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Developmental
College Student
Self-Regulation:
Results From
Two Measures*

This study compared 34 lower-achieving (developmental) first-time college students' self-reported self-regulation strategies from a Likert scale to those they reported in structured interviews. Likert scales have offered convenient administration and evaluation and have been used to identify what and how learners study. The reported study activity of regular admission college students' has predicted their subsequent college achievement; in the same study, responses did not support concurrent validity for the lower-achieving students (Nist, Mealey, Simpson, & Kroc, 1990). College students who failed to meet regular admission requirements enrolled in 2 sections of a college study skills course reported significantly different strategy use between their Likert and interview responses on five of the fifteen strategies classified by each of the measures.

Researchers and practitioners have used Likert scales to measure learning processes and activities that are generally regarded as part of self-regulation (SR) in that they measure activities students employ to engage, monitor, sustain, and evaluate their learning processes (cf., Nist, Mealey, Simpson, & Kroc, 1990; Zimmerman & Martinez-Pons, 1988). Self-regulation, synonymous with metacognition (Brown, Hedberg, & Harper, 1994) or metacognitive adjustments by learners in response to feedback on errors (Brown, Bransford, Ferrara, & Campione, 1983), has been extended to activities that support self-regulation, such as managing distractions (Orange, 1999). Evidence indicates that selected SR strategies may be a key distinguishing charac-

teristic between developmental and regular admission college students and between more and less expert learners (Ley & Young, 2001). The current study was designed to add to the literature on which learning processes, specifically self-regulation activities, developmental students use, with what frequency they are used, and to confirm comparability of two self-regulation measures with developmental students, an interview and a Likert scale.

The National Center for Education Statistics (NCES, 2001) reports that 71% of all 4-year institutions and 80% of 2-year institutions offer some form of remediation. Educators assisting these students attempt to identify their learning processes through the use of self-report measures, largely Likert scale items. University educators have used Likert measures of study activities to advise students how to improve their study habits. While researchers have used Likert and structured interviews to identify students' learning processes, colleges have used a student's responses to Likert measures as an advising tool. Researchers investigating self-regulation want unbiased data to interpret and from which to draw conclusions. Confirming the measures' comparability would provide support using a valid, easily-administered and interpreted Likert scale with lower-achieving college students. Furthermore, "if at-risk [college] students are to be identified. . . the literature suggests that tailored interventions can boost students' success" (Le, Casillas, & Robbins, 2005, p. 502).

Ambiguous results from earlier studies using self-report Likert measures to identify study activities and their frequency have raised questions about using such measures with lower-achievers, especially college developmental students (Deming, Valeri-Gold, & Idelman, 1994; Ley & Young, 1998b; Nist et al., 1990; Young & Ley, 1997). A combination of ten different Likert scales to measure learning processes predicted college GPA for regular admission students but not for developmental students (Nist et al., 1990). Likert responses predicted achievement among 168 regular admission freshmen in a study skills course but not among 71 developmental freshmen in the same course. No combination of the ten study-skill scale scores regressed upon developmental student GPAs scales was predictive. Developmental and regular admission students from intact classes reported using the same study activities with the same frequency on the four factors: repetition, integration, comprehension monitoring, and coping (Ley & Young, 1998a).

On the other hand, Ley and Young (1998b) found that when responding to an interview, developmental students reported using significantly fewer strategies and using them less often than did regular admission students. A discriminant analysis of 15 self-regulation strategies from

the interview correctly classified 73% or 21 of the 28 regular admission students and 25 of the 31 developmental students. The evidence to reject a Likert scale is far from conclusive. This investigation provides data to identify what strategies developmental students report using and how often. The data add to the literature on self-regulation and relative usefulness of two different measures of self-regulation. If lower-achievers' Likert responses align with their interview reports, they would cross validate each other. An investigation comparing the two types of scales would also contribute to the body of research to inform policy decisions at institutions using Likert scales to diagnose developmental student's study and learning strategies. This study used two different measures of self-report, a Likert scale, and a structured interview, to capture the types of strategies reportedly used by developmental college students.

Method

This study compared developmental students' strategy frequency rankings from interviews to those from Likert items. Lower-achieving college students reported the activities they would complete and how frequently they used the strategies when presented with each of eight instructional circumstances in a structured interview. Within two weeks of completing the interview, the same students ranked the frequency with which he or she used fifteen self-regulation strategies presented as Likert statements.

