the following four threshold concepts which have been associated with the use of ePortfolio in different courses within the BED programme.

Threshold concept one: the purpose of ePortfolio for learning needs to be clear and explicit

The threshold concept of *purpose* was identified by Joyes et al. (2010) who contend that “the purposes behind the use of ePortfolios must be aligned to the particular context” (p. 22). The findings from this research study support such a view, for when the purpose of the ePortfolio was made explicit through the study guide or learning activities, the participants were more likely to report their learning as being enhanced. This was evidenced in the purpose of ePortfolio for journaling in the Teaching Children from Diverse Ethnicities course, as a storage and presentation tool in the PIP courses and as a narrative ePoster in Teaching Social Sciences. In contrast, the differences in opinion on the value of learning through the ePortfolio in the Teaching Technology course suggest that the purpose of the ePortfolio was not clear enough for all participants. This is surprising as reference to its use in the study guide is more detailed than in any other course, which leads one to question the lecturer’s role in ensuring students make links between the ePortfolio purpose and learning intentions. Thus, explicitly identifying the purpose of ePortfolio in courses will authenticate its place in the learning. As described by Meyer and Land (2006), the portal learning experience associated with this threshold concept results in an irreversible positioning and understanding which leads designers and developers towards accommodating the next threshold concept as a conceptual building block.

Threshold concept two: the design of constructivist learning activities should include authentic ePortfolio pedagogy

The threshold concept of *constructivist learning activity design* relates to the second concept identified by Joyes et al. (2010) who state that there should be “conscious design and support of a learning activity suited to the purpose and context” (p. 22). Laurillard (2012) supports the view that intentional use of technology as a pedagogic tool for learning requires appropriate design of learning experiences. These research findings suggest that where the learning activities utilized the capability of ePortfolio for constructivist learning, participants perceived their learning to be authentic.

Examples of such activities were illustrated in the personal and professional reflective activity in Teaching Children from Diverse Ethnicities and in the digital visual narrative in Teaching Social Sciences reflecting self-authorship (Baxter Magolda, 2014) and digital identity (Lewis and Gerbic, 2012a). On the other hand, the activities in PIP did not utilize the ePortfolio capabilities for synthesizing and integrating learning (Peet et al., 2011), and the opportunity to utilize the pedagogic capability of ePortfolio to support a range of thinking skills was lost.

This threshold concept, once operationalized, draws the learner into constructivist learning in different ways which are authentic to ePortfolio as a vehicle for that learning. This requires course designers and developers to appreciate the transformative and integrative capability of ePortfolio for learning, rather than simply an add-on to a course.

Threshold concept three: ePortfolio as social pedagogy enables co-construction of knowledge

A threshold concept of *social pedagogy* is identified in this research project to be a powerful way of learning through ePortfolio. This is supported by Bass (2014) who describes an

ePortfolio as social pedagogy which engages learners in scripting for an audience of peers for the purpose of seeking critical feedback from the community of learners. Such an approach fits well the ePortfolio, which is part of the suite of Web 2.0 tools which enable the creation and sharing of information online, anywhere and anytime (Foroughi, 2015) as learners actively co-construct knowledge.

Teaching Social Sciences drew on social pedagogy in the context of the collaborative group community-based project, when participants shared experiences and supported each other in activities reflected in their ePoster. In Teaching Children from Diverse Ethnicities, students were required to seek peer feedback from their community of learning on their critical reflections, as a way of refining and sharpening their ideas as well as surfacing assumptions. Student voice on the value of such learning speaks to the transformative nature of what was perceived as an authentic experience.

Threshold concept four: constructive alignment includes ePortfolio as part of learning design for defined outcomes

The final threshold concept of *constructive alignment* integrates the three previous concepts into what appears a common sense approach to ePortfolio and curriculum processes. This illustrates Meyer and Land’s (2006) point that deeply understanding a threshold concept represents a transformed way of viewing which was inaccessible prior to the portal experience, but becomes common sense and thus irreversible. Biggs (nd) describes constructive alignment as an approach to teaching where the outcomes of learning are initially defined, and teaching, learning activities and assessment are then designed to achieve the intended outcomes.

The constructive alignment of the threshold concepts of ePortfolio purpose, constructivist learning activity and social pedagogy for the purpose of enhanced learning outcomes has been evidenced in participant experiences in courses such as Teaching Children from Diverse Ethnicities and Social Sciences. However, such alignment has not occurred in all courses. In Teaching Technology the alignment is not clear enough, and in the Arts course, where the ePortfolio was perceived as not enhancing learning, there is a lack of constructive alignment. This would suggest that many course designers and developers have yet to cross through the portal to view these threshold concepts as essential for student learning. Once constructive alignment occurs, the connections appear to be expressed as authentic learning experiences, deep learning and increased motivation (Atherton, 2011).

