

ASSOCIATIONS BETWEEN STUDENTS' PERCEPTIONS OF MATHEMATICS CLASSROOM ENVIRONMENT AND SELF-HANDICAPPING IN AUSTRALIAN AND CANADIAN HIGH SCHOOLS

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ABSTRACT. Research investigating the relationship between classroom environment and self-handicapping was conducted in Australian and Canadian high schools. A sample of 2,006 students responded to a questionnaire that assessed student perceptions of classroom environment and self-handicapping. Simple and multiple correlational analyses showed that classroom environment accounted for small but significant proportions of variance in self-handicapping. Enhanced affective dimensions of the classroom environment were associated with reduced levels of self-handicapping. For Australian and Canadian students the relationship between each classroom environment scale and self-handicapping was very similar. There were no significant gender differences in the relationship between each classroom environment scale and self-handicapping. A commonality analysis revealed that conventional rather than constructivist classroom environment dimensions accounted for most of the variance in self-handicapping.

LIENS EXISTANT ENTRE LA PERCEPTION QU'ONT LES ÉTUDIANTS DE L'ENVIRONNEMENT D'UNE SALLE DE CLASSE DE MATHÉMATIQUES ET LE HANDICAP INTENTIONNEL DANS LES ÉCOLES SECONDAIRES CANADIENNES ET AUSTRALIENNES

RÉSUMÉ. Des recherches portant sur le lien entre l'environnement d'une salle de classe et le handicap intentionnel ont été menées dans des écoles secondaires australiennes et canadiennes. Un échantillon de 2 006 étudiants a répondu à un questionnaire visant à évaluer la perception par les étudiants de l'environnement d'une salle de classe et du handicap intentionnel. Des analyses corrélationnelles simples et multiples ont démontré que l'environnement d'une salle de classe avait une incidence légère mais significative sur la variance du handicap intentionnel. Un lien a été établi entre l'accroissement de la dimension affective d'une salle de classe et la diminution du handicap intentionnel. Le lien établi entre les proportions de la salle de classe et le handicap intentionnel chez les étudiants australiens était très semblable à celui présent chez les étudiants canadiens. La différence de sexe n'influait pas le lien entre l'environnement d'une salle de classe et le handicap intentionnel. Selon une analyse convergente, ce sont les dimensions traditionnelles plutôt que constructivistes de l'environnement d'une salle de classe qui étaient responsables de la majeure partie de la variance du handicap intentionnel.

This paper reports cross-national research on the relationship between classroom environment and self-handicapping by students in Australian and Canadian high school mathematics classes. The working hypothesis for this study was that classroom environment influences student self-handicapping. Before describing this research, the fields of classroom environment and self-handicapping are reviewed so that the theoretical and methodological bases of the present study are clearly understood. Classroom environment addresses a straight forward question: What is it like to be in this classroom? Self-handicapping is a more esoteric psychological construct: proactive, avoidant behavior which is designed to manipulate other people's perceptions of performance outcomes so that the student appears worthy to other people in the school (see Urdan, Midgley, & Anderman, 1988). Examples of such self-handicapping strategies include putting off study until the last moment, fooling around the night before an examination and deliberately not trying in school.

BACKGROUND

Classroom environment

It is over 30 years since Walberg and Moos launched the modern era of classroom environment research through independent research agendas (see Fraser, 1986). The most common methodological approach of this research has been to define classroom environment in terms of students' perceptions and use instruments that assess specific dimensions of the environment (e.g. student cohesiveness, teacher support). The fundamental classroom environment question is "What is it like to be in this classroom?"

Learning environment research has its roots in the work of early social psychologists. Lewin's (1936) *field theory* defined behavior as a function of person and environment (i.e. $B=f\{P,E\}$). For Lewin (cited in Cartwright, 1975, p.11), "(T)he field with which the scientist must deal is the "life space" of the individual. This life space consists of the person and the psychological environment as it exists for him."