Sample

Participants were postsecondary first semester students enrolled in two sections of a college study skills course offered at a two-year institution in a south-central location of the United States. The students were enrolled in the study skills course based upon an ACT score below 18, the minimum for regular admission. The mean age for the 35 participants was 21.7 with 63% between 17 and 19 years of age. Participants had a mean ACT composite score of 13.5. There were 12 males and 23 females and 19 whites, 13 African Americans, and three other race or race not identified.

Measures

Data were collected from participants with each of two measures, a fifteen-item Likert scale (Lan, 1996, Appendix A) and an eight-item structured interview (Zimmerman & Martinez-Pons, 1988, Appendix B). The Likert-scaled items present each of the fourteen strategies as an activity for which the respondent ranks the frequency with which he or she uses the strategy. The fourteen strategies represent a fairly

comprehensive schema for classifying learner self-regulating activities: self-evaluation, organizing and transforming, goal-setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorization, seeking assistance from teachers/experts, from classmates, or from others, reviewing tests, reviewing notes, reviewing texts (Zimmerman & Martinez-Pons, 1986). The fifteenth category is reserved for strategies other than self-regulation strategies.

Zimmerman and Martinez-Pons (1986) developed the structured interview instrument to elicit self-regulated strategies but without prompting participants with specific strategies. Using a post hoc design, 93% of 80 high school participants were correctly classified into preassigned high/low achievement tracks based on strategy use as measured by the interview. In a subsequent study with participants from fifth, eighth, and eleventh grades, they found that students who were classified as gifted reported statistically significant greater use of self-regulated learning strategies than did students classified as regular (Zimmerman & Martinez-Pons, 1990).

The structured interview protocol (Zimmerman & Martinez-Pons, 1986, Appendix B) requires the interviewer to ask the participant questions for which an interviewer records the strategy and the frequency indicated by the interview. The interviewer poses open-ended questions about what strategy the participant would use in eight different instructional circumstances. The interviewer always must ask for and record additional strategies the student uses when confronted with the situation described in the item. In contrast a student completing the Likert items indicates the frequency with which he or she engages in each of 15 specific activities, such as "seeking assistance from teachers/experts."

We adapted the interview to postsecondary participants by deleting the words "report card" before the word "grade" in two of the eight learning instructional circumstances, substituting the words "the semester" for "marking periods" in one learning instructional circumstance and deleting the words "your family's" before the word "history" in one learning instructional circumstance. These were the only changes to the protocol developed by Zimmerman and Martinez-Pons (1986). Both measures yield five ordinal frequency ranks for each of 15 self-regulation strategies. Likert and Interview frequency terms were assigned numerical ranks from 0 to 4, corresponding from least to most frequent responses. Table 1 lists the frequency options by measure and the resulting recoded numerical value for each of the five different frequency terms from each measure.

Table 1

Mode, Median and Percentile Rank for Self-Regulation (SR) Strategy Use by Likert and Interview Measures (N = 34)

Strategy Item	n	Mdn	Mode	Percentiles		
				25%	50%	75%
Lik1 Self-Evaluation	34	3.0	3	2.0	3.0	3.3
Int1 Self-Evaluation	35	4.0	4	3.3	4.0	4.0
Lik2. Organizing and transforming	34	3.0	4	2.0	3.0	4.0
Int2 Organizing and transforming	35	3.0	0	0.0	3.0	4.0
Lik3 Goal-setting and planning	34	3.0	3	2.0	3.0	3.0
Int3 Goal-setting and planning	35	0.0	0	0.0	0.0	3.7
Lik4 Seeking information	34	3.0	4	2.0	3.0	4.0
Int4 Seeking information	35	2.3	0	0.0	2.3	3.5
Lik5 Keeping records & monitoring	34	3.0	3	2.0	3.0	4.0
Int5 Keeping records & monitoring	35	3.0	4	0.0	3.0	4.0
Lik6 Environmental structuring	34	3.0	4	2.0	3.0	4.0
Int6 Environmental structuring	35	3.2	4	2.7	3.2	3.7
Lik7 Self-consequences	34	2.0	2	1.0	2.0	2.0
Int7 Self-consequences	35	0.0	0	0.0	0.0	3.0
Lik8 Rehearsing & memorization	34	3.0	3	2.0	3.0	4.0
Int8 Rehearsing & memorization	35	0.0	0	0.0	0.0	3.0
Lik9 Seeking assist from teachers	33	3.0	2	2.0	3.0	4.0
Int9 Seeking assist from teachers	35	2.0	0	0.0	2.0	3.0
Lik10 Seeking assist from classmates	34	2.0	2	2.0	2.0	3.0
Int10 Seeking assist from classmates	35	0.0	0	0.0	0.0	3.0
Lik11 Seeking assist from others	34	2.0	2	2.0	2.0	3.0
Int11 Seeking assist from others	35	3.0	4	1.0	3.0	4.0
Lik12 Reviewing tests	34	3.0	4	2.0	3.0	4.0
Int12 Reviewing tests	35	3.5	4	3.0	3.5	4.0
Lik13 Reviewing notes	34	3.5	4	3.0	3.5	4.0
Int13 Reviewing notes	35	0.0	0	0.0	0.0	0.0
Lik14 Reviewing texts	34	3.0	3	2.0	3.0	3.0
Int14 Reviewing texts	35	2.0	0	0.0	2.0	4.0
Lik15 Other	33	2.0	3	2.0	2.0	3.0
Int15 Other	35	3.6	4	3.0	3.6	4.0

