Soc Psychol Educ (2009) 12:157–174
DOI 10.1007/s11218-008-9078-7

What causes failure and success? Students' perceptions of their academic outcomes

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Received: 7 April 2008 / Accepted: 30 September 2008 / Published online: 13 November 2008

Abstract How do students' conceptualize the causes of their own academic successes and failures? Taking a phenomenological approach, students identified the causes of their performance immediately following return of a graded examination. We then used factor and item analyses to organize causes that were identified by a substantial number of students into meaningful conceptual clusters, and confirmed those empirically derived clusters in a different sample of students using confirmatory factor analysis. That analysis indicated that students' descriptions of the causes of their outcomes were consistent with a hierarchical model in which specific causes such as effort and ability are subsumed in one of two more general clusters—facilitating causes and inhibiting causes—but many students explained their outcome by identifying causes from both categories. At a practical level, measuring unitary causes proved to be a reliable and valid way of assessing spontaneous thoughts about what causes academic outcomes.

Keywords Causal thought · Attributions · Student reactions to success and failure · Grading

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Feedback plays a key role in education (e.g., Ford and Smith 2007). As students strive to reach learning goals—both their own and those put in place by others—they are often guided by graded evaluative experiences that let them know if their efforts are superlative, adequate, or unsatisfactory. Self-regulatory models of achievement assume that students, in response to these evaluations, expend considerable mental energy reviewing their efforts and outcomes, identifying factors that hampered their efforts, and critiquing the strategies they used and the results they obtained. They search for the causes of their performance and, depending on the answer they find, they respond to the experience in more or less adaptive ways (Okun et al. 2006).

The current investigation examined the nature of this causal analysis by asking students who had just received their grades on a major course examination to identify the factors that caused them to get the grade they did. Drawing on the rich empirical legacy of attribution theory (e.g., Graham et al. 2002) we assumed that students seek to explain and control their educational outcomes by identifying relatively stable causal forces that generate those outcomes. As (Heider 1958, p. 79) explained, the perceiver "grasps reality, and can predict and control it, by referring transient and variable behavior and events to relatively unchanging underlying conditions, the so-called dispositional properties of this world."

We began our investigation into perceptions of educational outcomes by asking students an open-ended question, "What do you think caused your outcome on this test?" so as not to constrain their natural causal search. We then explored, in a second study, the properties of the most commonly reported causes using more structured measurement methods, and confirmed those empirically derived clusters using confirmatory factor analysis in a third study. Before describing these findings, we provide an overview of prior studies of students' causal analyses of their educational outcomes.

1 Causal explanations of educational outcomes

How do students react when they read the grade scrawled at the top of their homework papers, when they locate their test scores posted on the bulletin board outside the class, or cautiously check their grades on the class website? Although their reactions are, in many cases, emotional ones characterized by strong affective content, here we focus on their cognitive inferences about the causes of their outcomes; their ruminations in response to the question "Why did I get this grade?"

Heider (1958), in his initial analysis of this process, identified four phenomenologically prominent causes: ability, effort, luck, and the difficulty of the task. Subsequent researchers augmented this list, finding that students' causal interpretations tend to be extensive, structured, and—in many cases—motivated by the need to sustain their self-image (Anderson 1991; Bempechat and Mirny 2005). Elig and Frieze (1979), in a study of people's reactions to success and failure at a laboratory task, found that ability and task difficulty were reported as causes by a large proportion of participants, but that other causes were also cited: luck, intrinsic motives, stable effort, unstable effort, mood, and personality. (They also noted that many of the participants who failed did not search for a cause: they just denied that they failed.) When Asmus (1986) asked students to explain their successes and failures in music classes he found that 80% of the causes they cited stressed internal factors, with a particularly strong emphasis on ability. The students surveyed by Bornholt and Möller (2003) stressed effort in their explanations of success or failure on mathematics and English tests. Hui (2001), who investigated responses of students and teachers in schools in Hong Kong, found that outcomes were attributed to studying, psychological well-being, concern for educational future, friendships, and relationships at home, with peers, with people and at school. Beyer (1998), using a role-play method in which students rated causes after imagining they failed or passed an important test, found that men tended to stress ability after success, whereas women emphasized studying and attentiveness.

Most theorists assume that these myriad specific causes are the manifest indicants of a latent conceptual structure that explains achievement. Heider (1958), for example, noted the importance of internality-externality (or locus of causality) and stability and Weiner (1985) added controllability as the third dimension underlying causal thinking. These dimensions are thought to play a critical mediational role in determining the consequences of causal thoughts, including affective reactions, shifts in expectations, and changes in behavior (cf. Anderson 1991, Forsyth 1986).

The descriptive adequacy of Weiner's three-dimensional theory has been supported in a number of studies (Meyer 1980). Bar-Tal et al. (1984), for example, collected the spontaneous causal accounts of students and then asked them to rate the identified causes as to locus, stability, and controllability. They reported substantial agreement among the participants in their ratings, suggesting that the theoretical dimensions corresponded to cognitive structures. When Russell et al. (1987) measured people's causal attributions using both open-ended and dimensional methods, they found the techniques yielded similar conclusions. Similarly, Van Overwalle (1989), working with a 10-item list of causes (intelligence, interest, desire, effort, habits, knowledge, help, bias, teaching, difficulty, and luck), used factor analysis to confirm the dimensions stressed in Weiner's (1979) attribution theory (locus, stability, and controllability).

