Journal of Educational Psychology
2001, Vol. 93, No. 3, 477–487

0022-0663/01/$5.00 DOI: 10.1037//0022-0663.93.3.477

Context Moderates Students' Self-Reports About How They Study

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Models of self-regulated learning hypothesize that learners selectively match study tactics to varying tasks and diverse goals. In this study, relative to each of 3 contexts—reading for learning, completing a brief essay, and studying for an exam—students rated the frequency with which they applied 26 study tactics, used 20 textbook features and other resources, and adopted 30 goals for studying. Analyses revealed substantial context effects in these self-reports. Nine separate principal component analyses of ratings corresponding to cells in a 3 × 3 matrix of (a) tactics, resources, and goals by (b) contexts, identified considerable discrepancies in items' assignment to components, and heterogeneous loadings across contexts. These findings bolster the premise that students' reports of self-regulating studying behaviors are context specific. They also raise questions about using self-reports of self-regulated learning that do not reflect context effects.

Strategic learners have four characteristics. First, they critically assess tasks, such as studying a textbook chapter, to identify features that may influence how they engage with the task and the degree of success they will have. Second, on the basis of their assessment, strategic students define short-term goals and probably overall goals for studying. Third, they know alternative cognitive tactics that provide options about tactics to apply to studying. Finally, strategic students make judgments about which tactic(s) or pattern(s) of tactics has the greatest utility for achieving the goals they choose to pursue (Hadwin & Winne, 1996; Winne, 1995, 1997; Winne & Hadwin, 1998).

Goals provide standards against which strategic students may monitor unfolding engagement with the task or the product(s) constructed as they engage with it. When strategic students monitor these events, they are self-regulating learning (SRL; Winne, 1995). SRL updates self-knowledge and perceptions about the task's changing states, thereby creating information that self-regulating learners can use to select, adapt, and even generate tactics (Butler & Winne, 1995; Hadwin & Winne, 1997; Winne & Hadwin, 1998). The element of *intent* to adapt cognitive engagement distinguishes SRL from "just using" tactics. An expert whose domain knowledge includes well-formed, automated tactics that accomplish complex tasks within that domain of expertise has little occasion to self-regulate learning. Domain knowledge suffices for experts.

Strategic learning and SRL entail sensitivity to tasks' varying initial conditions and feedback generated by engaging with the task (Butler & Winne, 1995). Therefore, conditional knowledge that triggers metacognitive control of studying tactics includes features that distinguish one situation from another (Jenkins, 1979; Winne & Perry, 1999), and transfer of studying tactics should vary according to students' perceptions about tasks and the situations in which tasks are embedded. Given the centrality of transfer to research on learning skills and cognitive strategies, we believe research on SRL should attend more to contexts for studying (see also Howard-Rose & Winne, 1993).

Context can influence how students study. For example, Winne and Marx (1982) interviewed elementary school students about what they perceived their teacher wanted them to do after the teacher had issued an instructional cue in a lesson. Their descriptions indicated that students judge the familiarity of brief instructional episodes and, on that basis, make decisions about how they engage in classroom activities. In other words, the study goals and tactics chosen are contingent on the task itself. Scholnick and Friedman (1993) also suggested that goal setting and task planning are contingent on the complex interplay between cognition, beliefs, attitudes, and motivation. Planners use this information to make strategic decisions about tactics and approaches to tasks. Therefore goal setting and planning happen in the context of complex understandings about oneself, the task at hand, and the environment. Such findings highlight the importance of context in SRL wherein learners are sensitive to tasks and strategically apply tactics, resources, and goals in response to task conditions (McKeachie, 1988; Hadwin & Winne, 1996; Winne & Hadwin, 1998).

On this account, investigations of strategic learning should attend to which study tactics students actually use and why students choose particular tactics over others. Furthermore, such questions should be addressed in multiple contexts that affect how students make those decisions.

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Support for this research was provided by grants 410-95-1046 and 410-98-0705 to Philip H. Winne from the Social Sciences and Humanities Research Council of Canada.

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Self-Report Questionnaires

Many self-report questionnaires have been developed to reflect components of SRL for use in basic research, counseling, and first-year experience courses in higher education as well as self-help situations. However, these questionnaires rarely distinguish studying contexts and the dependence of students' goals for studying on context. Three questionnaires are prominent in research and practice and have solid theoretical grounding (see also Winne & Perry, 1999).

The Learning and Study Strategies Inventory (LASSI; Weinstein, Zimmermann, & Palmer, 1988) is "a 77-item self-report measure of strategic, goal-directed learning" (Zimmerman, Greenberg, & Weinstein, 1994, p. 190). Its items, compiled after a thorough review of other questionnaires and surveys of learning and studying, address covert and overt behaviors related to learning and studying in general. The instrument generates 10 scales: Anxiety, Attitude, Concentration, Information Processing, Motivation, Scheduling, Selecting Main Ideas, Self-Testing, Study Aids, and Test Strategies. The LASSI has been used extensively for identifying difficulties in learning and studying, designing interventions, and measuring changes to learning and studying in learning-to-learn courses (Weinstein et al., 1988).

The Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) is used to assess motivational orientations and learning strategies relative to a specific college course, and its developers have acknowledged that responses may vary as a function of course context. The MSLQ consists of a 31-item motivation section that records students' goals and value beliefs for a course, plus efficacy and anxiety about tests. It also includes a 31-item learning strategy section that reflects students' reports about using cognitive and metacognitive tactics, and a 19-item section on managing resources. Nine subscales are formed: Task Value, Self-Efficacy for Learning and Performance, Test Anxiety, Rehearsal, Elaboration, Organization, Metacognition, Time and Study Environment Management, and Effort Regulation.

The Study Process Questionnaire (SPQ; Biggs, 1986) was developed to assess students' approaches to learning in terms of combinations of general strategies and motives. It assesses (a) deep approaches to learning that consist of intrinsic motivation plus strategies associated with understanding, discussing, and reflecting; (b) surface approaches to learning that consist of extrinsic motivation plus strategies for focusing on details and accurately reproducing information; and (c) achieving approaches to learning characterized by performance motivation plus strategies for efficiently organizing time and effort spent on learning. Primarily, the SPQ has been used to identify approaches to learning in educational programs.

