

Student background and course involvement among first-year college students in introduction to psychology: implications for course design and student achievement

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Research suggests that measures of student background (aptitude tests, prior grades and prior coursework) and course involvement (attendance and participation) predict course achievement. However, the relative contribution of these variables remains unclear. This study utilised path analysis to examine the relative roles of student background and course involvement in predicting exam performance in an introduction to psychology course. Also, course involvement was tested as a potential mediator between student background and performance. Instructor records and student (N = 108) self-report data were used. Only background variables significantly predicted exam performance. Additionally, course involvement did not mediate the relations between background variables and performance. The findings suggest that prior preparation significantly influences understanding of psychology in introductory psychology courses and that course design may influence the importance of course involvement in predicting student achievement in such courses.

BACKGROUND

Research suggests that student background is associated with academic achievement. In particular, achievement test scores (such as ACT or SAT scores; Beecher and Fischer, 1999), prior grades (or GPA; Beecher and Fischer, 1999) and prior knowledge (Thompson and Zamboanga, 2003) are associated positively with performance in college courses⁴. Additionally, some researchers have found course involvement to be positively related to academic performance. For example, more frequent class attendance has been linked to greater course achievement (Van Blerkom, 1992). However, the relative contribution of student background and course involvement to predicting achievement has not been adequately examined (Hill, 1990). Therefore, one goal of this study was to investigate the comparative roles of student background and course involvement in predicting exam performance in an undergraduate course. It was expected that both student background and course involvement would positively predict exam performance. However, given that student background reflects more enduring contributions to student achievement than immediate course involvement, it was anticipated that the association would be stronger for student background. Additionally, it is possible that student background is indirectly associated with exam performance via course involvement. For example, college GPA is correlated positively with attendance

and attendance is positively related to exam performance (Trice, Holland and Gagné, 2000). Thus, part of the influence of prior grades on exam performance may operate through course involvement. Hence, a second goal was to examine the potential mediational role of course involvement between student background and exam performance.

METHOD

Sample

Participants were 108 second-semester first-year college students enrolled in an Introduction to Psychology course at Midwestern University in the United States (32% male; M age = 18.0). The course consisted of twice-weekly lecture sessions and once-weekly recitation (smaller group) sessions. Although not all the students in the course were first-year, the sample was restricted to first-year students to allow for a clearer analysis of the influence of student background (e.g. achievement test scores, recent college performance, prior relevant courses) on exam performance. Total enrolment in the course was 200, while the total number of first-year students was 146 (the focus of this study). Of these first-year students, the final sample consisted of 108 with complete data. With the exception of recitation performance, where those with missing data ($M = .83$) had significantly lower recitation performance ($M = .89$, $\eta^2 = .04$), there were no significant differences on the study variables.

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⁴ The ACT (American College Test) is a common aptitude test used by institutions of higher education in the United States to assist in admissions decisions. It was designed to assess an individual's preparation for higher education. The SAT (Scholastic Admissions Test) is a common aptitude test used by institutions of higher education in the US to assist in admissions decisions. It was designed to predict an individual's performance in their first year of higher education. GPA stands for grade point average and is a standard academic evaluation method used in the US that is based on a four-point scale.

No information was collected regarding student ethnicity. However, most students were state residents and thus reflected the state's predominantly white european-american middle-income population.

To provide a context for understanding the analyses, results and implications of this study, information regarding the course in which the students in this sample were enrolled will be provided. The goal of the Introduction to Psychology course was to help students become familiar with the major concepts, theories and perspectives that characterise the field of psychology. Lectures were based on presentation software and audiovisuals provided by the textbook publisher. Thus, the majority of the material presented during lecture closely followed the information in the textbook. Similarly, the large majority (86%) of the exam items were derived from the textbook publisher's test-bank, with the remaining questions drawn from guest speakers and audiovisual materials. In essence, lectures and course exams both corresponded closely with the information in the textbook, which is typical of many introductory psychology courses. Given the large enrolment in this psychology class, students spent two hours per week in lecture and one hour per week separated into smaller group sessions (approximately 30 students each) called recitations. Recitations met once a week and were designed to aid students' understanding of psychological concepts covered in the course and to supplement their knowledge about the field of psychology in general. The smaller-group setting gave students the opportunity to discuss challenging and interesting topics in greater depth, ask questions and conduct small experiments. Our measure of recitation performance consisted of attendance and homework.