Note: Frequency responses ranked from 0 for none mentioned (Lik) or never (Int) to five for always (Lik) or most-of-the-time (Int).

Since the Likert scale and the interview measure are not summed scores but rank orders of heterogeneous items, calculating reliability estimates for either of the measures are not appropriate (cf., Pedhazur & Smelkin, 1991). Each Likert item and the interview yield a frequency classification for each of 14 different self-regulation activities and one other category. The correlations between higher self-regulation activity levels and higher achievement levels support the validity of the Likert measure (Lan, 1996) and the structured interview (Zimmerman & Martinez-Pons, 1986) with regular- or high-achieving students.

Procedures

A graduate research assistant trained to conduct the interviews went to the two classes and asked participants to voluntarily participate in the study. Those who agreed signed an informed consent form, completed a demographic data form, and were interviewed during the first two weeks of the semester. During the last class of the first two weeks in the semester and after completing the interviews, participants completed the Likert scale. To avoid the response cuing inherent in the Likert, participants were interviewed prior to receiving and completing the Likert scale. The interview does partially cue the respondent to the degree that it describes conditions during which many learners employ a particular self-regulation strategy, although none is implied or suggested. The Likert was administered to the group of participants in each class after the interviews were completed for the class.

Following the protocol validated by Zimmerman and Martinez-Pons (1986), the interviewer read eight different instructional circumstances to each participant and then asked questions about what the participant did in that circumstance (Appendix B). For example, one circumstance was "Assume a teacher is discussing a topic with your class, such as the history of the civil rights movement. He or she says that you will be tested on the topic. Do you have a particular method to help you learn and remember what was discussed in class?" After the participant told the interviewer what he or she would do, the interviewer then asked, "What if you are having difficulty, is there any particular method you use?" The interviewer recorded what the participant said on a form. Regardless of whether or not the interviewee offered one or more strategies for an instructional circumstance the interviewer asked, "What if you are having difficulty? Is there any particular method you use?" (Zimmerman & Martinez-Pons, 1986, p. 619). The participant was asked how consistently (seldom, occasionally, frequently, or most of the time) he or she uses a strategy that he or she had previously identified. For example, the interviewer asked the participant how often do you "read

the book—1, seldom; 2, occasionally; 3, frequently; or 4, most of the time?” The participant, who held a card printed with the same rating options, rated the consistency with which he or she used the strategy and the interviewer recorded the consistency number by the strategy.

Two trained raters classified each instructional circumstance response as one of 15 self-regulating strategy categories: self-evaluation, organizing and transforming, goal-setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorization, seeking assistance from teachers/experts, from classmates, or from others, reviewing tests, reviewing notes, reviewing texts, and other [than SR]. Every response was coded independently and fewer than 5% were discrepant and those were quickly reconciled through a brief discussion between the two raters.

The interview results yielded multiple frequency ranks for a strategy category, because the participant could identify more than one strategy or activity to the interviewer. The Likert measure resulted in only one frequency. Strategies for which participants did not identify any activity were coded with a 0 frequency; the equivalent Likert was ranked never. If the participant did not mention a strategy in a particular category during the interview, the frequency was 0. The frequency rank for the interview self-regulation strategy categories was calculated by averaging the frequency ranks given for each activity in the same self-regulation category. Therefore if a participant only mentioned one activity in a category during the interview, the frequency for that activity was the self-regulation category frequency. If a participant identified two or more activities in the same self-regulation category, the average frequency for the two or more activities represented the interview self-regulation category frequency that was compared to the corresponding Likert self-regulation category frequency. Because only 4 of the interview self-regulation frequency ranks had a mode of 2 or greater and 9 of 15 interview self-regulation frequency ranks had a mode of 0 or 1 (the other category does not contain self-regulation strategies), the potential for distorting the data through averaging two or more frequencies in the same category was limited.