Each questionnaire addresses features that constitute SRL in general, but none explicitly investigate and link studying tactics with situated goals for which students select those tactics. Items such as "I try to find relationships between what I am learning and what I already know" (LASSI) imply a goal for cognitive processing (integration) but do not address contexts in which students might select that goal or particular versions of tactics that might be relevant to that goal. Also, none of these questionnaires assess students' adaptations across learning contexts. Items such as "I make simple charts, diagrams, or tables to summarize material in my courses" (MSLQ) indicate the extent to which students report using such translation tactics, but they don't reveal contexts in which summarization is chosen as a goal or in which the translation tactic is used to approach the goal of integration versus another goal, such as self-testing. In general, self-report questionnaires do not characterize changes in approaches to studying.

We hypothesized that responses to self-report items about study tactics, selecting goals, and using external resources vary when study context varies (see Zimmerman, 1994). To investigate this hypothesis, we developed a questionnaire that asked students to report the frequency with which they applied a variety of study tactics, selected various study-related resources, and adopted goals in three distinct contexts within one course: reading for learning, completing a two-page essay called a think paper that was assigned in the course, and studying for the midterm examination. Findings that self-reports vary as a function of context would extend other research where context is not taken into account and would indirectly support Winne's (1995) conjecture that students are generally self-regulating even though forms of self-regulation may not be optimally productive.

Method

Participants

An information sheet and a letter of consent were distributed to students (Mean = 21.9 years) enrolled in a first course in educational psychology at Simon Fraser University. Of 232 students, 106 (54%) consented to participate. Complete data were available for 86 of these students for the tactics section of the questionnaire, 94 students for the resources section, and 92 students for the goals section.

Questionnaire and A Priori Scales

Building on strengths of the LASSI, MSLQ, and SPQ, we designed a strategic learning questionnaire to collect self-report data about study tactics students use, contexts in which they use tactics differentially, and goals students associate with tactics in those different contexts. We reviewed items in the LASSI, MSLQ, and SPQ to generate separate lists of contexts, goals, and tactics referred to in items. We eliminated redundant entries, extended each list by drawing on concepts from models about depth and breadth of cognitive processing, and grouped similar descriptions. To these lists we added descriptors for resources such as bolded terms, italicized print, summaries, and chapter objectives that appeared in the textbook used in the students' course (Good & Brophy, 1995), as well as other resources such as internet sources and library databases that students might consult to supplement lectures and assigned readings.

We identified two groups of goal-related items. One group consisted of nine types of information on which students might deliberately focus: principles, facts and details, important ideas, what the student wants to learn, gaps in the student's knowledge, challenging information, easy information, terms, and what counts for marks. The second group of goal-related items consisted of 21 purposes for using study tactics, such as understanding, memorizing, monitoring, selecting, organizing, creating external records (storing), translating, and integrating. These types of goals were implicitly and explicitly abundant in the questionnaires we reviewed and represented kinds of task-specific cognitive processing that are the subject of SRL and metacognition. We acknowledge that goals blend motivational, cognitive and affective facets in SRL (see Hadwin & Winne, 1997), but a full investigation of types of goals was deemed beyond the scope of questions investigated in our project. Broader conceptions of goals and motivation have been addressed and investigated in the MSLQ (Pintrich et al., 1991).

After editing candidate items for consistency, we organized them into a 3-part questionnaire. Sample items are presented in the Appendix. In

Part 1, students provided demographic information. In Part 2, students rated how frequently they engaged in various features relating to studying. A staircase figure depicted relative frequencies as six increasingly higher steps labeled *never, 1–2 times, occasionally, half the time, quite often,* and *always.* Ratings were coded 0–5, respectively. These items were assigned a priori to eight scales describing studying tactics, seven scales of resources students use during studying, and eight scales of goals they focus on while studying based on theories of SRL and depth and breadth of processing.

Tactic scales. The eight tactic scales represent general types of study processes reflected by 26 individual tactics that appeared in most of the study strategies questionnaires we reviewed. Tactic scales were Structuring Content (making an outline of content; creating charts, tables, or diagrams; changing the order or structure of ideas), Selecting (highlighting, underlining, circling, or starring material; ignoring or removing details), Making Deeper Links (making concept maps, using mental imagery, writing out a summary, creating mnemonics, creating analogies, making up examples), Planning (setting objectives for oneself, planning a method for the task, planning time), Rehearsing (rehearsing information, talking things through with oneself), Questioning (making up questions, predicting questions that might be on the exam, answering questions that students make up), Collaborating (assisting peers, asking peers for assistance, asking the instructor or teaching assistant about course content), and Note-Taking (taking notes, recopying notes, creating a glossary, and making small additions to notes or text).

Resource scales. Study resources were grouped into seven scales according to sources of the resource, such as the textbook or personal resources. Our items imitate those from other questionnaires and add specific features from the textbook students used in this course. The seven resources scales were Personal Resources (notes made outside lectures, content remembered from lectures); Provided Resources (course outline, instructor handouts, the marking scheme, tapes of classes); and five resources that were specific to the textbook: Textbook Organizers (table of contents, index, section headings, chapter objectives), Textbook Summary Items (chapter summary, questions for reflection), Textbook Applications (cases to consider, research-at-work, implications for teachers sections), Textbook Illustrations (illustrations, photographs, tables in the text), and Textbook Types of Print (bold and italicized print).

Goal scales. Goal scales represented a spectrum of task-specific cognitive processes that guide SRL and metacognition (see Hadwin & Winne, 1997; Winne & Hadwin, 1998), including three kinds of goals about selecting content to study and five kinds of cognitive processing goals. The selection goals were Selecting for Depth (focusing on information related to principles, the most important ideas), Surface Selection (focusing on information related to facts, details, and terms), and Other Types of Selection (focusing on information related to what one wants to learn, gaps in one's knowledge, things one finds challenging, things one finds easy, what counts for marks). Processing goals were Understanding (focusing on not missing anything, getting the big picture, understanding specific points, figuring out what the task was), Storing (focusing on creating a record to refer to, reproducing information verbatim), Monitoring (making predictions, seeking out feedback, checking progress while working, seeking better ways to do one's work), Integrating and Translating (focusing on translating content into one's own words; linking new ideas with one's prior knowledge, different sources from the course, or one another; activating relevant prior knowledge; drawing conclusions; applying concepts and ideas; evaluating content for contradictions; evaluating content on the basis of one's prior knowledge), and Memorizing (focusing on remembering).