Measures

Instructor records (i.e. records of recitation attendance, homework scores and exam scores) were used for this study. In addition, prior to taking the final (i.e. fourth) exam, students completed a brief paper-and-pencil questionnaire that assessed student background, course involvement and other course-specific information of interest to the instructor.

Student background

Student background measures included ACT scores, first-semester college GPA and number of prior psychology courses taken (including any courses taken during secondary education – high school in the US).

Lecture involvement

Lecture involvement scores were created by averaging lecture attendance and note-taking, two self-report items taken from the end-of-semester questionnaire. Lecture attendance was determined using a four-point scale ranging from 1 (*did not attend*) to 4 (*always attended*). Note-taking was assessed using a four-point scale ranging from 1 (*does not describe me at all*) to 4 (*describes me extremely well*) in response to the statement "During the lecture, I took notes on all major points made by the instructor."

Recitation involvement

Recitation involvement scores were created by totalling for each student the number of recitation classes attended and the homework scores (both taken from instructor records), standardising totals within recitation group and then combining the two totals. Homework consisted of a variety of weekly assignments designed to better prepare students for class discussions and activities.

Exam performance

The exam performance measure consisted of an average of students' scores on four 50-point (non-cumulative) multiple-choice exams.

Perception of exams

Student perception of the type of preparation needed to succeed on the exams was assessed using a four-point scale ranging from 1 (*does not describe me at all*) to 4 (*describes me extremely well*) in response to the statement "I can do well on exams simply by reading the book and obtaining class lecture notes from the instructor".

Analysis plan

First, preliminary analyses were conducted to assess gender differences and bivariate correlations among study variables. Second, descriptive data for the item assessing students' perception of the exams were obtained to determine the percentage of students who felt they could succeed on the exams without attending lectures. Third, structural equation modelling was used to analyse the proposed path model. The statistical assumptions were met adequately for the analyses to be conducted. LISREL 8.51, a structural equation modelling statistical software package, was used to conduct the analyses. Structural equation modelling enables researchers to simultaneously examine direct and indirect influences of predictors on one or more outcome variables and yields statistical estimates of the adequacy of the model's fit to the observed data. The path model included direct effects of student background (ACT, prior GPA, number of prior psychology courses) and course involvement (lecture involvement and recitation involvement) on exam performance, as well as the indirect effects of student background on exam performance via course involvement. Conducting this analysis using a model-fitting program, such as LISREL, permitted simultaneous estimation of all the model paths and yielded estimations of the fit of the model to the data.

RESULTS

Preliminary analyses were conducted to assess gender differences and bivariate correlations among study variables (see Table 1). With the exception of first-semester college grades, where females ($M = 3.16$) reported significantly higher GPA, $t(106) = 2.35, p < .05$, than males ($M = 2.84$), there were no significant gender differences. However, significant bivariate correlations emerged, whereby first-semester college GPA was associated positively with recitation involvement and ACT score. Additionally, ACT score and first-semester college GPA were associated positively with exam performance,

while recitation involvement had a moderate positive association with exam performance. These associations were consistent with expectations.

Frequency data were obtained regarding students' perceptions of exams. Forty percent ($n = 43$) of the students responded "Describes me well" to the

statement "I can do well on exams simply by reading the book and obtaining class lecture notes from the instructor.", while 35% ($n = 38$) responded "Describes me very well." In short, the majority (75%, $n = 81$) of the students felt they could succeed on the exams by simply reading the textbook and obtaining lecture notes, without actually attending lectures.

Table 1: Descriptives and correlations

Variable	1	2	3	4	5	M	SD	Range
1. ACT						24.06	3.55	0-36
2. Prior GPA	.43**					3.06	0.67	0-4
3. Prior psychology courses	-.09	.02				0.60	0.58	0-2
4. Recitation involvement ($\alpha = .88$)	.01	.30**	-.08			0.89	0.12	0-1
5. Lecture involvement ($\alpha = .67$)	-.05	.14	.04	.16		2.47	0.85	1-4
6. Exam performance ($\alpha = .80$)	.44**	.59**	.14	.19+	.02	0.77	0.08	0-1