Results

Histograms revealed a threat to the normal distribution assumption for parametric *t*-tests. The Lilliefors test statistic, a variation of the Kolmogorov test when estimating parameters from the data, determined if the values came from a normal distribution (Sprent, 1989). None of the interview or Likert frequency rank tests had normal distributions. Therefore, nonparametric tests were more appropriate because of the

ordinal nature of the data and because the data were not normally distributed, although these tests are less powerful than the corresponding *t* test for normally distributed, interval data (Gall, Borg, & Gall, 1996). Items 1, 3, 7, 8, and 10 met the assumptions for a Wilcoxon signed ranks test (Daniel, 1978; Easton & McColl, 1997) which assumes a symmetrical distribution for the differences between the two ranks to calculate the test statistic.

Each strategy was analyzed individually to enable comparisons for each strategy so that they would not be masked by grouping responses together for ordinal data. Compensating for the threat to Type I error rate inflation possible with 15 pair-wise ordinal comparisons, the level of significance for each test was set at $p = .01$. The current data met assumptions for a paired signs test; both measured a continuous variable on an ordinal scale with independent values for each self-regulation measure taken from the same subject (Daniel, 1978). The Wilcoxon test ranked the differences, excluding no-difference pairs before assigning a sign and summing the positive and negative ranks to determine if the median difference was zero. The sign test was calculated by summing all the positives, negatives, and ties and then computing a Z score and a value associated with the frequency of the positives and the negatives (George & Mallery, 1999). A binomial test occurs when there are two observations possible, with and without a certain characteristic, each with a probability of one-half; otherwise, test is the same as a sign-test. The tests comparing the fifteen strategy pairs revealed the consistency or discrepancy between the Likert and self-regulation interview strategy frequency rankings of the responses offered by the participants (Table 2).

The nonparametric measures of central tendency revealed more evenly distributed responses within the Likert frequencies (Table 1) than in the interview frequencies. If participants identified a strategy during an interview they reported using the strategy more frequently than when ranking the frequency on the Likert. Interview strategy frequency rank modes equaled either the lowest or the highest of the potential value; nine were 0 and six were 4. Seven of the 10 interview strategies had medians between 3, frequently, and 4, most of the time; five were 0; three were between 2 and 3. Likert responses had a mode 2 or greater for all strategy categories and were more evenly distributed with modes of 2 for four strategies, 3 for six strategies, and 4 for five strategies.

Nine of the interview strategies were often not mentioned at all; five of these had modes and medians of zero (Items 3, 7, 8, 10, 13). The nine interview strategies with a mode of 0 included organizing and transforming (Strategy 2), goal-setting and planning (Strategy 3), seeking

Table 2
Nonparametric Tests for Negative and Positive Differences

		Z ¹ Differences	Negative Differences	Positive	Ties
1	Self-Evaluation ^a	-3.39***	6	25	3
2	Organizing and transforming ^b	-1.49	19	10	5
3	Goal-setting and planning ^a	-3.32***	20	9	5
4	Seeking information ^b	-2.55	20	6	8
5	Keeping records and monitoring ^c	n/a	13	9	12
6	Environmental structuring ^b	-0.39	12	15	7
7	Self-consequences ^a	-1.49	18	10	6
8	Rehearsing and memorization ^a	-4.11****	27	4	3
9	Seeking assist from teachers ^c	n/a	20	4	9
10	Seeking assist from classmates ^a	-2.72	21	7	6
11	Seeking assist from others ^c	n/a	11	14	9
12	Reviewing tests ^c	n/a	7	14	13
13	Reviewing notes ^a	-4.69****	28	0	6
14	Reviewing texts ^b	-1.44	20	11	3
15	Other ^b	-3.47***	5	25	3

^a Wilcoxon signed rank test; ^b Sign test; ^c sign test for binomial distribution.

*** $p \leq .001$; **** $p \leq .0001$

information (Strategy 4), self consequences (Strategy 7), rehearsing and memorization (Strategy 8), seeking assistance from teachers (Strategy 9), seeking assistance from peers (Strategy 10), reviewing notes (Strategy 13), reviewing texts (Strategy 14). The remaining five interview modes had the highest possible value, 4, self-evaluation (Strategy 1), keeping records and monitoring (Strategy 5), environmental structuring (Strategy 6), seeking assist from peers (Strategy 11), and reviewing tests (Strategy 12). The remaining mode, other (Strategy 15), was for strategies that students reported using that were not self-regulation (e.g., getting a drink, praying).