Some researchers, however, report evidence that suggests other dimensions may also underlie perceptions of specific, unitary causes. When Wimer and Kelley (1982) asked participants to explain a number of events, they discovered five interpretable dimensions: internality (The Person), stability (enduring-transient), good–bad, simple–complex, and motivation. Vispoel and Austin (1995) used a critical incident method to examine the reactions of junior high school students to their academic successes and failures, but their analyses did not confirm the theoretically predicted dimensions. Studies using a cognitive network method to examine causes similarly failed to support the traditional attributional dimensions of internality, stability, and controllability. Lunt (1988), for example, asked participants to identify the links between a small number of possible causes of failure (e.g., biased teaching, rarely studies, little intelligence, poor concentration, poor time allotment, unlucky, and physically sick). He found that these judges' data suggested two causal chains representing two possible routes to failure in an exam. One chain joined a number of inhibiting factors, such as rarely studies and little intelligence, whereas the other chain included only unlucky and physical illness. Ling et al. (2003), using a different method for assessing network connections, found that inhibiting factors—rarely studying and little intelligence—formed a causal chain, but their findings added time management, mind wanders, and sickness as key causes of failure. Anderson's (1983, 1991) studies of individuals' perceptions of causes further suggest that theoretically prominent dimensions may not reflect the phenomenological reality of people's cognitive structures. He asked participants to sort 63 causes of both social and nonsocial outcomes in one of two ways: on the basis of similarity in meaning or into two categories. He then used multidimensional scaling and clustering procedures to examine these data before concluding that his participants were "quite facile at both categorical and dimensional thinking" (Anderson 1991, p. 323). He found little evidence, though, that people's perceptions of causes are consistent with the dimensions posited by Heider (1958) and other theorists.

Due, in part, to these diverse findings researchers have also proposed additional or alternative dimensions, including globality (e.g., Abramson et al. 1978), intentionality (e.g., Elig and Frieze 1975), achievement orientation, vitality, mastery, energy, attitude, and ability (e.g., Falbo and Beck 1979), and power, motivation, and task-difficulty (e.g., Kernis and Granneman 1990). Indeed, the diversity of dimensions both posited and identified empirically prompted Wimer and Kelley (1982, p. 1143) to conclude that causal dimensions may actually "derive from the minds of attributions theorists, not laypeople".

2 Current studies and hypotheses

The present research contributes to this effort to chart the conceptual structure underlying students' reactions to their educational outcomes, and to initiate development of a measure that will validly and reliably index student's explanations of the causes of their outcomes. This approach assumes that individuals are capable of identifying multiple unitary causes following performance, but that these various causes reflect an implicit theory that identifies the critical causes of academic performance. When, for example, students receive a poor grade on a test they might conclude that difficulty of the test and the low quality of the teaching were key causes, but these unitary attributions reflect a more fundamental dimension such as locus of causality.

We used both open-ended and structured methods to measure students' perceptions of the causes of their performance (Benson 1989; Elig and Frieze 1974, 1975, 1979). Taking seriously Ross and Fletcher's (1985) charge that researchers should look more closely at "the different kinds of causal dimensions people use, and the nature, type, and frequency of attributions as they occur in everyday life" (p. 114) we first asked students who had just received the results from a classroom examination to list any causes that they felt might have influenced their performance. Unlike participants in role-play studies in which they imagine themselves in a performance setting or scenario paradigms in which participants read about events and then offer causes, our participants personally experienced the outcome that required explanation. Although our measurement methods may have influenced their attributions, we hoped that the attributions they recorded would more closely approximate the causal thought that occurs spontaneously following an academic performance (Anderson 1983).

As Elig and Frieze note, "when subjects are presented with a set of rating scales for a finite set of causal attributions," the rating scales "create a tendency for subjects to rate causal categories higher than they might ordinarily" (1975, p. 3; see also

Enzle and Schopflocher 1978). Ross and Fletcher (1985, p. 114) similarly complain that too often investigators use dimensional models "as the conceptual base for framing the independent and dependent variables," virtually guaranteeing that their results will confirm a particular theoretical model of causal thinking. Such procedures indicate that participants, when asked, are capable of making distinctions among various types of causes, but these perceptual distinctions may not correspond to the cognitive structures undergirding spontaneous thoughts about causes. To avoid this alternative interpretation, participants were asked to tell us what factors caused them to get a particular grade, and we then examined the naturally occurring relationships among the causes they reported (McMillan and Forsyth 1983).