Murray (1938), Stern, Stein, and Bloom (1956) and Pace and Stern (1958) extended Lewin's work to develop a *need-press* theory in which persons are conceptualized in terms of their psychological needs and the environment in terms of its press. Needs are the important determinants of behavior within the individual (Genn, 1984). According to Murray (1938), "the press of an object is what it can do to the subject – the power it has to affect the well-being of the subject in one way or another" (p. 121). Pace (1963) suggested that an environment's crucial aspects are "its overall atmosphere or characteristics, the kinds of things that are rewarded, encouraged, emphasized, the style of life which is valued in the community and is most visibly

expressed and felt" (p. 73). Within this theory, need and press interact to produce and guide behavior. In a school, an individual student or teacher has particular needs and the school's press either satisfies or frustrates these needs. Stern (1970) extended need-press theory to develop a theory in which the degree of person-environment congruence is related to student outcomes (Fraser, 1986). This theory has been the basis for person-environment fit studies in which the congruence between actual and preferred environments is assessed and related to student outcomes (see Fraser, 1994).

The concepts of alpha press and beta press are important methodological terms in learning environment research. Murray (1938, p. 122) used these terms to distinguish between "the press that actually exists as far as scientific discovery can determine it" (alpha press), and "the subject's own interpretation of the phenomena that is perceived" (beta press). In operational terms, alpha press is assessed by a detached observer who codes specific events according to some scheme and beta press is assessed by the milieu inhabitants. Alpha press is consistent with behaviorism and was very fashionable in classroom research during the 1960s and early 1970s. Because it involves direct observation, alpha press is considered highly objective. By contrast, beta press represents the environment as perceived and experienced by the individual and, in a classroom setting, is dependent on the subjective assessment of students and teachers. According to Murray, beta press exerts the greater influence on behavior because that is what is felt, interpreted and responded to by the person (Hjelle & Ziegler, 1981).

The distinction between low-inference and high-inference measures for assessing learning environments has been recognized in recent learning environment literature (see Fraser, 1994). Rosenshine (1970) defined a low-inference measure as a rating system that classifies specific, denotable, relatively objective classroom behavior and is recorded as frequency counts. High inference measures require the respondent to make an inference based on a series of classroom events using specific constructs (e.g. classroom competition). Studies which focus on the meaning of school and classroom events have tended to utilize high-inference measures. Since the work of Walberg and Moos in the 1960s, almost all classroom environment research has employed high inference measures of beta press (i.e. Students and teachers have been asked to make summary judgments about the classroom based on long term exposure to the environment in that classroom.) While some teachers may not be comfortable with asking students about the environment in classrooms, this approach to data collection has become an essential methodological principle of this research domain.

Research conducted during the past 30 years has shown that the quality of the classroom environment in schools is a significant determinant of student learning (Fraser, 1994, 1998a). That is, students learn better when they perceive the classroom environment positively. Numerous research studies

have shown that student perceptions of the classroom environment account for appreciable amounts of variance in learning outcomes, often beyond that attributable to background student characteristics. For example, Goh and Fraser (1998) use the Questionnaire on Teacher Interaction (QTI: Wubbels & Levy, 1993) to establish associations between student outcomes and perceived patterns of teacher-student interaction in primary school mathematics classes in Singapore. In another outcomes study, Newby and Fisher (2000) found statistically significant associations between environment in university computer rooms and students' differences. Other studies have used classroom environment scales as dependent variables in investigating variations in environment across different settings. Studies reviewed by Fraser (1998b) have shown that classroom environment varies according to school type (i.e., coeducational, boys' and girls'), grade level and subject area.

Some areas of contemporary classroom environment research include assessing special education classrooms in England (Adams, 2000), studying computer classroom environments in Indonesian universities (Soerjaningsih, Fraser, & Aldridge, 2001) and investigating associations between classroom environment and student academic efficacy in Australian schools. (Dorman, 2001).

The learning environment field has developed rapidly with a suite of validated instruments and research in at least twelve domains (e.g. evaluation of educational innovations, comparison of student and teacher perceptions of classroom environments, and using environment instruments to facilitate changes in classroom life (Fraser, 1998b). Typically, empirical studies have employed these instruments or contextually modified derivatives to assess the particular environment under investigation. For example, the Catholic School Classroom Environment Questionnaire was developed specifically to assess the environment in Australian Catholic school classrooms (Dorman, 1999). Classroom environment researchers have also focused on the particular characteristics of constructivist classroom environments. In a constructivist environment, meaningful learning is a cognitive process in which students make sense of the world in relation to the knowledge which they have constructed. The Constructivist Learning Environment Survey (CLES: Taylor, Fraser & Fisher, 1997) was developed to assist researchers to assess the constructivist dimensions of classrooms. While student achievement and student attitudes have been prominent outcome variables in these studies, no studies to date have focused on self-handicapping as an outcome of classroom environment. The present study builds upon and extends the learning environment field of research by incorporating in the one study the latest learning environment instrumentation and recent developments in the study of self-handicapping.