Most Likert strategy measures of central tendency were between 2 and 4. Likert medians for self-consequences (Strategy 7) equaled 3 and seeking assistance from classmates or others (Items 10 & 11) and using other [than SR] (Strategy 15) equaled 2 the same as the mode. Likert median values also were more central or moderate frequency than were the interview medians; the Likert medians were at least 2, sometimes, to 3.5, more than often whereas the interview medians were 0, strategies not mentioned, to 4, strategies used most-of-the-time.

Likert medians and modes exceeded interview medians and modes for eight strategies: Goal-setting and planning (Strategy 3), seeking information (Strategy 4), self consequences (Strategy 7), rehearsing and memorization (Strategy 8), seeking assistance from teachers (Strategy 9), seeking assistance from peers (Strategy 10), reviewing notes (Strategy 13), reviewing texts (Strategy 14). In contrast, interview median and mode were higher than Likert median and mode for strategies self-evaluation (Strategy 1), seeking assist from peers (Strategy 11), and other (Strategy 15).

For five strategy categories, the interview frequency ranks were higher than the Likert frequency ranks: self-evaluation (Strategy 1), environmental structuring (Strategy 6), seeking assist from peers (Strategy 11), reviewing tests (Strategy 12), and the other [than SR] category (Strategy 15). The remaining 10 had negative differences, indicating they used the strategy more often when responding to the Likert than during the interview: organizing and transforming (Strategy 2), goal-setting and planning (Strategy 3), seeking information (Strategy 4), keeping records and monitoring (Strategy 5), self consequences (Strategy 7), rehearsing and memorization (Strategy 8), seeking assistance from teachers (Strategy 9), seeking assistance from peers (Strategy 10), reviewing notes (Strategy 13), reviewing texts (Strategy 14). Two strategies had almost a third of the participants report the same frequency for the same strategy on each measure. Records and monitoring (Strategy 5) and reviewing tests (Strategy 12), tied 12 and 13 times respectively; both strategies had medians and modes equal or greater than 3.

The interview and Likert responses did not differ significantly for ten of the fifteen measures, thereby offering some support for their comparability and concurrent validity. The Wilcoxon test identified five strategy frequencies (self-evaluation, goal-setting..., rehearsing..., reviewing notes) that differed significantly; the other category differed although it is not a strategy. The Likert scale elicited a higher frequency response for all but self-evaluation. The highest Likert medians were reported for 13 (3.5), and strategy 2, 4, 6, 12, 1, 3, 5, 8, and 9 with a 3; interview, 1 (4), 15 (3.6), 12 (3.5), 6 (3.2), and 5, 11, and 2 all with 3.

The means from the ten items not significantly different between the interview and Likert responses indicate the same frequency for strategies. To determine which strategies students used most frequently, the frequency means for Likert and interview, were sequenced so that both interview and Likert means for any item precede any other item means that follow. The ten, from most to least frequent followed by the interview and Likert means in parenthesis are reviewing tests (Strategy 12; 3.15, 2.94), environmental structuring (Strategy 6; 3.06, 2.91), seeking assist from others (Strategy 11; 2.51, 2.47), keeping records and monitoring (Strategy 5; 2.45, 2.85), organizing and transforming (Strategy 2; 2.20, 2.79), seeking information (Strategy 4; 1.97, 3.06), seeking assistance from teachers (Strategy 9; 1.95, 2.91), reviewing texts (Strategy 14; 1.94, 2.91), assistance from peers (Strategy 10; 1.34, 2.26), self-consequences (Strategy 7; 1.2, 1.71).

There were statistically significant differences in rank orders between the Likert scale and the interview frequencies for five of the fifteen strategy categories. The signs test answered one research question, did developmental participants report different frequency ranks for a self-regulation strategy recorded on the Likert measure than reported during a structured interview? The *p* value of the Wilcoxon Signed Ranks tests were set at .01 to determine the percentage of the time that the test would incorrectly indicate a statistically significant difference in the number of positive and negative discrepancies between the two measures. The two different measures elicited a sufficient number of plus or minus signs to indicate a statistically significant difference between the two distributions of self-evaluation (Strategy 1), rehearsing and memorization (Strategy 8), reviewing notes (Strategy 13), and the other [than SR] category (Strategy 15); Likert values were higher for Strategies 1 and 15 and lower for the other two. The sample differences between the Likert scale and the interview matched the pair values for these four categories. The sign tests did not detect the magnitude of the discrepancy differences, only a statistically significant number of either higher or lower rankings, and, therefore, effect size of the difference could not be determined. Spearman's rho correlations tested for the strength of the relationship between items for the paired frequencies; none of the paired correlations were significant at the 0.1 level.