Conclusions

This article has reported on student perspectives of learning through ePortfolio in a number of curriculum courses. A tentative conclusion to be drawn from the findings is that the intended role of ePortfolio in a curriculum requires intentional curriculum design with regard to a number of threshold concepts. If these concepts (purpose, constructivist learning activity, social pedagogy and constructive alignment) are included in the design of ePortfolio in curriculum, student learning may be enhanced. One example of such enhanced learning might reflect the capability of ePortfolio for social constructivism (Bass, 2014) in presenting learning through digital visual narratives. These can reveal more of the “self” (Lewis and Gerbic, 2012a) than that of a traditional written essay. Furthermore, ePortfolio has the capability to reflect different ways of thinking, such as purposeful goal-directed thinking for evidencing, relating and appraising learning

associated with standards-based assessment (Lewis and Gerbic, 2012b). Peet et al. (2011) contend that ePortfolio can support integrative thinking as a 21st century skill, while Strudler (2006) reported on the strength of ePortfolio to support critical reflective thinking. Some of these characteristics of enhanced learning have been identified in the research study, particularly in the Children from Diverse Ethnicities and the Social Sciences courses. Based on the theoretical lens of threshold concept theory, the use of ePortfolio for learning, and the findings of this research study, the following recommendations are made for course designers and developers:

- Key threshold concepts should be incorporated into course design if the capabilities of the ePortfolio for enhanced learning are to be realized.
- Ad hoc implementation of the ePortfolio into discrete courses within a programme should be avoided in favour of planning for ePortfolio use at a programme level, with consideration of its purposes and capabilities for specific contexts.
- Documentation, such as study guides developed for student users, should explicitly name the type of ePortfolio to be developed, as this makes clear the purpose of the ePortfolio in the course.
- Staff, and particularly course designers and developers, should receive professional learning on the place and potential of ePortfolio in curriculum design related to the threshold concepts.

This research project had a focus on students as stakeholders for the purpose of informing course designers and developers. While acknowledging the need to be mindful of the self-report nature of students, it appears that participant expectations, assumptions and experiences of learning through ePortfolio align with the identified threshold concepts. This can be tentatively linked to the awareness of the course developer of such concepts for, in those courses where participant learning experiences suggest an absence of the threshold concepts, one could argue that the course developer was in a liminal (pre-threshold) state of shallow understanding of ePortfolio pedagogy, which acted as a barrier to student learning. On the other hand, those who had moved across the threshold and through the portal, with subsequent deeper conceptual understanding, had utilized the constructive alignment of the threshold concepts for enhanced learning. Further research through a similar study of course developer experiences of ePortfolio for learning could test this hypothesis, as well as critique the threshold concepts based on student participant experiences in this study.

It is acknowledged that, in this instance, threshold concept theory has been uncritically adopted; however, an approach involving a critique of the theory through the dominant hegemonic view (which hides assumptions, expectations and power positioning) might reveal significantly different results with respect to identifying threshold concepts in ePortfolio for enhancing student learning. There is ample opportunity to continue to explore the question: how do we enhance student learning through ePortfolio?

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Appendix A

Questionnaire

1. All the courses which have used an ePortfolio are listed.
 - a. For each of the courses in which you have used your ePortfolio, place a tick next to the name of the course.
 - b. For each of the courses in which you have used the ePortfolio, place a tick in the column which best describes the value of using the ePortfolio for your learning in this subject (Column A: Enhanced my learning; Column B: did not affect my learning; Column C: Negatively affected my learning)
2. Select one/two of the courses in which you feel your learning was enhanced by using the ePortfolio. Name each course and then describe the way(s) in which the ePortfolio enhanced your learning.
3. Select one/two of the courses in which the ePortfolio did not affect your learning in the subject. Name each course and then explain why you feel the ePortfolio did not affect your learning.

Appendix B

Focus group questions

1. I'm interested to find out more about your experiences with using an ePortfolio in your courses. Everyone started using the ePortfolio in the second semester of their first year, in the *Professional Inquiry and Practice* course?
 - Did the ePortfolio in any way influence your learning in the course?
2. You have continued to use ePortfolio in other Professional Inquiry and Practice courses in your second and third years. Has this been useful to your learning?
 - Tell me about the different ways you have used the ePortfolio in these courses.
 - Which of these courses do you think benefitted from using the ePortfolio for teaching and learning? Why do you think this?
3. In third year some of you will have used an ePortfolio in the course: *Teaching Children from Diverse Ethnicities*
 - Did you find the ePortfolio useful in this course? Please elaborate.

Author biography

Lyn Lewis is the Head of the School of Education at Auckland University of Technology. She has many years of experience in initial teacher education and, since 2007 has been involved in teaching with ePortfolios. Alongside the introduction and implementation of ePortfolios in different Undergraduate and Postgraduate courses, she has been involved in researching student perceptions of learning through ePortfolios.