A final methodological issue concerns the response scale used to assess perceptions of causal impact. Although many theories of attributional thought assume that a cause located near one end of an attributional dimensions is the logical opposite of causes located near the other end of the dimension (the bipolarity assumption), several studies indicate that, at any given moment, an individual can formulate attributions that may be both internal and external, controllable and uncontrollable, and so on (Enzle and Schopflocher 1978; Russell et al. 1987; Solomon 1978; see Hastie 1984; Ross and Fletcher 1985). Given this controversy, we avoided the use of bipolar ratings, such as "good luck–bad luck" or "ability–effort." Instead, we simply asked respondents to rate the perceived magnitude of the causal impact of all the causes.

We based our predictions about the number and nature of the dimensions underlying students' attributions on the work of Wimer and Kelley (1982) and Weiner (1979, 1985). First, as Wimer and Kelley (1982) note, "researchers do not agree on a single set of attributional categories" (p. 1143). However, with few exceptions exploratory analyses of the structure of attribution have identified a locus of causality, or internal versus external, dimension (Meyer 1980; Meyer and Koelbl 1982; Passer et al. 1978; Russell 1982; Russell et al. 1987; Wimer and Kelley 1982; cf. Falbo and Beck 1979). Although less consistently, several investigations have also revealed a "good–bad" dimension (Passer et al. 1978; Ryan et al. 1981; Wimer and Kelley 1982). Applied to an achievement setting, this view suggests that causes tend to be valenced: "good" causes increase the likelihood of success, whereas "bad" causes increase the likelihood of failure. We therefore expected to find evidence of both a locus of cause and a good–bad dimension in our analyses.

Second, we also predicted that the causes obtained would be hierarchically structured. Again, most theoretical models assume that all dimensions are equal in terms of cognitive importance, but Wimer and Kelley report that the primary conceptual dimension underlying attributions is good–bad. In their study such distinctions as internal and external were secondary, but the primary distinction was between positive and negative causes. If some dimensions are superordinate to others, then attributional thought may be organized in a multilevel, hierarchical structure in which causes such as effort and ability are subsumed by more general dimensions which are in turn subsumed by still more global dimensions. From this perspective, attributional thought can be considered to be a special case of hierarchically organized schema, with a small number of global attributional factors or dimensions subsuming a relatively greater number of more specific causal factors (Read 1987). To allow for a hierarchical structure, we carried out both primary factor analyses (to identify global dimensions) as well as secondary factor analyses (to identify secondary factors within the more global factors).

3 Method and results

3.1 Participants

A total of 1,040 students attending introductory psychology classes at a large urban university participated in the research. The sample was heterogeneous with regards to sex, race, and level of academic performance. Participants were informed that their input was being sought for a project dealing with the causes of academic performance, and that their responses were strictly confidential. To increase feelings of anonymity, participants were told not to put their names on any of the response forms. All participants also signed consent forms, and listened to a lecture that explained the purpose and significance of the findings later in the semester.

3.2 Procedure

In all cases participants' responses were measured on the first class day following administration of a examination in the course—one of 3 or 4 exams that would be given in the class. Fifteen minutes prior to the start of class, computer generated printouts that listed test scores (percent correct) by identification number were posted around the classroom. For students who came in late, or were unsure of their grades, several assistants were stationed in the classroom to provide students with their grade.

All grades were based on a criterion-referenced grading scale: 90–100 as A, 80–89 as B, and so on and this standard was known to all students. To minimize the impact of interpersonal factors on students' responses, normative information such as the class average or the numbers of As and Bs was not provided to students until after the questionnaires were completed. We also did not allow students the opportunity to discuss their scores with one another until after they completed their ratings. The tests themselves were not returned to the students, but after the measurement sessions the examination was reviewed and students were asked to make appointments to review their tests with the instructor or teaching assistants.

3.3 Study 1

To identify possible causes of academic outcomes we asked 243 students to write down their answer to the question "What do you think caused your outcome on this test?" In keeping with the inductive strategy adopted in this research, we then edited the 600 causes we collected to eliminate items which were nearly identical in wording and meaning (e.g., "studied a lot" and "put in a lot of studying"). After this review a final set of 175 items remained, and included such causes as *good book*, *ambiguous test questions*, *unfair teacher*, *interested in subject*, *studied carefully*, and *too many pressures*.

Nearly all of these causes were valenced ones—they suggested that the causal factor influenced their outcome in positive or a negative way. Students did not, for example, suggest that their score was caused by luck, the test, or studying. Instead, they indicated that their score was caused by good luck or bad luck; the unfair test or the valid test; their good study skills or their not studying enough. A small set of items, such as fate, God's will, friends in class were more ambiguous with respect to valence, but these items were the exception rather than the rule.

A second group of 119 students who had just received their grades on a major course examination rated the causal importance of the 175 causes on a five point scale ranging from 1 (*not at all causally important*) to 5 (*very causally important*). Through written instructions, participants were reminded that they were not rating "whether or not the item actually describes the class, the teacher, the test, or your studying, but the causal importance of each item." Post-session discussion with the students indicated that they understood these instructions.