To further determine the validity of the two alternative forms of self report for each of the fifteen strategy categories, a Kendall's rank correlation statistic tested for a relationship between a participant's reported strategy use and his or her achievement, as none of the frequency ranks in any of the fifteen categories in either measure nor the achievement scores conformed to a normal distribution. There was no correlation

between course points and frequency ranks in any of the fifteen strategy use categories from either of the two self-report measures, the interview or Likert. The total number of different strategy categories participants suggested was also uncorrelated with total course points. Only the total number of different activities for the interview self-evaluation (Strategy 1) strategy category, was moderately correlated to total course points ($n = 33$, $\tau = .33$, $p < .05$).

Developmental student achievement was unrelated to any self-reported self-regulation strategies indicated by the Likert or through the interview. The achievement measure, course points, may have lacked range to detect any differences for any one measure; the total points possible with bonus points was 1060; over half the participants earned over 950 points and 85% earned over 730 points. The relatively flat distribution clustered at the high-end indicated that most of the participants in this class earned most of the points possible. Therefore the lack of relationship between achievement and self-regulation may be explained partially by the clustering of data points at the high end of the scale.

Discussion

There was some support for using the results from a Likert scale to identify and assist developmental, that is lower-achieving or at risk, students. Responses to the two measures did not significantly differ for ten of the fifteen strategy frequencies: organizing and transforming (Strategy 2), keeping records and monitoring (Strategy 5), environmental structuring (Strategy 6), consequences (Strategy 7), seeking assistance from teachers (Strategy 9), seeking assistance from peers (Strategy 10), seeking assist from peers (Strategy 11), reviewing tests (Strategy 12), and reviewing texts (Strategy 14). On the other hand, developmental students reported using five strategies more often on the Likert scale than during the interview: goal-setting and planning; seeking information; rehearsing and memorization; and reviewing notes.

Three Likert items elicited significantly higher strategy frequencies than did the interview. Results from three of the Likert items should be cautiously interpreted: goal-setting and planning, rehearsing and memorization, and reviewing notes. At least half of the respondents never mentioned using three of the five strategies during the interview: goal-setting and planning; rehearsing and memorization; and reviewing notes. Without a Likert item to cue them, many learners did not report any activities for these three strategies; the median and mode were zero. These lower-achieving learners may have been offering socially acceptable responses to the Likert scale items for goal-setting and planning; seeking information; rehearsing and memorization; and

reviewing notes, since in all cases many of the students did not report using the strategy at all during an interview but did when prompted by a Likert item including the strategy. Higher and lower achieving students reported comparable strategy frequencies for these three items in an earlier study using the interview (Ley & Young, 1998b), which may be more accurate.

The only self-regulation strategy developmental learners reported using more often in an interview than in a Likert item was self-evaluation. Only one of the interviewees did not mention some form self-evaluation, evidence that these students do practice self evaluation (checking their own work). The interview median and mode at highest frequency, 4, contrasted to the Likert median and mode at 3. Perhaps since the interview activities were reported and then coded by researchers, the learners did not recognize self-evaluation as synonymous with activities they described in the interview earlier. For example, the student may not recognize an activity such as, "I look at my assignment to be sure it is complete before I turn it in". It is also possible that self-evaluation is a SR strategy used by developmental learners, however, it is a strategy that requires completion of activities to be evaluated, and would be insufficient as an effective learning strategy independent of other applied strategies.

Developmental students have many activities they claim to engage in while studying that are unrelated to studying; they may be considered study distractions, such as getting a drink. Interviews elicited greater frequency for activities that were not self-regulation activities at all; they were classified as other [than self-regulation]. The interview median and mean frequency for the distractions were at least one point higher than for the Likert. The interview may collect more accurate details about such misconceptions about what a study strategy is and how often a student uses activities counterproductive to learning while considering them study activities.

Four activities they reported using most often were among the strategies which have discriminated between developmental and regular admission students. Despite the fact they report using them most often in this study, developmental students in an earlier study reported using them less often in an interview than did the regular admission students (Ley & Young, 1998b). The activities, reviewing tests, environmental structuring, keeping records and monitoring, and organizing and transforming materials, have predicted higher achievement status. This may mean that they do not effectively implement these strategies but know that they should be using them; or that they use them often but not as often as required for academic success. Those that were used least

often, seeking information and assistance from teachers and peers, contrasted with seeking information from others, which was the third most frequently reported activity as measured by means of the ten strategies which do not differ on Likert and interview measures. Developmental educators may want to encourage students to seek help from experts, such as their instructors or tutors, rather than asking someone else about how to complete work.