Self-handicapping

For a number of years, social researchers have investigated the handicapping strategies employed by people to explain their behaviors in different circumstances. Self-handicapping is defined by Berglas and Jones (1978, p. 401) as "any action or choice of performance setting that enhances the opportunity to externalize (or excuse) failure and to internalize (or reasonably accept credit for) success." More recently, researchers have become interested in the study of academic self-handicapping by school students. (Covington, 1992; Jagacinski, & Nicholls, 1990; Kolditz, & Arkin, 1982; Pyszczynski & Greenberg, 1983; Riggs, 1992; Urdan, Midgley, & Anderman, 1998). Importantly, self-handicapping strategies precede performance and influence performance. Examples of such self-handicapping strategies include putting off study until the last moment, fooling around the night before an examination and deliberately not trying in school.

Covington's (1992) self-worth theory is particularly important to an understanding of self-handicapping by high school students. Covington contends that students struggle to escape being labeled as stupid. As contrived personal weaknesses can be used to justify poor performance, self-handicappers usually engage in behavior that impedes performance. It is important to note the difference between attributions and self-handicapping. While attributions follow success or failure, self-handicapping is an a priori strategy that precedes performance. Avoidant behaviors like fooling around the night before an examination contrast with approach behaviors such as effort, persistence, and engagement which have been the focus of much psychological research.

To further understand the notion of self-handicapping, theorists have distinguished between behavioral self-handicapping and self-reported self-handicapping (Arkin & Baumgardner, 1985; Hirt, Deppe, & Gordon, 1991). Behavioral self-handicapping occurs when individuals actively construct impediments that are likely to lower their chances of success (Hirt, McCrea, & Kimble, 2000). Students might deliberately not prepare for an examination so that failure can be explained in terms of a lack of study rather than a lack of ability. Positive self-evaluation and the approval of others in a competitive environment can be maintained if an "escape mechanism" has been constructed before the impending failure. If, by chance, the student is successful, this success would be rationalized by reference to internal characteristics that are enhanced during self-evaluation: I am smart. I did well without having to work.

Self-reported self-handicapping refers to external circumstances that could be used to explain poor performance. For example, students might claim that they are forced to work long hours in their parent's business and that

this time commitment prevented study. Again, student failure is externalized. It is not the student's fault that examination results were poor.

Studies have shown that people who are both high and low in self-esteem use handicapping strategies but for different reasons (Midgley, Arunkumar, & Urdan, 1996; Tice, 1991). High self-esteem individuals use handicapping strategies to enhance their image by appearing to succeed despite minimal preparation. Low self-esteem individuals use handicapping to protect their image when there is a likelihood of poor performance. Recent research in the United States has found that lower achievers and students who have low self-perceptions of academic competence are more likely to engage in self-handicapping. According to Urdan, Midgley and Anderman, self-perceptions of competence may be a positive, significant predictor of self-handicapping even when performance outcomes are controlled. Compared to females, males are more likely to engage in self-handicapping (Midgley & Urdan, 1995). More specifically, recent research by Hirt, McCrea and Kimble (2000) confirmed that these sex differences applied to behavioral self-handicapping only. In fact, their study concluded that women do not engage in behavioral self-handicapping.

Kimble, Kimble and Croy (2000) investigated the development of self-handicapping tendencies. They found that, whereas high-esteem third grade students acted adaptively by practising for an evaluation, sixth grade students prepared more only if they were reminded of their personal resources. This study confirmed the view that, as students get older, they become more self-conscious and more prone to self-handicap. Students who receive self-affirming experiences were less motivated to self-handicap.

THE PRESENT RESEARCH

Aims

The study had three aims:

- to validate scales that assess classroom environment and self-handicapping of high school students in Australia and Canada,
- to examine the relationships between students' perceptions of mathematics classroom environment and their use of self-handicapping, and whether these relationships are similar according to country and gender of student, and
- to establish whether scales of the What Is Happening In This Classroom and the Constructivist Learning Environment Survey account for unique variance in self-handicapping.