Every item was rated with respect to each of three distinct contexts for studying: reading for learning; preparing to write a short think paper, in which students designed an instructional program according to either behavioral principles or cognitive principles and critiqued their design from the alternative position; and studying for the 30-item, multiple-choice midterm exam. The latter two contexts were salient as students had handed in the think paper 2 weeks prior and had taken the midterm 2 days before completing the questionnaire.

In Part 3 of the survey, students answered other items not relevant to the present purpose.

Procedure

In a lecture period, students were given a consent form that clearly described the purpose and nature of our study. They were explicitly informed that they could withdraw without penalty at any time. Those agreeing to participate were then allowed the remaining 40 min of the period to complete the questionnaire. A debriefing session was held 4 weeks later following activities that were part of another investigation.

Results

Scale scores were computed by summing responses to each item on a scale and dividing by the number of items on the scale, creating an average item score. Thus, all scales have equal metrics ranging from 0 to 5. Cronbach's alpha coefficients are shown in Table 1 for these short scales. The median alpha coefficient across all scales, most with just two to four items, was .62, with a range of .27–.89. Means, standard deviations, and correlations for tactics, resources, and goal scales for the three studying contexts are listed in Table 2.

Comparing A Priori Scales Across Contexts

We tested our hypothesis that students vary studying as a function of study context by computing 3 two-way analyses of

Table 1
Cronbach's Alpha Coefficients for A Priori Scales

Scale	Items	Reading	Think paper	Midterm exam
Tactics				
Collaborating	3	.58	.49	.66
Making deeper links	5	.74	.68	.68
Note-taking	4	.68	.62	.65
Planning	3	.76	.77	.80
Questioning	3	.78	.76	.81
Rehearsing	2	.60	.47	.49
Selecting	2	.27	.59	.54
Structuring content	4	.71	.59	.69
Resources				
Personal resources	2	.47	.68	.45
Provided resources	4	.54	.44	.47
Textbook applications	3	.69	.72	.71
Textbook illustrations	3	.76	.89	.79
Textbook organizers	4	.58	.60	.60
Textbook summary items	2	.49	.52	.42
Textbook types of print	2	.38	.86	.57
Goals				
Integrating and translating	9	.84	.87	.83
Memorizing[a]	1	—	—	—
Monitoring	4	.56	.60	.56
Other selection	5	.66	.72	.68
Selecting for depth	2	.53	.62	.53
Storing	2	.52	.52	.55
Surface selection	2	.66	.82	.72
Understanding	4	.55	.64	.60

Note. *N*s for scales range from 95 to 97.
[a] Cronbach's alpha coefficients cannot be calculated when there is only one item in a scale.

Table 2
Means, Standard Deviations, and Correlations (Raw and Corrected for Attenuation) for A Priori Scales Across Study Contexts

	Reading for learning (R)		Think paper (P)		Studying for midterm (E)		R, P		R, E		P, E	
Scale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*r*	*r*-corr	*r*	*r*-corr	*r*	*r*-corr
Tactics												
Collaborating	.91	0.87	1.63	0.90	1.72	1.17	.47	.88	.50	.81	.71	1.00
Making deeper links	1.60	0.93	1.29	0.91	2.10	0.93	.57	.80	.78	1.00	.58	.85
Note-taking	2.15	1.17	1.72	1.02	2.66	1.24	.57	.88	.73	1.00	.58	.91
Planning	2.59	1.42	3.25	1.31	3.33	1.32	.66	.86	.80	1.00	.81	1.00
Questioning	1.62	1.28	1.01	1.18	2.98	1.39	.56	.73	.49	.62	.38	.48
Rehearsing	2.39	1.37	2.13	1.31	3.73	1.13	.38	.72	.50	.92	.35	.73
Selecting	3.25	1.16	2.20	1.58	3.34	1.32	.54	1.00	.75	1.00	.58	1.00
Structuring content	1.62	1.39	2.24	1.49	2.31	1.64	.54	.83	.54	.77	.54	.85
Resources												
Personal resources	2.77	1.38	3.12	1.48	3.91	1.22	.32	.57	.55	1.00	.42	.76
Provided resources	1.96	1.02	2.34	0.95	2.34	0.94	.44	.90	.64	1.00	.61	1.00
Textbook applications	2.26	1.00	1.47	1.10	2.15	1.01	.58	.82	.60	.86	.68	.95
Textbook illustrations	2.28	1.05	1.25	1.19	2.08	1.09	.46	.56	.64	.83	.67	.80
Textbook organizers	2.20	1.04	1.92	1.12	2.55	1.09	.57	.97	.71	1.00	.66	1.00
Textbook summary items	1.29	0.61	.82	0.66	1.39	0.63	.57	1.00	.68	1.00	.58	1.00
Textbook types of print	2.07	0.42	1.39	0.87	2.13	0.41	.31	.54	.60	1.00	.31	.44
Goals												
Integrating and translating	2.96	0.82	3.20	1.06	3.32	0.84	.51	.60	.74	.90	.46	.54
Memorizing	3.20	1.20	2.37	1.57	4.27	0.93	.13	—	.40	—	.09	—
Monitoring	1.79	0.82	2.50	0.85	2.43	0.83	.49	.85	.56	1.00	.67	1.00
Other selection	3.18	0.89	2.85	1.05	3.37	0.85	.47	.68	.72	1.00	.54	.77
Selecting for depth	3.97	0.86	3.60	1.21	4.30	0.77	.44	.77	.69	1.00	.52	.91
Storing	2.65	1.20	2.20	1.31	3.09	1.26	.37	.71	.58	1.00	.44	.82
Surface selection	3.87	0.85	3.38	1.42	4.26	0.82	.41	.56	.66	.96	.46	.60
Understanding	3.15	0.87	3.35	1.01	3.82	0.81	.30	.51	.54	.94	.48	.77