3.3.1 Factor analyses

These ratings were examined in a principle axes factor analysis with squared multiple correlations inserted in the diagonal, and an oblique rotational procedure, promax rotations, to allow for correlations among the dimensions. The scree test procedure suggested that six factors should be retained, and these factors together accounted for 91.4% of the total variance. The first two factors encompassed broad content domains and they accounted for a substantial share of the total variance (68.5%). General *inhibiting causal factors* loaded at 0.40 or more on the first factor (e.g., tired, teacher hard to understand, not motivated, poor study habits), whereas *facilitating causal factors* loaded on the second one (e.g., good study habits, book is clear, studied very hard, took good notes). The remaining four factors were much more specific: *luck* (e.g., fate, God's will), *friendship* (e.g., friends in the class), *mood* (e.g., good mood, relaxed), and *good book* (e.g., book is clear). All of the items that loaded on the sixth factor also loaded on the second factor, indicating these two factors were interrelated. Because intercorrelations among the first five factors were negligible, other types of analyses such as principle components and factor analyses with varimax rotations yielded similar findings.

To identify more specific scales within the two global factors, a second series of factor analyses was carried out. In this phase, items that loaded highly on the inhibiting causes factor or the facilitating causes factor were separately factor analyzed. Based on these analyses, the global inhibiting causes factor was broken down into 8 more specific dimensions: bad teacher, low motivation, poor preparation, low immediate effort, personal problems, bad test, bad book, low ability. The global facilitating causes factor included 4 more specific factors pertaining to motivation, effort, preparation, and the quality of instruction. The remaining factors were not subjected to secondary analysis since so few items loaded on them.

3.3.2 Psychometric analyses

We used traditional scaling methods to develop scales that corresponded to each of the global and specific factors identified through factor analysis. The items that were included on the questionnaire that resulted from this process tapped the 15 causal factors described above. Four criteria were used to determine inclusion of an item: (1) high factor loading in the primary or secondary factor analysis, (2) conceptually representative of the domain of content identified in the factor analysis, (3) high item-to-scale correlation, and (4) significant improvement in the scales' internal consistency as indicated by increase in alpha coefficient. In a very small number of instances, an item was slightly reworded to increase its clarity. The final set of items is shown in Table 1.

Table 1 Items and factor loadings in the four-factor solution

Item	Factor 1	Factor 2	Factor 3	Factor 4
Teacher hard to understand	0.8549	0.2247	0.0310	−0.0222
Teacher did not explain material	0.8544	0.2355	0.0615	−0.0114
Studied wrong things	0.8191	0.1878	0.0956	0.0477
Bad teacher	0.8079	0.2526	0.0427	0.0553
Book is unclear	0.8054	0.1813	0.1070	−0.0189
Material on test not covered well	0.7973	0.2404	0.0856	0.0383
Didn't know what to study	0.7937	0.2338	0.0922	0.0791
Misunderstood teacher	0.7929	0.2188	0.0858	0.0741
Unfair test	0.7884	0.2352	0.1578	0.0305
Confused by text	0.7867	0.1929	0.0130	0.0399
Text difficult to understand	0.7665	0.2375	0.1042	0.0561
Not motivated in this class	0.7660	0.0922	0.1667	0.0223
Confused by teacher	0.7584	0.1578	0.0652	−0.0477
Lack of help from teacher	0.7530	0.2661	0.1843	0.0770
Not motivated in general	0.7501	0.0997	0.1565	0.1899
Studied wrong material	0.7465	0.1438	0.1060	0.0591
Test questions hard to understand	0.7376	0.2254	0.0510	0.0406
Reviewed poorly	0.7050	−0.0468	0.1282	0.0761
Not committed to doing well in school	0.7198	0.1093	0.1499	0.1804
Not keeping up	0.7184	0.0569	−0.0631	0.1840
Typically don't work very hard	0.6892	0.1467	0.0737	0.2398
Didn't study much	0.6835	−0.0376	0.0526	0.1443
Typically don't work study much	0.6830	0.0717	0.0873	0.1973
Low ability in this area	0.6829	0.2477	0.2542	0.1404
Book is boring	0.6750	0.0952	0.1974	0.1240
Poor health	0.6746	0.1592	0.1164	0.2992
Studied carelessly	0.6343	0.0377	0.0016	0.1348
Not interested in school	0.6057	0.0437	0.1452	0.0978
Laziness	0.5902	−0.0695	0.1143	0.1514
Personal inadequacies	0.5526	0.1057	0.2694	0.4727
Emotional problems	0.5247	0.1145	0.1665	0.6421