Distinctiveness of the present research

The research reported in this article was distinctive for four reasons. First, research on academic self-handicapping is a relatively new field with no substantive research area in Australian or Canadian high schools. Accordingly, the validation of a scale to assess self-handicapping in Australian and Canadian high schools is important to the development of this field. Second, no studies have attempted to bring together the latest developments in the fields of self-handicapping research and psychosocial classroom environment research in high schools. Given that classroom environment has been shown to be a potent predictor of student cognitive and affective outcomes, the bringing together of these two fields is an important research direction. It could be hypothesized that classroom environment mediates the tendency of students to engage in academic self-handicapping activities. Indeed, self-handicapping research involving college students found that classroom context variables were stronger predictors of students' self-handicapping than were demographic variables (Garcia, Lissi, Matula, & Harms, 1996). Third, because self-handicapping is a clear sign of purposeful disengagement from school related activities, the academic performance of students who self-handicap is likely to suffer. Accordingly, the present study focuses on an area of significant interest and concern for educators. Fourth, few classroom environment studies have involved mathematics classrooms and no previous studies have investigated the relationship between mathematics classroom environment and self-handicapping.

Sample

The sample employed in this study consisted of 2,006 students drawn from 9 Australian and 4 Canadian high schools. Australian students from Grades 8, 10 and 12 and Canadian students from Grades 9 and 10 participated in the study. Table 1 describes the sample.

TABLE 1. Description of identifiable sample by country, gender and grade (N = 2,006 students)

Grade Level	Sample Size					
	Australia		Canada		Total	
	Male	Female	Male	Female	Male	Female
Grade 8	191	172	-	-	191	172
Grade 9	-	-	266	286	266	286
Grade 10	172	230	224	175	396	405
Grade 12	134	156	-	-	134	156
Total	497	558	490	461	987	1,019

Assessment of classroom environment

An important principle of the present study was to provide a comprehensive, parsimonious assessment of contemporary classroom environment. Significant recent work that attempts to bring parsimony to the field of learning environments by combining the most salient scales from existing questionnaires has produced an instrument called the What is Happening in this Class questionnaire (WIHIC; Aldridge & Fraser, 2000). While the WIHIC is comprehensive, it is designed to assess conventional rather than constructivist classroom environments. Constructivist environments emphasise students' prior knowledge in their development of new understandings and reflection on interpersonal negotiation of meaning within a consensual domain of the classroom community (Taylor, Fraser & Fisher, 1997). The Constructivist Learning Environment Survey (CLES; Taylor, Fraser, & Fisher) is designed to assess constructivist dimensions of classroom environment.

In the present study, seven scales from the WIHIC and three scales from the CLES provided a comprehensive assessment of classroom environment. From the original 56-item WIHIC, 42 items from its seven a priori scales were selected. From the CLES, 18 items from three scales were selected. Table 2 shows each of these six-item scales and their common sense descriptions. Each item used a 5-point response format (viz. Almost Never, Seldom, Sometimes, Often, Almost Always). One significant theoretical perspective that has become firmly established in learning environment research is that instruments should possess scales that assess Moos's (1974) three general categories for conceptualizing human environments: *Relationship* (the nature and intensity of personal relationships within the environment), *Personal Development* (basic directions along which personal growth and self-enhancement tend to occur) and *System Maintenance and System Change* (the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change). Table 2 shows the classification of each scale according to this taxonomy.

Assessment of self-handicapping

To assess self-handicapping, a modified version of a 6-item scale developed by Urda, Midgley and Anderman (1998) was developed for the study. Each of the six items in the self-handicapping scale asks about an a priori strategy that students use to rationalize low performance. In the modified version, the six items were reworded to ensure that students focused on their mathematics class. The response format for all items was a 9-point scale with anchors of 0 (not at all true) and 8 (very true). A typical self-handicapping item was: Some students put off doing their mathematics homework until the last moment so if they don't do well on their work, they can say that is the reason. How true is this of you? As the focus of all items was the active

construction of impediments to academic work, this scale measured behavioral academic self-handicapping.