Note. *N*s for correlations range from 97 to 106. All scales were transformed to a common metric of 0 to 5 by computing the average item score for each scale. *r* = raw correlation; *r*-corr = correlation corrected for attenuation.
For all raw correlations $\geq .20$, $p \leq .05$.

variance (ANOVAs), one each examining students' self-reported levels (frequencies) of applying study tactics, using resources, and selecting goals. Components in these ANOVAs were, respectively, the a priori groups of subscales for tactics, resources, and goals. Contexts were reading for learning, preparing to write the think paper, and studying for the midterm exam. Where appropriate, we followed up with one-way ANOVAs within each studying context to test for differences in the levels students reported applying the several tactics, using the multiple resources, or choosing differing goals. All statistical tests were adjusted using the Greenhouse–Geisser conversion to degrees of freedom. Follow-up univariate ANOVAs were corrected using the modified Bonferroni test and tested at $p < .004$ (.05 divided by the number of tests).

In the 2-way ANOVA of study tactics subscales by context, statistically detectable main effects were observed for students' self-reports about applying tactics, $F(5.50, 467.80) = 48.04$, $p < .001$; and for context, $F(1.86, 158.07) = 96.95$, $p < .001$. The first effect indicates that independent of context, students reported applying the eight study tactics at different levels. The second effect shows that there was difference due to context in students' reports about how much they applied study tactics in general.

The interaction between study context and study tactics was also statistically different from zero, $F(9.89, 840.67) = 32.61$, $p < .001$. Across the three studying contexts, the profile of using the eight a priori tactics was not parallel. That is, students reported using tactics differently across contexts.

We computed eight follow-up univariate ANOVAs to examine the Context × Tactic interaction. Means differed significantly across studying context for each a priori tactic (structuring content, $F(1.81, 183.17) = 22.88$, $p < .004$; selecting, $F(1.69, 167.65) = 48.24$, $p < .004$; making deeper links, $F(1.82, 173.04) = 42.84$, $p < .004$; planning, $F(1.67, 172.16) = 39.84$, $p < .004$; rehearsing, $F(1.93, 195.33) = 85.14$, $p < .004$; questioning, $F(1.90, 186.37) = 121.09$, $p < .004$; collaborating, $F(1.86, 193.07) = 52.25$, $p < .004$; and note-taking, $F(1.92, 189.67) = 49.95$, $p < .004$. This supplements the interaction effect from the two-way ANOVA and indicates that students reported varying how much they applied each of the eight study tactics depending on studying context.

In the analyses of students' self-reports about using studying resources, similar findings emerged. There was a main effect for resources, $F(4.51, 419.56) = 88.03$, $p < .001$; a main effect for studying context, $F(1.73, 160.60) = 51.29$, $p < .001$; and an interaction between resources and study context, $F(6.01, 559.28) = 26.75$, $p < .001$. The seven follow-up one-way ANOVAs indicated that there were mean differences across studying context in students' self-reported use of each of the seven a priori studying resources—personal resources, $F(1.80, 185.57) = 29.58$, $p < .004$; provided resources, $F(1.84, 185.66) = 26.93$, $p < .004$; textbook text organizers, $F(1.91, 198.42) = 23.32$, $p < .004$; textbook summary sections, $F(1.91, 196.56) = 61.18$, $p < .004$; textbook applications, $F(1.96,$

201.85) = 46.05, $p < .004$; textbook illustrations, $F(1.79, 186.67) = 63.37$, $p < .004$; and textbook types of print $F(1.36, 139.14) = 62.76$, $p < .004$.

Finally, the analyses of students' self-reports about goals they select for studying produced a main effect for goals, $F(4.95, 450.42) = 45.66$, $p < .001$; and a main effect for studying context, $F(1.49, 135.50) = 311.29$, $p < .001$. The interaction between goals and study context was also different from zero, $F(6.91, 628.82) = 35.38$, $p < .001$. The eight follow-up one-way ANOVAs revealed mean differences in studying context for each a priori studying goal—understanding, $F(1.73, 179.89) = 26.59$, $p < .004$; storing, $F(1.87, 190.46) = 30.73$, $p < .004$; memorizing, $F(1.66, 172.70) = 77.50$, $p < .004$; monitoring, $F(1.89, 192.55) = 57.59$, $p < .004$; integrating and translating, $F(1.54, 157.62) = 9.10$, $p < .004$; selecting for depth, $F(1.54, 161.58) = 31.32$, $p < .004$; surface selection, $F(1.44, 149.86) = 30.64$, $p < .004$; and other types of selection, $F(1.67, 167.39) = 19.85$, $p < .004$.

Together these two-way ANOVAs and follow-up univariate analyses support our hypothesis that responses to self-report items about study tactics, selecting goals, and using external resources vary when study context varies. We did not have any hypotheses or ways of explaining higher and lower differences between specific contexts or between specific study tactics, goals, and resources. Therefore we did not conduct further post hoc contrasts of differences in these cell means.

We explored variation due to context further by correlating each a priori scale across a pair of study contexts. If context does not matter, these correlations should be consistently high. They were not (see Table 2). Effect sizes for these correlations, measured by r^2, varied considerably: from .12 to .66 for study tactics scales correlated across contexts, .10 to .50 for resources scales, and .01 to .56 for goals scales.

These estimates based on raw correlations can be refined. First, we corrected each correlation in Table 2 for attenuation due to unreliability of each scale (measured by Cronbach's alpha). We then squared these corrected correlations to create r^2 effect size statistics that reflect variance shared across a pair of contexts for the scale. Subtracting each r^2 from 1 creates an estimate of variance attributable to differences in context that are not attenuated as a result of unreliability. If context does not affect students' application of study tactics, use of resources, and selections of goals, these values should be zero.