Table 1 continued

Item	Factor 1	Factor 2	Factor 3	Factor 4
Trick questions on test	0.5224	0.2139	0.2087	0.0921
Bad mood	0.5161	0.1208	0.2273	0.4642
Personal problems	0.5081	0.0529	0.0464	0.6777
Depressed	0.5054	0.1129	0.1363	0.7163
Not smart	0.4935	0.1874	0.3996	0.1907
Unhappy	0.4910	0.1392	0.1993	0.6534
Dumb	0.4362	0.1727	0.3814	0.2261
Highly motivated	0.1134	0.7721	−0.0723	0.0908
High desire to achieve	0.0146	0.7395	−0.0251	0.0739
Good study habits	0.2609	0.6979	−0.0190	0.0591
Very motivated overall	0.1029	0.6768	−0.1618	0.0722
Book is clear	0.2077	0.6631	−0.0146	−0.0769
Studied carefully	0.1837	0.6386	−0.1645	0.0175
Concerned with succeeding	−0.0129	0.6305	−0.0190	0.1128
Typically work hard	0.1202	0.6289	−0.0415	0.1341
Studied right things	0.1135	0.6266	−0.0162	−0.0344
Book is interesting	0.2691	0.6158	0.0544	−0.0566
Knew what to study	0.0581	0.6144	−0.0072	0.0034
Text easy to understand	0.1960	0.6064	0.0151	−0.0415
Book is clear	0.2028	0.5825	−0.0267	−0.0297
Teacher clarified material	0.1110	0.5782	0.1198	−0.0380
Teacher easy to understand	0.0621	0.5604	0.0607	0.0283
Ambitious	0.0268	0.5531	0.0465	0.0565
Relaxed	0.1204	0.5424	0.2542	0.0193
Calm while taking test	0.1258	0.5337	0.1606	0.0122
Took good notes	0.1059	0.5323	0.0728	0.1052
Serious	0.1381	0.5178	0.0329	0.1391
Good student	−0.0498	0.4770	0.1533	0.0771
Feeling relaxed	0.0877	0.4368	0.0903	−0.0411
Good mood	0.1384	0.3978	0.3804	0.0463
Good luck	0.0676	0.0230	0.7432	−0.0789
Fate	0.1806	−0.0336	0.6690	0.0795
Have friends in class	0.0162	0.0534	0.6542	−0.0154
Bad luck	0.1758	−0.0587	0.6021	0.4711
Fortunate	0.1861	0.1143	0.5911	0.0800
Like fellow students in class	0.0006	0.0180	0.5446	0.0470
Unfortunate	0.3522	0.0028	0.4858	0.1174
Have no friends in class	0.2564	−0.0179	0.4769	0.0096

3.4 Study 2

Participants ($n = 345$), after receiving the numeric score and letter grade they earned on the second major exam in their course, were given the list of 69 randomly ordered causes developed in Study 1. After examining the list, participants rated the causal importance of each item on a scale from *not at all causally important* (1) to *very causally important* (5).

3.4.1 Factor analyses

Another series of factor analyses was conducted to replicate the results of Study 1. The principle axes factor analysis with promax rotation yielded 4 factors that accounted for 74.5% of the total variance. The eigenvalues for these four factors were 23.86, 7.89, 3.50, 2.00, and they accounted for 47.69, 15.77, 6.99, and 4.00% of the total variance.

The results of the factor analysis are shown in Table 1. Only *inhibiting causes* loaded on the first factor, although the locus of the cause influenced the magnitude of the loading. External factors, such as “teacher hard to understand” and “book is unclear,” had the highest loading on this factor, followed by items focusing on motivation (“not motivated in this class”), preparation (“studied wrong material”), effort (“laziness”), and ability (“not smart”). The second factor, in contrast, referred to *facilitating causes*. In this case, the factor loadings decreased as the items shifted from internal causes (“high effort”) to external causes (“book is clear”). The third factor, *uncontrollable causes*, pertained primarily to fate, luck, and having friends in the class, but such causes as low ability, personal inadequacies, and dumb had small loadings on this factor as well. The final factor focused on *personal limitations* such as personal and emotional problems. All the items that loaded on this factor also loaded on the inhibiting causes factor.

As in Study 1, attributions tended to fall into global categories, but subcategories within these general clusters could also be identified via secondary factor analyses. The subfactors found in Study 2, for the most part, corresponded to those obtained in Study 1. In all, 17 specific attributional clusters were obtained: 7 inhibiting subfactors (bad teaching, low motivation, poor preparation and low effort, personal problems, low ability, bad test, and bad book); 7 facilitating subfactors (high motivation, good preparation, high effort, good teaching, good book, good test, relaxed); and 3 uncontrollable subfactors (good luck, bad luck, and friends in the class). Again, alternative factor analyses (principle components or principle axes with varimax rotations) yielded similar results.

3.4.2 Psychometric analyses

To determine if participants responded consistently to the items that comprised these subfactors, scales were created by averaging together items that had high loadings on either the global factors or the specific factors. Both types of scales were internally consistent; the Cronbach alpha coefficients ranged from a low of 0.69 for the Good Preparation scales to a high of 0.94 for the Bad Teacher scale. This item analysis was also used to identify pairs of items that were so highly correlated that one of the items could be deleted without loss of content (e.g., “dumb” and “not smart”). In addition,