TABLE 2. Descriptive information for 10 classroom environment scales

Scale Name	Scale Description	Sample Item	Moos's Schema
Student Cohesiveness	The extent to which students know, help and are supportive of one another.	I know other students in this class.	R
Teacher Support	The extent to which the teacher helps, befriends, trusts and is interested in students.	The teacher takes a personal interest in me.	R
Involvement	The extent to which students have attentive interest, participate in discussions, do additional work and enjoy the class.	I explain my ideas to other students.	R
Investigation	The extent to which skills and processes of inquiry and their use in problem solving and investigation are emphasised.	I carry out investigations to test my ideas.	P
Task Orientation	The extent to which it is important to complete activities planned and to stay on the subject matter.	I pay attention in this class.	P
Cooperation	The extent to which students cooperate rather than compete with one another on learning tasks.	I work with other students in this class.	P
Equity	The extent to which students are treated equally by the teacher.	I am treated the same as other students in this class.	S
Personal Relevance	The extent to which school mathematics connects with students' out-of-school experiences.	I learn how mathematics can be part of my out-of school life.	R
Shared Control	The extent to which students are invited to share with the teacher control of the learning environment.	I help the teacher to decide which activities are best for me.	P
Student Negotiation	The extent to which opportunities exist for students to explain and justify to other students their newly developing ideas.	I talk to other students about how to solve problems.	S

NOTE: R: Relationship; P: Personal Development; S: System Maintenance and System Change

Methods of analysis

In the present study, associations between classroom environment and self-handicapping were investigated using simple and multiple correlation analyses. These analyses were conducted separately for each country and gender. Correlational analyses for the total sample were also performed. To establish whether the relationship between classroom environment and self-handicapping differed according to country and gender, *Z* tests for differences between two correlation coefficients were conducted (see Kanji, 1993). For example, to test for gender differences in the relationship between student cohesiveness and self-handicapping, the correlation between student cohesiveness and self-handicapping for males was compared with the correlation

between student cohesiveness and self-handicapping for females. Because ten separate analyses were conducted for both country and gender, the Bonferroni Inequality was employed to control for Type 1 error (Stevens, 1992). Accordingly, the planned Type 1 error for each analysis was reduced from $p = .05$ to $p = .005$.

To examine the amount of variance in self-handicapping explained by the WIHIC and CLES scales used in the present study, a commonality analysis of unique and common variance was conducted (Cooley & Lohnes, 1976; Goh & Fraser, 1998). In this context, the uniqueness is the variance in self-handicapping attributable to either the WIHIC or the CLES scales beyond that attributable to the other instrument. Commonality is the confounded contribution shared by both the WIHIC and CLES scales in predicting self-handicapping.

VALIDATION OF INSTRUMENTS

Scale internal consistency

Estimates of the internal consistency of the 10 classroom environment scales were calculated using Cronbach's Coefficient alpha. As shown in Table 3, these values ranged from .76 for personal relevance to .90 for shared control. These results indicate that all 10 scales have very sound internal consistency. For the six-item self-handicapping scale, the Coefficient alpha was .84, indicating good internal consistency. This result compares favorably with coefficients for the original self-handicapping scale reported by Midgley et al (1997) and Urdan, Midgley and Anderman (1998).

Discriminant validity

An important characteristic of classroom environment instruments is that the scales have sound discriminant validity. That is, the scales assess mutually exclusive dimensions of the classroom environment. Table 3 reports data about the discriminant validity of the ten classroom environment scales using the mean correlation of a scale with the remaining nine scales as an index. These data indicate that the scales do overlap but not to the extent that would violate the psychometric structure of the instrument. Additionally, the data compare favorably with discriminant validity data of other well-established classroom environment instruments (see Fraser, 1998b).

TABLE 3. Validation data and scale statistics for classroom environment and academic self-handicapping scales ($N = 2,006$ students)

Scale	Coefficient Alpha	Mean Correlation	Scale Mean	Standard Deviation
Student Cohesiveness	.83	.38	25.34	4.08
Teacher Support	.86	.46	20.19	5.19
Involvement	.82	.47	19.27	4.84
Investigation	.87	.43	17.29	5.14
Task Orientation	.83	.33	23.84	4.57
Cooperation	.78	.43	21.80	4.63
Equity	.85	.40	23.22	5.09
Personal Relevance	.76	.43	18.76	5.07
Shared Control	.90	.33	13.88	5.59
Student Negotiation	.82	.44	19.47	5.11
Self-handicapping	.84	-	13.58	10.30

RESULTS

The first set of analyses involved simple correlations between each classroom environment scale and the self-handicapping scale for country and gender sub-samples and the total sample. Results shown in Table 4 reveal that 40 of the 50 simple correlations were significant ($p < .05$) which is 16 times that expected by chance alone. Correlations were generally weak but it is noteworthy that all statistically significant correlations were negative. Higher scores on these classroom environment scales were associated with reduced levels of self-handicapping. Each of the results in Table 4 can be interpreted in its own right. For example, higher levels of Task Orientation in the mathematics classroom were associated with lower levels of self-handicapping, irrespective of whether country sub-samples, gender sub-samples or the total sample were analyzed.