To illustrate our procedure, consider the study tactic scale about making deeper links. Raw correlations across contexts were .57, .78, and .58 (Table 2). Correcting these correlations for attenuation due to unreliability of measurement produced estimated correlations of .80, 1.00, and .85, respectively. (We followed the common practice of rounding down to 1.00 when the correction for attenuation produced an estimated correlation greater than 1.) These effect size estimates indicate students have reasonably robust styles that generalize across contexts with respect to the tactic of making deeper links when they study. Squaring each corrected correlation and subtracting that value from 1 yielded r^2 estimates of variance in making deeper links that is due to context. These effect sizes were .35 when context varied from reading for learning to preparing to write the think paper, .00 for reading for learning versus studying for the midterm exam, and .27 when the context changed from preparing to write the think paper to studying for the midterm exam. The two nonzero r^2 statistics show that students adapt their style as a function of context for studying (see also Nesbit, Winne, Hadwin, & Stockley, 1997).

Correlations corrected for attenuation typically have larger standard errors than raw correlations. Thus, before proceeding to calculate effect size estimates of context effects, we calculated a confidence interval for each correlation corrected for attenuation at $p \leq .01$ (see Hunter & Schmidt, 1994) to examine whether the effect size estimates would be dependable.

With respect to investigating whether students report using study tactics differently as a function of context, the relevant question is not whether these correlations corrected for attenuation are statistically different from zero but whether they approximate a population value of $r = 1.00$. There is no inferential test possible at the precise value where the population parameter is 1.00. However, by substituting a population value of nearly 1.00—say .999—it is possible to use Fisher's r-to-z transformation on the way to computing a one-tailed z test that addresses whether our correlations corrected for attenuation are statistically different from .999. We note that at this extreme value, caution must attend interpretations of results of these computations. Bearing this in mind, the largest of our correlations corrected for attenuation that is not 1.00 is .97. It differs from a population parameter of .999; $z = -16.38$, $p \leq .001$. Because this is the largest of our correlations corrected for attenuation, all other z tests will yield larger values. That is, none of the other smaller correlations corrected for attenuation can be viewed as having been sampled from a population where the correlation corrected for attenuation has a value of approximately 1.00.

In Table 3 we present r^2 estimates of effect sizes attributable to studying context for all the a priori scales across the three pairs of studying contexts based on the correlations corrected for attenuation in Table 2. Among the eight study tactic scales, 12 of 36 r^2 estimates (33%) exceed .25, with a range of .26 to .77. For self-reports about using study resources, 9 of 21 r^2 estimates (43%) exceed .25, with a range of .27 to .80. On scales describing students' selections of goals for studying, 12 of 18 r^2 estimates (67%) exceed .25, ranging from .29 to .74.

Collectively, results of the ANOVAs and estimates of effect sizes strongly support our interpretation that students vary the tactics applied, resources used, and goals selected for studying according to the context of studying. We conjecture that reading for learning and studying for the examination share more features as tasks than each does with the task of preparing to write a think paper. The former two studying contexts are ones that highlight acquisition with minimal generation and moderate synthesis. The think paper task emphasizes generation and synthesis based on acquisition. Our results support this view. The median value of effect sizes due to context (Table 3) is 0 when comparing the reading for learning and preparing for an exam contexts. In contrast, the median value is .38 when comparing reading for learning with preparing to write the think paper, and .28 when comparing studying for an exam with preparing to write a think paper. Thus, there are similarities and differences in self-reports across contexts. The extent to which styles are adapted across contexts is proportional to the degree to which the task conditions differ.

Table 3
Effect Size Estimates of the Influence of Context on Self-Reports About Studying Based on Correlations Corrected for Attenuation in Table 2

Scale	R, P	R, E	P, E
Tactics			
Collaborating	.22	.35	.00
Making deeper links	.35	.00	.27
Note-taking	.23	.00	.17
Planning	.26	.00	.00
Questioning	.47	.62	.77
Rehearsing	.49	.15	.47
Selecting	.00	.00	.00
Structuring content	.30	.40	.28
Resources			
Personal resources	.68	.00	.42
Provided resources	.19	.00	.00
Textbook applications	.32	.27	.10
Textbook illustrations	.69	.32	.36
Textbook organizers	.07	.00	.00
Textbook summary items	.00	.00	.00
Textbook types of print	.71	.00	.80
Goals			
Integrating and translating	.64	.19	.71
Memorizing[a]	—	—	—
Monitoring	.29	.00	.00
Other selection	.54	.00	.40
Selecting for depth	.41	.00	.18
Storing	.49	.00	.32
Surface selection	.69	.08	.64
Understanding	.74	.12	.40

Note. R = reading for learning; P = think paper; E = exam.
[a] Estimates cannot be made because there is only 1 item on this scale.

Comparing Empirically Defined Components Across Contexts

A second approach to examining whether context influences students' self-reports about studying is to explore for empirical, as opposed to a priori, structure in data. To do this, we computed nine principal-components analyses followed by varimax rotation. Data for these analyses were ratings on each type scale (tactics applied, resources used, and goals selected) within each context for studying (reading for learning, writing the think paper, and studying for the midterm examination).

We selected a principal-components model because it is the most appropriate method when seeking a minimum number of components accounting for the maximum portion of total variance (Hair, Anderson, Tatham, & Black, 1995; Tabachnick & Fidell, 1996). We considered including components with eigenvalues less than but near the traditional cutoff of 1.0 (see Cliff, 1988) but rejected this option in each analysis because it was typical that items loaded on multiple components before relaxing the traditional criterion. Reporting only components with eigenvalues greater than or equal to 1.0 limits muddying already complex results, although we note a concern raised by an anonymous reviewer that "it is well known that Kaiser's 'eigenvalues greater than 1' rule tends to over factor."

We chose a varimax rotation to separate components and simplify interpretation. Consistent with recommendations by Hair et al. (1995), we included all items in the rotations rather than only items exceeding an arbitrary loading because communality values for all items were acceptable (greater than .40) and most were greater than .55.

We examined assumptions and qualities of these principal-components analyses using four indicators recommended by Hair et al. (1995). First, we looked for adequate zero-order correlations ($r > .30$) among scales in each analysis. Second, we used Bartlett's sphericity statistic to infer whether the pool of items exhibited a correlational structure that might reveal components. Third, we examined anti-image matrices to verify that partial correlations among residuals were small. Finally, we inspected the Kaiser–Meyer–Olkin measure of sampling adequacy for each analysis. Each of our principal-components analyses was satisfactory in terms of all four criteria.