Table 2 The 18 scales and items used to measure causal thought

Scale	Items
Low effort	Lack of effort, didn't study much, didn't know what to study, studied wrong material,
	Reviewed poorly, studied carelessly, not keeping up, didn't take good notes, material on test not well covered
Low motivation	Lack of effort, not motivated in general, not serious about this class, not committed to doing well in school
Low ability	Not smart, low ability in this area
Bad teaching	Lack of help from teacher, bad teacher, teacher did not explain material, teacher hard to understand, teacher is boring
Bad test	Test questions hard to understand, unfair test, test too difficult, trick questions on test
Bad book	Confused by the book, book is hard to understand
Personal problems	Bad mood, felt nervous during test, personal problems, emotional problems, poor health
High effort	Put forth a great deal of effort, studied carefully, studied right things, studied a lot, knew what to study, studied right things
High motivation	Very motivated to do well in this class, concerned with succeeding, serious about this class, high desire to achieve,
	Put forth a great deal of effort, ambitious, typically work (study) very hard
Good preparation	Studied right things, took good notes, knew what to study
High ability	Generally find academics easy, high level of ability in this area, high level of ability in school
Good teaching	Teacher clarified difficult material, teacher easy to understand
Good test	Good test, easy test
Good book	Book is interesting, book is easy to understand, book was clear
Relaxed	Felt relaxed during the test, felt good, calm while taking test
Good luck	Fortunate, good luck
Bad luck	Unfortunate, bad luck
Friends	Have friends in class, have no friends in class

three items dealing with ability (e.g., high level of ability in school) were added since this critical set of causes was not well-represented in the initial item pool generated in Study 1. The results of this analysis are shown in Table 2. The final set of items includes 61 unitary causes that can be added or averaged to yield 18 specific attribution scores and 3 global attribution scores.

3.5 Study 3

The third study followed the procedures used in Study 2. Students ($n = 333$) who had just received their grades (percent correct and letter grade) rated each of the causes listed in Table 2 on a scale from *not at all causally important* (1) to *very causally important* (5).

3.5.1 Reliability and validity

The means, standard deviations, alphas, and zero-order correlations are presented in Table 3. Means could range from 1 (*low causal impact*) to 5 (*high causal impact*), but the lowest score actually obtained was 1.35 (bad teaching) and the highest was 4.10 (good teaching). The standard deviations were relatively homogeneous (ranging from 0.49 to 1.17), and most of the scales had high internal consistencies. The scales with the lowest alphas, low ability (0.83), good preparation (0.72), good teaching (0.80), and good test (0.83) all had very few items, so these reliabilities are satisfactory.

3.5.2 Model testing

We used LISREL 8.54 (Jöreskog and Sörbom 2003) to examine the structure of these causes. In this analysis we used a parsimony-adjusted index (root mean square error of approximation [RMSEA]), an incremental index (comparative fix index [CFI]), an index based on covariances (standardized root mean square residual [SRMR]), a non-normed fit index [NNFI], and the following cutoffs, recommended by Kline (2005), as indicating acceptable fit levels: RMSEA ≤ 0.10, CFI > 0.90, SRMR < 0.10, and NNFI > 0.90. We used the average of the scales items as an indicator for each item.

We tested and compared the three structural equations models summarized in Table 4. A one-factor model, in which both inhibiting and facilitating factors loaded on a single factor (negatively and positively, respectively), provided a relatively poor fit to the data. A two-factor model that differentiated between facilitating causes and inhibiting causes provided significantly improved fit, but the comparative fit index (CFI) did not reach the levels specified by Kline (2005) for an acceptable model. We therefore tested a third model, the hybrid model in Table 4 and presented in Fig. 1, which permitted the two factors to covary. This model provided an improved fit over the two-factor model and significantly better fit; χ^2 (85, $N = 330$) = 332.26, CFI = 0.92, SRMR = 0.066, RMSEA = 0.094 (90% CIs: 0.084; 0.10), NNFI = 0.90. As Fig. 1 indicates, all of the second-level causal factors loaded significantly on their respective factors, and these two factors were only slightly correlated with one another. Alternative models, including a model with 3 factors corresponding to facilitating, inhibiting, and the more uncontrollable causes (good luck, bad luck, and friends) provided a relatively poor fit to the data, as did factors that assumed the causes were organized in a bipolar structure. The hybrid model, however, reached a relatively nominal level of fit only after 4 error terms for the indicators were allowed to covary. These error terms included low effort and low motivation (0.24), high effort and high motivation (0.39), high effort and preparation (0.43), and high motivation and preparation (0.22).

4 Discussion

What do students think when they receive their grades on a major in-class test? Extending prior theory and research, the current studies suggest students' search for causes is concentrated in two areas: inhibiting causes that impede performance and facilitating causes that aid performance. These categories suggest that individuals tend to be practical thinkers, for they seek out and identify causes that will provide them with the means to understand, and possibility improve, their performance. Although this good–bad, facilitating-inhibiting dimension is inconsistent with most extant theoretical

Table 3 Scales, Means, Standard Deviations (s.d.) and intercorrelations among the scales. The alphas for each scale are entered along the diagonals