Note: $N = 108$

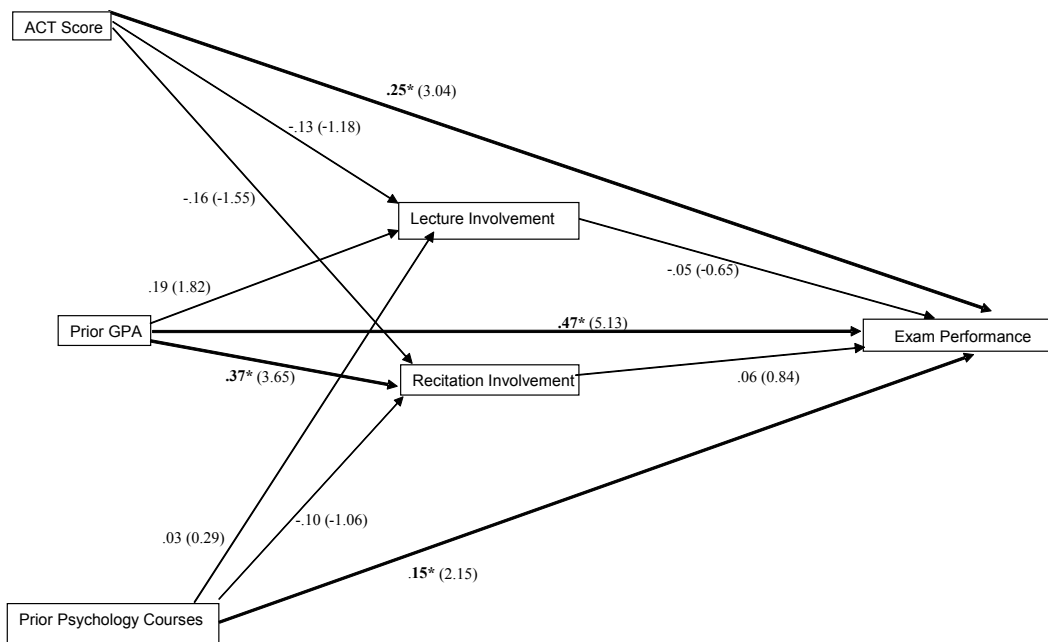
+ $p < .10$; * $p < .05$; ** $p < .01$

The path model was estimated using the maximum likelihood estimation technique, which is the estimation method recommended in most situations (Chou and Bentler, 1995). Model fit (i.e. correspondence between the model and the data) was assessed using the chi-square statistic (χ^2), the Incremental Fit Index (IFI), the Comparative Fit Index (CFI) and Standardised Root Mean Residual (SRMR). The following criteria have been recommended for satisfactory goodness-of-fit: a non-significant χ^2 , $IFI \geq .95$, $CFI \geq .95$, and $SRMR \leq .05$ (Hu

and Bentler, 1999). Our model did not yield a significant χ^2 value, $\chi^2(1, 108) = 1.42$; $p = ns$, which suggested a good fit. Similarly, values on the goodness-of-fit indices were in appropriate range ($IFI = 1.00$, $CFI = 1.00$, $SRMR = .02$).

Path analysis revealed significant direct relations between student background variables and exam performance (see Figure 1). Specifically, ACT score, first-semester college GPA and number of prior

Figure 1: Path analysis of student background and course involvement predicting exam performance



Note: $N = 108$; $R^2 = .42$; * $p < .05$

First numbers are standardised path coefficients (beta weights); numbers in parentheses are t -values.

psychology courses were associated positively with exam performance (total $R^2 = .41$). However, none of the course involvement variables were significantly related to exam performance (total $R^2 = .01$). Thus, student background, but not course involvement, predicted exam performance.

Prior college GPA was associated significantly with recitation involvement but not with lecture involvement. However, given that recitation involvement was unrelated to exam performance in the model, it did not mediate relations between college GPA and exam performance. Additionally, there were no significant indirect effects of ACT ($\beta = .001$; $t = -.24$), prior GPA ($\beta = .02$; $t = .45$), or prior psychology courses ($\beta = -.01$; $t = -.71$) on exam performance. In short, no mediational effects of course involvement on the association between student background and exam performance emerged.

DISCUSSION

Consistent with prior research, student background variables associated with prior knowledge (achievement test scores, prior grades and prior coursework) were strongly predictive of exam performance (Beecher and Fischer, 1999; Thompson and Zamboanga, 2003). This suggests that general ability and prior knowledge of psychology are each important predictors of student achievement in introductory psychology. In a sense, significant determinants of student course success occur prior to the first day of class. However, contrary to what was expected, course involvement did not significantly predict exam performance nor did it mediate the relation between student background and exam performance. Additionally, of the student background measures, only prior GPA was associated with course involvement. Hence, regardless of students' level of course involvement, prior knowledge and ability were directly associated with exam performance.