Tactics. Principal-components analysis of the 26 tactics items followed by varimax rotation produced seven components accounting for 63% of total variance in the reading to learn context, nine components accounting for 68% of total variance in the think paper context, and eight components accounting for 67% of total variance in the midterm exam context. Components from the rotated solutions for each context are presented in Table 4. Components and items within components are sequenced to facilitate comparison across contexts.

Three components that we labeled planning, questioning, and collaborating are nearly identical across all three contexts. Six other components labeled structuring, remembering, selecting, and three others we chose not to label, are nearly unique across contexts.

To further examine context effects, we used this procedure. First, we created principal-component scores for each participant on each principal component identified by analyses for each of the three contexts: reading to learn, think paper, and exam. Next, we correlated these principal-component scores across contexts. For example, there were seven principal components identified in the reading to learn context and nine principal components in the think paper context. Correlating each of the seven components with each of the nine components generated 63 correlations across the two contexts.

To the extent context has influence, principal components describing tactics should differ in each context, and therefore these correlations should be low. The range of these correlations in this illustration was −.21 to .60 with a median of .03. Fifty of the 63 correlations (79%) had an absolute value less than or equal to .20, the value of a correlation coefficient that would be statistically detectably different from zero at $p \leq .05$, given our sample size. We applied the same procedure to the 56 correlations of principal-components scores across the reading to learn and exam contexts and to the 72 correlations of principal-components scores across the think paper and exam contexts. Descriptive statistics are presented in Table 5. A total of 75%–79% of the correlations had an absolute value less than or equal to .20, depending on the contexts compared.

We also compared correlations between pairs of components judged to reflect the same underlying construct. As illustrated in Table 4, matched tactic components included plan, question, and collaborate because they shared the same questionnaire items. Correlations between these components across contexts were slightly higher, ranging from .31 to .78, with a median of around .46. A squared median of .46 shows that 21% of variance is shared.

Table 4
Tactic Items Forming Components and Rotated Components Loadings in Each Context

Component	Reading for learning	Loading	Think paper	Loading	Preparing for midterm	Loading
Plan	**Set objectives**	.85	**Set objectives**	.81	**Set objectives**	.88
	Plan time	.76	**Plan time**	.81	**Plan time**	.79
	Plan a method	.81	**Plan a method**	.72	**Plan a method**	.78
					Rehearse	.47
Question	**Predict questions**	.91	**Predict questions**	.77	**Predict questions**	.78
	Answer my questions	.87	**Answer my questions**	.89	**Answer my questions**	.84
	Make up questions	.51	**Make up questions**	.69	**Make up questions**	.73
					Make examples	.53
Collaborate	**Ask peers for help**	.73	**Ask peers for help**	.81	**Ask peers for help**	.90
	Assist peers	.81	**Assist peers**	.80	**Assist peers**	.88
Structure	**Concept map**	.59	**Concept map**	.54	**Concept map**	.47
	Charts–tables	.50	Charts–tables	.51	Outline content	.75
	Outline content	.49	*Change order–structure*	.71	Recopy notes	.67
	Summary	.77	*Rehearse*	.55	Summary	.80
	Create glossary	.64	*Analogies*	.54	Create glossary	.66
	Ask content questions	.40				
	Recopy notes	.73				
Remember	**Mnemonics**	.77	**Mnemonics**	.83	**Mnemonics**	.62
	Analogies	.66	Annotate	.40	Annotate	.62
	Make examples	.67	*Create glossary*	.66	Analogies	.54
	Rehearse	.72			*Mental imagery*	.54
	Talk through	.70				
Select	**Remove detail**	.73	**Remove detail**	.44	**Remove detail**	.70
	Change order–structure	.45	Highlight–underline	.79	Highlight–underline	.73
	Mental imagery	.50	Take notes	.70	Take notes	.56
			Recopy notes	.54		
A	*Annotate*	.61	*Make examples*	.76	*Change order–structure*	.73
	Highlight–underline	.73	*Mental imagery*	.50	*Charts–tables*	.56
	Take notes	.54				
B			Ask content questions	.88	Ask content questions	.41
					Talk through	.67
C			*Summary*	.75		
			Outline content	.65		
			Talk through	.50		

Note. Bold items are shared across all contexts; italicized items are unique to a single context.

Table 5
Descriptive Statistics for Correlations Among Principal Components Across Contexts

Context	Min	Max	*Mdn*	% ≤ |.20|
Overall (all components)	−.39	.78	.04	72
Tactics				
Reading to learn, think paper	−.21	.60	.03	79
Reading to learn, exam	−.39	.78	.07	75
Think paper, exam	−.25	.71	.02	79
Resources				
Reading to learn, think paper	−.21	.63	.13	71
Reading to learn, exam	−.25	.64	.12	56
Think paper, exam	−.24	.56	.09	42
Goals				
Reading to learn, think paper	−.22	.39	.03	75
Reading to learn, exam	−.23	.66	.03	74
Think paper, exam	−.24	.46	.06	68

To the extent that this implies a relationship among matched components, it also indicates that there is another 79% of residual variance that is distinctive as a result of context. These findings suggest that empirically defined components seem to share more variance across contexts than a priori scales; however, context differences predominate in terms of items associated with components and weak correlations between components across contexts.

Resources. Principal-component analyses followed by varimax rotation of ratings about 20 resources used for studying produced six components accounting for 64% of total variance in the reading to learn context, four components accounting for 59% of total variance in the think paper context, and six components accounting for 65% of total variance in the exam context. Results of these analyses are displayed in Table 6.