There was evidence impugning the validity of both measures. Neither the Likert nor the interview strategy frequencies correlated with the developmental students' total course points. The interview and Likert scale item results for developmental students at the beginning of the semester were unrelated to their subsequent course achievement. On the other hand, lack of any statistically significant relationship with achievement may be an artifact of restricted range for the achievement measure and the lack of power of the nonparametric test. Likert self-reports of learning and study strategies have not been related to developmental student success but have been related to regular admission student college success (Deming et al., 1994; Nist et al., 1990). Interview data collected with the same protocol had successfully predicted developmental or regular admission classification, a dichotomous achievement indicator (Ley & Young, 1998b).

During the interviews, most developmental students offered "other" strategies, (such as, get a drink, just do it, or pray, obviously not self-regulatory strategies. Twenty-five respondents had ranked "other" interview frequency above the Likert frequency. Developmental participants were able generate several non-self-regulation activities for studying during an interview and claim that they use them far more frequently than when responding to a Likert item about the frequency of using "other" [than SR] strategies. The current results are consistent with other findings that suggest self-report Likert frequency-ranking strategy statements may not be a valid measure of what learning activities developmental students use and how often they use them (Deming et al., 1994; Ley & Young, 1998b; Nist et al., 1990; Young & Ley, 1997). The results from this study indicate that developmental learners are more likely to recognize that they use a strategy at least occasionally than to recall an activity for the strategy. Evidence suggests that the recollection may be inaccurate, because developmental students' Likert responses, unlike regular or higher achieving students' strategy frequencies, have not been related to achievement. Developmental learners therefore may inflate strategy frequencies on Likert items over the frequencies they select when recalling what strategies he or she would use given common instructional circumstances. In this study, developmental students

may have reported more accurate self-regulation information about self-regulation processes through an interview than on Likert items. In an interview, the learner may be less likely to generate a strategy that they did not use than to indicate using a strategy at least once that they can recall ever using at any time.

The current results do not support the validity of either of the two self-report measures of self-regulation among developmental students although they do provide additional evidence that the Likert items may be especially problematic. Agreement between the two measures is not an indicator that either is valid; neither may be. Disagreement between the rank order frequencies indicates the two measures are not from the same frequency distributions and therefore are not measuring the same location parameters. In this case, the interview may be measuring recalled activities and frequencies but not actual activities used with the frequency indicated. Asking developmental students what they do to self-regulate their own learning processes and how frequently they engage in the respective activities may be a difficult questions for poorly self-regulated learners to answer accurately and even more difficult when they are given socially acceptable options from which to choose a frequency such as on the Likert.

One form of self-report may more accurately measure self-regulation by asking students to record what they have done during a specific and relatively short instructional time, e.g., a week. This technique of logging study activities was an effective self-regulation intervention that increased achievement among college statistics students (Lan, 1996). Indeed researchers may want to investigate the usefulness of self-regulation interventions without attempting to measure learners past self-regulation activity use or predict future use given an instructional circumstance.

Measuring self-regulation accurately among those who are not able or willing to self-regulate is fraught with problems and remains a challenge. Of two other possible options for measuring self-regulation activities, observation or self-report about self-regulation activities used during a very recent and relatively short instructional time period, observations, in this case by teachers, have also been seriously flawed (Zimmerman & Martinez-Pons, 1986). The remaining option, another form of self-report, avoids the inherent flaws of asking respondents to speculate about future possible activities or asking them to recall and summarize self-regulating activities and estimate the frequency with which they use the activities over a long and ill-defined period of time. Asking the learners to identify what behaviors they have used during a short and specified time period rather than speculating about what they might

use in a particular circumstance, like the interview, or what they have typically used without reference to a particular class, such as the Likert items, may provide a more accurate picture of what self-regulation activities developmental students do or do not use and how often they use them. This self-regulation recording activity by regular achieving learners increased their achievement leading Lan (1996) to conclude that their self-observation led to an increase in the self-observed activity. Reporting self-regulation activities may increase self-regulation activity and achievement.

Researchers who are investigating self-regulation with developmental college students should consider identifying effective self-regulation interventions and measuring cognitive and affective outcomes instead of attempting to measure interim self-regulation processes. Further investigations to identify a more valid and reliable self-regulation measure for poorly self-regulating learners would seem warranted. On the other hand, such investigations will be challenging given developmental learners' inability to reliably recall what self-regulation activities they do and do not do.

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Appendix A

The Self-Regulation Learning Scale (from Lan, 1998. Used with permission.)

Below is a list of learning strategies students employ when they are studying. Circle the answer under each of the strategies to indicate how often you use the strategy when you study. An example is provided for each of the strategies in the parenthesis to help you understand these strategies.