Does student involvement make little difference for success in the course? Given apparent inconsistencies in the link between course involvement and student achievement (compare the present study to Hill, 1990), it is possible that the role of course involvement and its relevance to exam performance is largely dependent on course design. For example, highly text-based classes, in which in-class activities substantially overlap with information presented in the text, may be more conducive to course achievement for students who possess high levels of scholastic ability, possibly due to their heightened reading comprehension abilities. Accordingly, test-items derived specifically from the textbook may be more reflective of reading comprehension ability than of course involvement and students can succeed even if they do not often attend class. Consistent with this conclusion, the majority of students (75%) in the present study reported that they could have done well on the course exams simply by reading the textbook and obtaining lecture notes, without attending lectures. This would not likely be true in a course where lectures include a larger proportion of new material that does not overlap with information

in the text. Hence in a less text-based course, a different pattern of relations between student background, course involvement and exam performance may appear, and course involvement might be a more important predictor of academic success.

The course in the present study had high enrolment. In larger courses like this, it may be harder for students to actively participate in lectures (rather than just attend and take notes), hence the use of smaller-group recitations. However, it is possible that a measure of lecture involvement that assessed more active participation strategies, such as asking questions, could have yielded significant relations with exam performance. A measure of active participation in the recitation sections, given their smaller group setting, could have also revealed an effect of participation on exam performance. In short, further research with more precise measures is needed, such as measures that might be derived from systematic attendance checks in lecture, careful analysis of lecture note-taking and perhaps also indices of active lecture participation reflected in comments and questions during class.

Teaching and research implications

This study involved an Introduction to Psychology course where a large amount of the course material centred around the course textbook. Although it is likely that many introductory psychology courses internationally closely resemble the design of the course in the present study, there are many institutions of higher education in North America, Europe and elsewhere where text-based courses are not the norm. Thus, although the recommendations might be helpful to all instructors, the implications of the results are more specific to instructors in institutions where large-enrolment, text-based courses are more prevalent.

In designing courses, instructors are encouraged to carefully consider the purpose and independent utility of lecture, readings and student assessment as they relate to student learning and course achievement. Specifically, instructors should be thoughtful in determining how much in-class activities overlap with the information in the text. If instructors value rewarding course involvement and in-class effort, they should seek ways to integrate this into their course design. One way to do this, as implicated by these findings, is to increase the utilisation of in-class material and exam items that do not overlap text material. Doing so will increase the extent to which in-class effort is rewarded and possibly enable less academically prepared students (i.e. those with lower prior grades, achievement test scores and less prior relevant course background) to succeed.

Although this discussion has focused on weaknesses of text-based courses, in some situations, they are appropriate. For example, if a large number of the students in a course are non-traditional (e.g. who have extensive familial and work obligations) and expect to miss class on a regular basis, a text-based course may be appropriate. Given that these students would

likely miss several lectures, they may be better able to succeed in a course where the material they are responsible for learning comes primarily from the text, which they can study independently. Thus, in addition to the implications outlined above, instructors are also encouraged to consider student demographics when designing their courses so they can tailor each course to maximise student learning and achievement

Research comparing the role of student background and course involvement across a variety of course designs is needed. This can best be accomplished using an experimental design whereby course design is manipulated to test the effects of variations in course design on student learning and achievement. However, much of the available data on these issues is non-experimental. In an article discussing the use of structural equation modelling in school psychology, Keith (1999) described path analysis (a form of structural equation modelling) as "one of the most valuable methods for the analysis of non-experimental data", and mentioned that it is also "a powerful method of analysis for experimental, quasi-experimental and psychometric research" (p. 78). Thus, regardless of the type of data available, path analysis via structural equation modelling is a powerful tool for addressing causal relations in action research. In a sense, educators are often interested in exploring the extent to which various individual and contextual variables are associated with student achievement, and structural equation modelling is a statistical method well suited for addressing these types of issues. The primary drawback is that, due to its statistical assumptions, it functions best with larger sample sizes (i.e. at least 100).

In short, research involving creative methodology and data analysis is needed to elucidate whether the type of course design influences the relations between student background, course involvement and academic performance. Additionally, research is needed to examine specific factors that strengthen the role of course involvement and facilitate student achievement. This would allow instructors to fulfil a broader range of course objectives and serve a wider student demographic with their course design.

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