The pattern of significant correlations shown in Table 4 suggests that the relationship between classroom environment and self-handicapping is invariant across country and gender. To test this result, a series of Z tests for differences between two correlation coefficients described earlier in this paper was conducted for each pair of country and gender correlations. For the 10 pairs of correlations for country, significant differences between two pairs of correlations were found. The correlation between student cohesiveness and self-handicapping for Australian students ($r = -.21$) was significantly different to the corresponding correlation for Canadian students (r

TABLE 4. Simple and multiple correlations for ten classroom environment scales and self-handicapping ($N = 2,006$ students)

Classroom Environment Scale	Self-Handicapping									
	Simple Correlation					Multiple Correlation (β weights)				
	Australia	Canada	Male	Female	Full Sample	Australia ($R = .36$)	Canada ($R = .40$)	Male ($R = .38$)	Female ($R = .42$)	Full Sample ($R = .39$)
Student Cohesiveness	-.21***	-.07*	-.14***	-.13***	-.15***	-.02	.04	.02	-.01	.02
Teacher Support	-.20***	-.12***	-.13***	-.16***	-.15***	-.01	-.01	-.09	.05	-.01
Involvement	-.17***	-.14***	-.14***	-.18***	-.15***	.01	-.04	-.01	-.06	-.01
Investigation	-.19***	-.17***	-.16***	-.19***	-.17***	-.12*	-.01	-.04	-.08	-.07*
Task Orientation	-.37***	-.38***	-.32***	-.40***	-.36***	-.30***	-.42***	-.34***	-.34***	-.35***
Cooperation	-.20***	-.12***	-.14***	-.14***	-.16***	.03	.01	.01	.05	.01
Equity	-.26***	-.18***	-.17***	-.25***	-.22***	-.12*	-.01	.01	-.11*	-.07*
Personal Relevance	.01	.02	.02	.02	.01	.17***	.09*	.12**	.14***	.13***
Shared Control	.04	.03	.07	.02	.04	.14**	.04	.16***	.08	.10***
Student Negotiation	-.19***	-.06*	-.10***	-.15***	-.13***	-.08	.04	-.06	-.05	-.04

* $p < .05$ ** $p < .01$ *** $p < .001$

= $-.07$) ($p < .05$). A similar result held true for student negotiation with $r = -.19$ for Australian students compared to $r = -.06$ for Canadian students ($p < .05$). For gender, there were no significant differences between any pairs of simple correlations shown in Table 4. That is, according to these data, the relationship between classroom environment and self-handicapping was not different for males compared to females.

The second set of analyses consisted of multiple correlation analyses involving the set of 10 classroom environment scales as predictors of self-handicapping for the country and gender sub-samples and the total sample. Table 4 shows that the multiple correlation coefficients (R) ranges from $.36$ for the data collected from Australian students to $.42$ for female students. The square of the multiple correlation coefficient is equal to the proportion of variance in self-handicapping uniquely attributable to the ten classroom environment scales. For the present analyses, this statistic was approximately 16%. The closeness of these multiple correlation coefficients indicates very little difference in the overall relationship between classroom environment and self-handicapping according to country and gender. The beta weights (standardized regression coefficients) can be used to interpret which individual classroom environment scales made the largest contribution to explained variance in self-handicapping. From Table 4, it is clear that Task Orientation was the strongest predictor in absolute terms. In total, 18 of the 50 beta weights were statistically significant ($p < .05$).

The third set of analyses used commonality analysis as described earlier in this paper. The square of the multiple correlation (R^2) was used to examine what proportion of variance in self-handicapping was attributable to either the WIHIC scales or the CLES scales beyond that attributable to the other instrument. The commonality was that portion of the variance that was shared by both instruments. Results showed that the three CLES scales accounted for a relatively small amount of unique variance (3%) when compared with that explained by the seven WIHIC scales (13%). None of these proportions could be considered large. The commonality for this analysis was very small (1%), suggesting that the modest proportion of variance in self-handicapping explained by each instrument is unique. There was little overlap between the seven WIHIC and the three CLES scales.