Scale	M	s.d.	Low effort	Low Mo	Low ability	Bad teach	Bad test	Bad book	Personal	High effort	Hi Mo	Good prep	High ability	Good teach	Good test	Good book	Relaxed	Good luck	Bad luck	Friends
LE	2.31	0.95	0.96	0.647	0.374	0.506	0.405	0.502	0.519	−0.111	−0.109	−0.075	0.053	0.086	0.037	0.000	−0.033	0.041	0.132	0.168
LM	1.76	0.99		0.92	0.416	0.489	0.267	0.372	0.426	0.045	−0.086	0.052	0.159	0.131	0.171	0.084	0.090	0.019	0.045	0.106
LA	1.69	0.87			0.83	0.317	0.381	0.360	0.424	0.061	0.040	−0.007	−0.009	0.028	−0.031	−0.044	−0.042	0.071	0.317	0.185
BT	1.60	0.89				0.97	0.614	0.544	0.438	0.218	0.112	0.199	0.117	0.119	0.216	0.173	0.144	0.062	0.116	0.261
BS	2.38	1.15					0.91	0.571	0.420	0.176	0.150	0.120	−0.002	0.031	−0.091	0.024	−0.048	0.047	0.345	0.159
BB	2.10	1.20						0.94	0.368	0.094	0.077	0.045	−0.023	0.129	0.087	−0.031	−0.018	0.073	0.199	0.277
PP	2.06	0.96							0.87	0.133	0.043	0.076	0.041	0.061	0.050	0.061	0.001	0.049	0.355	0.183
HE	3.33	1.03								0.92	0.739	0.828	0.322	0.414	0.320	0.458	0.408	0.085	−0.102	0.127
HM	3.82	0.87									0.94	0.594	0.430	0.390	0.279	0.409	0.380	0.063	−0.097	0.102
GP	3.37	1.16										0.72	0.373	0.504	0.347	0.429	0.427	0.126	−0.141	0.129
HA	2.85	0.97											0.92	0.304	0.399	0.332	0.395	0.126	−0.139	0.145
GT	3.25	1.16												0.80	0.489	0.426	0.395	0.094	−0.039	0.131
GS	2.43	1.07													0.83	0.523	0.407	0.268	−0.095	0.294
GB	2.84	1.20														0.91	0.361	0.081	−0.077	0.156
Relaxed	2.88	1.13															0.91	0.218	−0.206	0.136
Good luck	1.85	1.01																0.91	0.046	0.207
Bad luck	1.73	1.07																	0.91	0.039
Friends	1.63	0.82																		0.88

Note: Scales consisted of a five-point Likert-type item, anchored by *not at all causally important* (1) to *very causally important*(5); LE = low effort; LM = low motivation; LA = low ability; BT = bad teaching; BS = bad test; BB = bad book; PP = personal problems; HE = high effort; HM = high motivation; GP = good preparation; HA = high ability; GT = good teaching; GS = good test; GB = good book

Table 4 Goodness-of-Fit statistics for tested models

Model	*df*	χ^2	$\Delta\chi^2$	RMSEA	CFI	SRMR	NNFI
One-factor	90	2214.96	–	0.27	0.57	0.21	0.50
Two-factor	89	654.14	1560.82*	0.14	0.85	0.08	0.82
Hybrid	85	332.26	80.47*	0.09	0.92	0.07	0.90

$^*p < 0.001$; *Note*: For all values, $N = 330$. RMSEA = root mean square error of approximation; CFI = comparative fit index; SRMR = standardized mean square residual; NNFI = non-normed fit index