Across contexts, there was some parallelism in items loading on components for A and B, but the outstanding feature of these results was considerable diversity due to context. Consequently, we decided not to label or interpret components. These results

Table 6
Resource Items Forming Components and Rotated Component Loadings in Each Context

Component	Reading for learning	Loading	Think paper	Loading	Preparing for midterm	Loading
A	**Research examples**	.66	**Research examples**	.74	**Research examples**	.55
	Chapter objectives	.63	**Chapter objectives**	.62	**Chapter objectives**	.57
	Teaching application	.53	**Teaching application**	.66	**Teaching application**	.68
	Chapter summary	.45	Chapter summary	.69	*Cases to consider*	.81
	Section headings	.72	Section headings	.63	*Reflection questions*	.78
	Italicized print	.66	Italicized print	.76		
	Tables in text	.57	Tables in text	.74		
	Table of contents	.34	Illustrations	.81	Illustrations	.53
			Photographs	.80		
			Bold print (bullets)	.64		
B	**Notes made**	.67	**Notes made**	.74	**Notes made**	.68
	Content remembered	.55	**Content remembered**	.70	**Content remembered**	.64
	Marking scheme	.71			*Tables in text*	.66
	Handouts	.49			*Bold print (bullets)*	.51
C	Reflection questions	.86	Reflection questions	.67	*Section headings*	.71
	Cases to consider	.77	Cases to consider	.71	*Italicized print*	.68
	Index	.61	Index	.64	*Chapter summary*	.66
			Table of contents	.63		
D	**Course outline**	.83	**Course outline**	.70	**Course outline**	.55
			Handouts	.63	*Index*	.81
			Marking scheme	.47	*Table of contents*	.63
			Tapes of class	.44		
E	Tapes of class	.71			Tapes of class	.88
	Bold print (bullets)	.70			Photographs	.61
F	Illustrations	.86			Marking scheme	.79
	Photographs	.82			Handouts	.48

Note. Bold items are shared across all contexts; italicized items are unique to a single context.

suggest that students report choosing resources for studying very differently as a function of context.

Using the same procedure as introduced for tactic components, we examined correlations among principal-component scores describing resources across contexts. We present results in Table 5. Seventy-one percent of the correlations between reading to learn and think paper principal-component scores, 56% of correlations between reading to learn and exam scores, and 42% of correlations between think paper and exam scores had an absolute value less than or equal to .20. This finding may suggest that principal components describing resources differ across contexts. We were unable to correlate matched components because there were none; all components differed in item loading across contexts (see Table 6).

Goals. The varimax rotated principal-component analyses of ratings about goals students selected in the three contexts produced nine components accounting for 70% of total variance in the reading to learn context, seven components accounting for 68% of total variance in the think paper context, and nine components accounting for 69% of total variance in the exam context. Components and item loadings from the rotated solutions are presented in Table 7.

Only two components that we labeled assembling–translating and reproducing had strong parallels in terms of item loading across all contexts. We applied the same procedure as before to examine correlations among principal-component scores describing goals across contexts. The results are shown in Table 5. Between 68% and 75% of the correlations among principal-component scores had an absolute value of less than or equal to .20. This finding indicates that principal components describing goals differ across contexts. We also compared correlations between pairs of components judged to reflect the same underlying construct as indicated by matched items across context components. In Table 7, matched goal components included reproduce and assembling–translating. Correlations ranged between .21 to .60, with a median of .28. Although principle components shared more variance across contexts than a priori scales, findings still support our hypothesis that considerable variation in goals exists across contexts.

Interpreting specific components should be done with caution because of the small sample size. Notwithstanding whatever individual components might be, that items load differently in each context and are weakly correlated across contexts supports our interpretation that students report different approaches to studying depending on the studying context.

Discussion

We asked students to self-report study tactics they applied, resources they used, and goals they selected for studying in each of three apparently different contexts: reading to learn, studying for an examination, and preparing to write a think paper. Scales defined a priori according to theory as well as scales we constructed on the basis of empirical patterns (correlations) in stu-

Table 7
Goal Items Forming Components and Rotated Components Loadings in Each Context

Component	Reading for learning	Loading	Think paper assignment	Loading	Preparing for midterm	Loading
Monitoring and evaluating 1	Checking progress	.77	Seeking better ways	.74	Seeking better ways	.58
	Seeking feedback	.73	Checking progress	.65	*Evaluating for contradictions*	.64
	Figuring out task	.55	Seeking feedback	.54	*Evaluating content based on prior knowledge*	.60
	Creating a record	.53	Figuring out task	.62		
			Organizing info	.48	*Understanding points*	.47
Reproducing	**Reproducing verbatim**	.80	**Reproducing verbatim**	.66	**Reproducing verbatim**	.78
	Organizing info	.39				
Selecting	What I want to learn	.75	*What counts for marks*	.82	What I want to learn	.87
	Challenging things	.67	*Not missing things*	.61	Challenging things	.64
	Gaps in knowledge	.69			*Easy things*	.50
	Evaluating content based on prior knowledge	.45			Gaps in knowledge	.49
Selecting 1	**Principles**	.78	**Principles**	.72	Important ideas	.77
					Principles	.63
					Big picture–gist	.53
Remembering and understanding	**Remembering**	.70	**Remembering**	.84	**Remembering**	.54
	Facts and details	.45	**Facts and details**	.61	**Facts and details**	.71
	Not missing things	.71	Terms	.73	*Organizing info*	.68
	Understanding points	.65	Understanding points	.70	Not missing things	.64
	Important ideas	.42	Important ideas	.48	Terms	.59
	What counts for marks	.68	Creating a record	.71	*Translating–own words*	.56
			Easy things	.60	Creating a record	.44
			Big picture–gist	.59		
			What I want to learn	.54		
Monitoring and Evaluating 2	Evaluating for contradictions	.80	*Evaluating content based on prior knowledge*	.68	*Figuring out task*	.83
	Seeking better ways to study	.56	Evaluating for contradictions	.59	*Seeking feedback*	.78
Assembling and Translating	**Linking ideas across sources**	.74	**Linking ideas across sources**	.72	**Linking ideas across sources**	.77
	Linking ideas with knowledge	.71	**Linking ideas with knowledge**	.66	**Linking ideas with knowledge**	.78
	Linking ideas with each other	.77	**Linking ideas with each other**	.56	**Linking ideas with each other**	.64
	Activating prior knowledge	.60	**Activating prior knowledge**	.60	**Activating prior knowledge**	.68
			Making predictions	.80		
			Drawing conclusions	.76		
			Applying concepts	.67		
			Challenging things	.65		
			Gaps in knowledge	.60		
			Translating–own words	.54		
Translating	Making predictions	.74			Drawing conclusions	.79
	Applying concepts	.67			Applying concepts	.70
	Drawing conclusions	.60			Making predictions	.63
	Big picture–gist	.53				
	Translating–own words	.50				
Selecting 2	*Easy things*	.80			*What counts for marks*	.74
	Terms	.74			*Checking progress*	.54

Note. Bold items are shared across all contexts; italicized items are unique to a single context.

dents' responses were consistently subject to context effects in both level of and patterns among tactics, resources, and goals. These findings support models of SRL that predict students perceive themselves as applying different tactics, using different resources, and seeking different goals depending on studying context.