1. Self evaluation of the quality of work (checking one's own assignments)
 always often sometimes rare never

2. Organizing and transforming (make an outline before writing a paper)
always often sometimes rare never
3. Goal-setting and planning (plan activities in advance)
always often sometimes rare never
4. Seeking information (gather information prior to beginning assignment)
always often sometimes rare never
5. Keeping records and monitoring (take notes of discussion)
always often sometimes rare never
6. Environmental structuring (have a specific place to study)
always often sometimes rare never
7. Self consequences (arrange for rewards or punishment for success or failure)
always often sometimes rare never
8. Rehearsing and memorization (repeat material until you have learned it)
always often sometimes rare never
9. Seeking assistance from teachers/experts (if I need help I ask the teacher)
always often sometimes rare never
10. Seeking assistance from classmates (if I need help I ask classmates)
always often sometimes rare never
11. Seeking assistance from others (if I need help I ask others)
always often sometimes rare never
12. Reviewing tests (I review my test)
always often sometimes rare never
13. Reviewing notes (I review my notes)
always often sometimes rare never
14. Reviewing texts (I review the book)
always often sometimes rare never
15. Other (use other strategies not listed here)
always often sometimes rare never

Appendix B

Self Regulated Learning Interview Schedule (from Zimmerman & Martinez-Pons, 1986. Used with permission.)

1. Check the students name before he/she enters the interview room.

2. Greet the student as follows: *"Hello, I am from the graduate school at _____.* You are [mention the student's name. When he/she responds in the affirmative, proceed]? *Thank you for agreeing to help us in this study. We are looking at the way students learn."*
 3. Give students the personal consent and biographical data forms to complete. Say, *"Please read and complete the consent form and the biographical data on the back."*
 4. Continue, *"I'd like to ask you some questions concerning the way you study. You will need to refer to this card [point to the consistency scale 3 x 5 card] to respond to some of the questions. Feel free to look at it when the time comes. Are you ready?"*
 5. For each question below: a) ask the question, b) follow up, and c) assign a score according to the following scheme:
 - a. — Ask the question
 - If the student gives a clear method, ask, *"Is there anything else you do?"*
 - If the student says "YES", but does not give an answer ask *"What do you do?"*
 - If the student offers a general or ambiguous method, ask *"Could you be more specific?"*
 - If the student says "I don't do anything (more)" or words to that effect, go to b.
 - b. — Then ask the follow-up question, *"What if you are having difficulty? Is there any particular method you use?"*
 - If the student gives a clear method, ask, *"Is there anything else you do?"*
 - If the student says "YES" but does not give an answer, ask, *"What do you do?"*
 - If the student offers a general or ambiguous method, ask, *"Could you be more specific?"*
 - If the student still says *"I don't do anything more"* or words to that effect, go to c.
- For each strategy mentioned, record the question number in the "Item number" column on the Individual Interview Response Form. Record the strategy in the "Strategy" column on the IIRF. Use only one strategy per line.
- c. — Say, *"Now, for each strategy that you mentioned, I will ask you how often you use it. look at the card in front of you to decide. [point to the 3 x 5 card] I will read the frequency categories along with you"*
- For each strategy mentioned, say, *"How often do you ... [mention the strategy]?"*

(1) Seldom (2) Occasionally (3) Frequently (4) Most of the time

Record the student response in the column titled "Frequency" on the Individual Interview Response Form.

d. — Then go to next question.

Questions

- I. Assume a teacher is discussing a topic with your class, such as the history of the civil rights movement. He or she says that you will be tested on the topic. Do you have a particular method to help you learn and remember what was discussed in class?
- II. Teachers often assign writing a short paper outside class on a topic such as history. Teachers will often use your score on this paper as part of your grade. In such cases, do you have a particular method to help you plan and write your paper?
- III. Teachers usually emphasize that mathematics requires great accuracy. Furthermore, students must complete much math work outside class, without the help of a teacher. Is there any particular method you use for completing your math assignments accurately?
- IV. Most teachers give tests at the end of the semester, and these tests greatly determine grades. Do you have a particular method for preparing for this type of test in English or history?
- V. Many times students have problems completing homework assignments because there are other, more interesting things they would like to do, such as watching TV, daydreaming, or talking to friends. Do you have any particular method for motivating yourself to complete your homework under these circumstances?
- VI. Outside the classroom, some students find it easier if they select or set up the place where they study. Do you have any particular method for selecting or setting up the place where you study outside class?
- VII. With homework assignments such as writing reports for science class or papers in English, do you have a particular method for checking your work after it's completed?
- VIII. When taking tests in English, science, or history, do you have a particular method for making sure your answers are correct before turning in the paper?

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