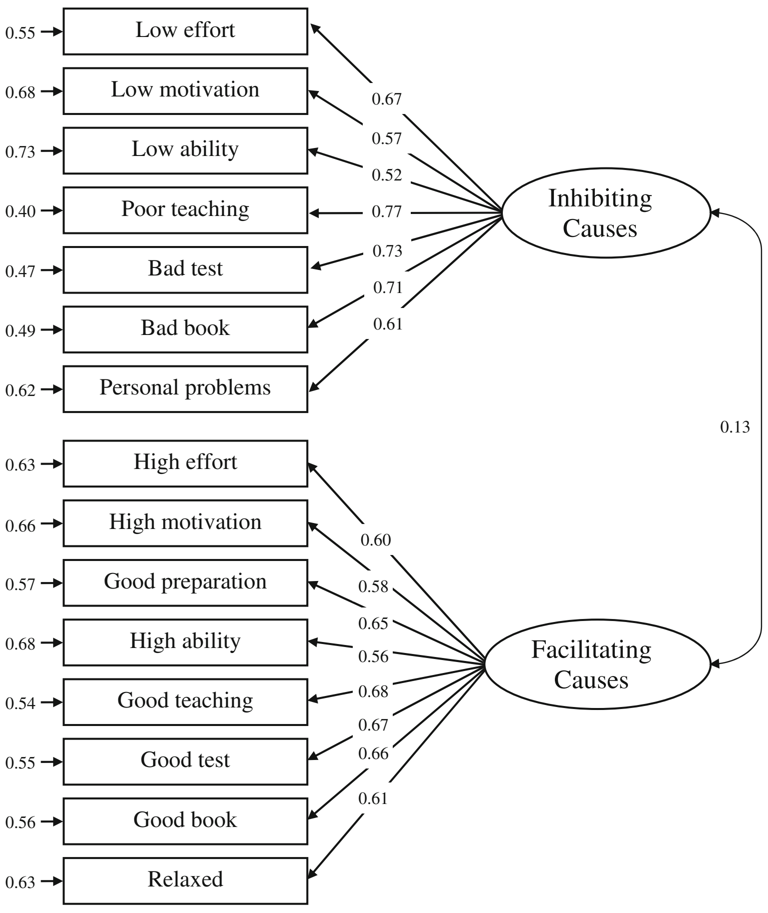

Fig. 1 The facilitating-inhibiting causes of academic performance model

models of attributional thought, it has been noted in several prior studies in performance settings (Ryan et al. 1981; Wimer and Kelley 1982).

These findings also suggest that causal dimensions tend to overlap at the cognitive level, for both facilitating and inhibiting factors included causes that varied in internality, stability, and controllability. These results conflict with some past research (e.g., Meyer 1980; Meyer and Koelbl 1982), but they are consistent with Russell et al.'s (1987) finding that certain theoretically opposite causes, such as ability and effort, were positively correlated with one another. Like the participants in the current studies, their participants generally made internal, unstable, and controllable attributions or external, stable, uncontrollable attributions.

If these interrelationships actually reflect the cognitive organization underlying attributional thought, then these structures appear to be monopolar rather than bipolar, nonorthogonal rather than orthogonal, and hierarchical rather than flat. The findings are thus consistent with a model of implicit causal thought that assumes that individuals generally attribute outcomes to a number of causes, but that these causes reflect an underlying cognitive structure related to success and failure. Hence, changes in attributions at one level of the hierarchy reverberate throughout the structure, prompting reorganization along a common specific or more global facet. For example, if a student blames her failure on "not knowing what to study," she will also tend to feel that "reviewing poorly" and "studying carelessly" were also important determinants of her outcome since these unitary causes are linked by a common attributional dimension: inhibitory factors. Attributional thought can thus be considered to be a special case of a hierarchically organized schema, with a small number of global factors or dimensions subsuming a relatively greater number of more specific causal factors. Many of these factors, such as effort, motivation, and luck, are influential in both inhibiting and facilitating success.

Additional work is needed, however, to further explore the model supported by the current findings, and address two clear limitations of the current work. First, the factor structure identified through the exploratory, open-ended analyses included factors related to luck and to having friends in the class, but this factor was not supported by confirmatory factor analysis. Only the first two factors, inhibiting and facilitating factors, were robust across all three studies. Second, the confirmatory factor analysis is problematic. Structural equations modeling confirmed the model, but the overall fit indexes are relatively low. These findings suggest that the causes may be cognitively organized in a way that we did not identify with our simple two factor model. The fact that several error terms were correlated suggests that 4 of the indicators may measure something other than the specific measurement variables and the two global latent factors in the model.

To close on a methodological note, the scales that were developed to assess attributional thought proved to be useful. Despite tremendous progress in the study of cognitive processes in educational settings, the measurement of attributional thought remains problematic (Benson 1989; Miller et al. 1981; Ross and Fletcher 1985; Whitley and Frieze 1985), particularly for assessing attributions from actual rather than contrived achievement tasks and feedback. Open-ended measures are sometimes used, but most investigators prefer to utilize structured rating scales that list either specific causes, such as ability or effort, or attributional dimensions, such as internality or controllability. Although in some cases these various approaches yield similar effects (Benson 1989; Elig and Frieze 1979), in other cases divergences arise when different methods are utilized (Maruyama 1982; Whitley 1987; Winograd et al. 1986).

Our studies provide evidence that there are two overarching dimensions that students use to provide categories that encompass different causes. Consistency was demonstrated across students in several different classes (although all were psychology classes). Some differences could be expected from the different studies because the nature of the classes, instructors, content, and importance of the exam, but the consistency of the findings across these variations further strengthens the finding that these two generic categories are used by students to help organize and make sense of more specific causes.

The measurement methods used in this research partially reconcile prior approaches to assessing attributions by using unitary items that have dimensional meaning but were generated through open-ended questioning. Taken together, the three studies indicate that the 61 causes can be combined to form 18 specific cause scales and 2 general dimensional scales. All 20 general and specific scales demonstrated internal consistency. The content validity of the items is supported by the use of a large number of items and the inclusion of content reported by individuals in an actual performance setting. One limitation of this procedure is that the specific attributional dimensions or factors obtained may apply only to college academic settings: they may not underlie attributions made in, say, work or sports settings (Anderson 1983). Another limitation is that causes were only assessed after immediate knowledge of the grade received, and no normative data were provided to students prior to their self-reports. However, the setting offers a number of advantages over a hypothetical scenario procedure. First, demand characteristics in studies that examine individuals' attributions about hypothetical events may prompt participants to be more logical and rational than they normally are when formulating attributions. Second, even though the specific factors obtained may not generalize to all performance settings, the classroom nonetheless provides an ideal setting for examining the general structure of spontaneous attributional processes.

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