DISCUSSION

As no previous research on the relationship between classroom environment and self-handicapping has been conducted, it is not possible to discuss the results of this study in the light of previous research. Nevertheless, the results of this study suggest several important points for researchers and teachers.

Implications for researchers

There are at least five implications of this study for researchers. First, it has established the validity of the ten classroom environment scales in two Western countries. Moreover, the study substantiates cross-national validation data on the WIHIC collected in Australia and Taiwan (Aldridge & Fraser, 2000). The WIHIC appears to have applicability in a wide range of school settings. Learning environment researchers should consider using the WIHIC in future studies.

Second, this research has provided further support for the self-handicapping scale of the Patterns of Adaptive Learning Survey (PALS: Midgley et al, 1997). While PALS scale items were modified to elicit responses for mathematics classes, they were very similar to the original items. With regard to their internal reliability, researchers can use this scale with a high degree of confidence.

Third, the results for the three Constructivist Learning Environment Survey scales are inconsistent. Whereas, student negotiation has a significant negative relationship with self-handicapping, personal relevance and shared control were positively but not significantly related to self-handicapping. While the result for student negotiation is plausible, the results for personal relevance and shared control are not easily explained and, given the small correlations, they do not warrant further consideration.

Fourth, the commonality analyses show that the WIHIC and CLES assess different dimensions of the mathematics classroom environment. However, because the uniqueness of the CLES scales was very small (2% and 3%), there is little to be gained by including these CLES scales in any similar study.

Fifth, replication studies are needed to confirm the weak associations between classroom environment and self-handicapping found in the present study. No causation can be inferred from this correlational research and further research on this issue could increase confidence in the generalisability of the present findings.

Implications for teachers

The most salient result of this study for teachers is that a negative relationship exists between the seven What is Happening in this Class scales and self-handicapping. These seven scales attempt to reflect conventional classrooms. Clearly, more positive conventional classroom environments are associated with reduced levels of self-handicapping. While it has become very trendy in educational circles to emphasize constructivism as the panacea for many curriculum-related issues in schools, the results of this study indicate that the attributes of the conventional classroom seem to be more

effective in reducing self-handicapping than constructivist environments. Emancipatory approaches to classrooms in which student inputs are emphasized are more likely to increase the frequency of self-handicapping strategies.

Task orientation was the most potent (albeit negative) predictor of self-handicapping. This finding suggests that classroom teachers should emphasize the completion of tasks and not be sidetracked by irrelevant content or distracting student behaviors. Adolescent youth require teacher involvement if they are to reduce their self-handicapping. Appropriate interventions by teachers are needed if student propensity to self-handicap is to be reduced. Such a view is consistent with that advanced by Kimble, Kimble and Croy (2000). In that study, upper primary students needed self-affirming experiences to reduce self-handicapping. For adolescent youth, teachers and administrators have significant roles in conveying to students that "it is not cool to be a fool". That is, leadership in the classroom and school is important.

The finding that the relationship between classroom environment and self-handicapping for males did not differ from that for females is particularly noteworthy. This result does not imply that males and female self-handicap to the same extent. It is not necessarily inconsistent with that of Hirt, McCrea and Kimble (2000) who asserted that men behaviorally self-handicap and women do not behaviorally self-handicap. Furthermore, that study was conducted with university students and assessed self-handicapping in a quite different way to the present study which focused on academic self-handicapping of high school students. The results of this study simply suggest that gender does not play a crucial role in the relationship between classroom environment and academic self-handicapping.

CONCLUSION

The study reported in this paper extends prior classroom environment research in that it was the first study to investigate the relationship between classroom environment and self-handicapping. The cross-national sample employed in the study added support to the generalisability of findings. A by-product of this research has been the validation of 10 classroom environment scales in Australia and Canada. Additionally, the self-handicapping scale developed by Midgley et al (1997) has been cross-validated. As causation cannot be implied from these correlational results, one cannot assume that classroom environment caused the reported levels of self-handicapping. A desirable but difficult direction of further research would be to conduct controlled intervention studies in which environment is deliberately manipulated and consequent levels of self-handicapping recorded.

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