As well as differentiation due to context, when we examined students' self-reports aggregated into scales defined a priori by theory, their application of tactics, use of resources, and choices among goals reflected overarching or noncontextual perceptions about studying. We interpret this to indicate that students have studying styles, a finding confirmed in a companion study by Nesbit, Winne, Hadwin, and Stockley (1997). Styles were not inherently robust across contexts, however. Their coherence diminished considerably when we used principal-components analysis to create scales based on empirical relations in the data. Students' latent perceptions about how they study differ from theorists'. Moreover, students' constructions of the dimensions of studying, as reflected in results of our principal-components analysis, show greater sensitivity and adaptation to context than theorists' representations of the dimensions of studying by the subscales that partition their questionnaires.

To the degree that our scales, whether defined a priori or empirically, tap features like those reflected in other questionnaires about study tactics and learning strategies, our findings imply that research about studying may need to take account of four complicating issues. First, although analyses of students' self-reports suggest they have general styles of studying, those styles flex in

response to variations of context. When questionnaires do not guide students to consider specific contexts or when students are not provided means for identifying the particular context they have in mind when they respond to self-report items, interpretations of their responses may be inappropriately general. Because SRL is by definition a contextually responsive behavior, research findings may be somewhat muddy as a result.

Second, following Howard-Rose and Winne (1993), questions can be raised about the grain size reflected by scales versus individual items. In the principal-components analyses we reported, there was considerable shuffling of items across components due to variation of context. Theoretically, these individual items correspond to small grain-sized tactics, basic building blocks of SRL (Winne, 1996; Winne & Perry, 1999). That a tactic migrates from one component to another as context varies affords an inference that students may constitute "orientations" to studying or strategic organizations of tactics differently when context varies. Issues of what a scale refers to may need to be reconciled with the view that SRL involves activating or changing just one tactic at a time.

Third, questionnaire items rarely reflect temporal qualities of SRL. As Winne and Perry (1999) and Hadwin (2000) pointed out, SRL is enacted over time through a series of unfolding events. The basic temporal unit of these events is the condition–action, or if–then sequence. Such sequences are not reflected in our, or others', questionnaire items. Rather, items describe mostly discrete, static actions. This may provide an importantly incomplete picture of dynamics that constitute SRL in studying. We speculate that these dynamics may also vary importantly as a function of context. Overall, if adaptation is the hallmark of SRL, data consisting only of self-report questionnaire items and scales that aggregate responses independently of time and context may weakly reflect, and may even distort, what SRL is.

Fourth, significant questions of construct validity need to be addressed in future research. For example, how much variance in a study tactic's observable form is allowable before classifying it as a different tactic versus a "variant" of a single, underlying tactic? Consider the variety of mnemonic tactics: imagery, keyword methods, first-letter acronyms, the method of loci, and so on. Most are used with the singular intention of assembling semantic relations between items to create a chunk of information. Are these separate tactics owing to differences in information manipulated or medium (semantic, image), or are they superficially different manifestations of one goal-directed tactic? When tactics migrate across components, are they the "same" tactic, or because goals may differ as a function of context, are they different? A pivot on which one may rest in answering this question is whether tactics should be classed by goals—standards used in metacognitive monitoring—or by demands made on cognitive resources when metacognitive control is exercised. Issues of this sort are not clearly reflected in data generated from self-report items where context is unknown.

Together, these four issues pose important challenges for future research on SRL concerning what the constituents of studying are, how those constituents cohere as dimensions of studying, what the generality of those dimensions is, and how accurately self-report data can portray the dynamics of studying events. Our research shows that context should not be glossed in studying these issues.

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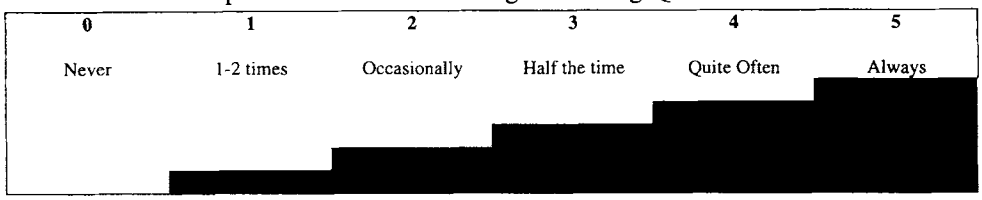
Appendix

Sample Items From the Strategic Learning Questionnaire



Indicate how frequently you...

... do these ACTIVITIES in each setting	Reading for Learning	Completing Think Paper #1	Studying for the Midterm
make up questions			
make up examples			
highlight or underline or circle or star			
create mnemonics (e.g., ROY G BIV)			
make small additions to notes/text (annot.)			
rehearse information			
assist my peers			
ask my peers for assistance			
plan a method for this task			
... focus on this INFORMATION in each setting			
facts and details			
the most important ideas			
things I find challenging			
... focus on this PURPOSE in each setting			
not missing anything			
creating a record I can refer to again			
translating content into my own words			
remembering			
getting the big picture/gist			
linking new ideas with one another			
... use this RESOURCE in each setting			
course outline			
instructor handouts			
notes you make outside of lectures & tutorials			
notes and content you remember from lectures & tutorials			
marking scheme			
In the *TEXTBOOK*:			
table of contents			
chapter summary			
tables provided			
bold blue section headings			
"Questions for reflection"			

Received April 30, 1997
Revision received November 8, 2000
Accepted November 8, 2000 ■