

Prediction of Academic Achievement from some Demographic, Family Background and Locus of Control Variables

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Introduction

Students' educational and psychological developments have been the subjects of many studies for a long period of time, because these areas of development are important aspects of educational development for students themselves, the students' family and educational authorities.

Both of these aspects, academic achievement and personality, are dependent on many variables, such as demographic and environmental factors. Demographic factors are related to variables such as grade or age and sex, and environmental factors are related to variables such as family background. Therefore, studying these variables and their effects on both academic achievement and personality of the students can help educators to consider some antecedents to academic achievement and personality and possible modifications to their teaching strategies where they might be appropriate.

Studying the antecedents of academic achievement has been focused upon by many researchers throughout the world for a long time. Some points are raised regarding this line of research.

First, some of these studies concentrated only on demographic and familial background of the students, while some concentrated on personality variables such as locus of control. However, studying these two important matters (family background and personality factor) simultaneously, and comparing these two aspects in predicting and analysing academic achievement, has received less attention from psychologists and educators.

Secondly, these kinds of studies have a great potential value to educators, because, particularly, educators can rarely change the familial background of the students, but it may be possible to modify students' personalities through educational practices in order to affect motivational development positively. In this regard, it can be said that even students' personalities are more flexible to change than their abilities through educational practices (Stipek & Weisz, 1981).

Thirdly, the findings of these kinds of research can help the educational administrators at different levels to consider the needs of

students in their educational planning.

Finally, although much research has been undertaken regarding academic achievement and its relation to familial background in Australia, these studies pay little attention to personality factors, especially locus of control.

Review of Literature

In social learning theory, the role of reinforcement and reinforcement value is very important. In this regard, any event that can change the potentiality of occurrence of a specific behaviour is called reinforcement and, on the basis of this definition, prediction of

behaviour can be made.

However, one of the determinants in prediction of behaviour is whether or not the individual perceives that the reinforcement that follows his/her behaviour is contingent upon his/her own behaviour or is controlled by other forces outside of himself/herself. In other words, whether or not an individual perceives a causal relationship between his/her action (behaviour) and the reinforcement (Rotter, 1966). Of course, perception of causal relationship is a relative concept, or it can vary in degree (Rotter, 1966). An individual may perceive that the reinforcement that follows his/her behaviour is not related completely to his/her behaviour, or he/she perceives his/her behaviour is under the control of other powerful sources. If the individual interpreted his/her behaviour in this way, his/her belief is called external control by social-learning theory (Rotter, 1966). In contrast, if the individual perceives that there is a relationship between reinforcement and his/her behaviour or perceives that the reinforcement is contingent upon his/her action, he/she is considered to manifest internal control (1966). Also, Stipek and Weisz (1981) stated that "locus of control is defined as generalized expectancy for internal or external control of reinforcement" (p. 102).

various researches have shown that there a significant relationship between locus of control and academic achievement, in the direction that students who have internal locus of control have higher grades and achievement-test scores than external students (Johnson & Kanoy, 1980; Kennelly & Mount, 1985; Stipek & Weisz, 1981; Maqsud, 1983).

Hansford and Hattie (1982) pointed out that certain gaps were observed in relation to self-measure in the literature. They mentioned that a few studies were concerned with young children's self-measures, and the effect of home environment as an intermediate variable between self-measures and achievement. In addition, the association between locus of control and academic achievement is usually considered in terms of an internal locus of control affecting academic achievement;

but, because these researches are usually correlational and cross-sectional, this conclusion can not clearly justify a causal relationship (Stipek & Weisz, 1981).

Outcomes of different studies regarding sex differences in relation to both locus-of-control and academic achievement have indicated contradictory results. Some of these studies did not find any different pattern for locus of control scores for males or females (Bar-Tal & Darom, 1979; Johnson & Kanoy, 1980). On the other hand, on the basis of other findings, Callaghan and Manstead (1983), have indicated that some sex differences have been found in locus of control and academic achievement. For example, Stipek and Weisz (1981) in their review mentioned that there is a stronger association between internal locus of control and achievement for boys than for girls.

From academic achievement point of view, a few studies have shown that there is no significant difference between the achievement of boys and girls (Ainley, Foreman & Sheret, 1991; Hilton & Berglud, 1974). While, the majority of research findings did shown sex differences on academic achievement. Generally, these researches revealed that girls' school achievement is higher than boys' school achievement (Khayyer, 1986; March, 1989).

Another variable that may affect locus of control and academic achievement is the age or grade of the respondents. The trend of changes of locus of control showed that responses of the students tend to become more internal with increasing age (Nowicki & Strickland,

1973). Hansford and Hattie (1982) pointed out that there is an increase in the correlation reported for locus of control and academic achievement as the grade level increased, from preschool to secondary.

Regarding the relationship between locus of control and socioeconomic status, it has been found that students of low socioeconomic status were more external than those of high socioeconomic status (Ludwigsen & Rollins, 1971; Nowicki & Strickland, 1973). Hansford and Hattie (1982), in their meta analysis concluded that individuals from lower-socioeconomic families had a less positive association between their self-measures and their achievement.

It has been found that mother's occupation was not related to academic achievement, although this variable has been shown to be important variable in other studies (Bank & Finlayson, 1973). For example, Milne, Ginsburg, Myers and Rosenthal (1986) consistently found that mother's employment has a negative effect on both reading and mathematics achievement. In this regard Heyns and Catsambis (1986) pointed out that the effects of mother's employment are highly related to socioeconomic status of the families. In other words, they stated that by omitting students from lower socioeconomic background from the sample, also omit

the positive effect of mother's employment on academic achievement.

Another variable that might affect both locus of control and academic achievement is family size. For example, Zajonc (1976) has indicated that increased externality was associated with larger family size. Also, it has been reported that the number of children in the family had a significant negative effect on academic achievement (Iverson & Walberg, 1982; Hauser & Sewell, 1985).

Language background is another factor that might influence on both locus of control and academic achievement. In spite of pervasive studies about the academic achievement of English and non-English-speaking students in Australia, few studies have been concerned about locus-of-control attitude among English and non-English-speaking students. However, several studies showed that minorities, in term of races, did show more external attitudes than non-minorities (Gurin, Gurin, Lao & Beattie, 1969; Hsieh, Shybut & Lotsof, 1969; Lefcourt, 1976; Tashakkori & Thompson, 1991). In regard to academic achievement, there exists a considerable amount of literature that deals with non-English speaking backgrounds or ethnic minority groups. The majority of these studies indicated that these groups obtain comparatively lower performance or achievement scores than other groupings in society (Ainley, Foreman & Sheret, 1991; de Lacey & Rich, 1979; Poole, de Lacey & Randhawa, 1985).

This study tries to determine the contribution of each independent variable in predicting locus of control and academic achievement. Previous researchers mostly sought to determine the relationship between some independent variables and academic achievement and locus of control separately. In other words, the nature of the most of previous researches is correlational and little attention pay to the exact mechanisms that might mediate such relationships.

In other words, the aims of this study is to determine, first, the contribution of some demographical, familial and locus of control variables in predicting academic achievement. Secondly, to determine the contribution of some familial and demographical variables in predicting locus of control. Finally to determine the direct and indirect effects of each demographical and familial variable on both locus of control and academic achievement.

[Insert Figure 1 about here]

Methods

Before discussing methods and procedures that were used in this study, several variables which are the basis for this study will be operationally defined.

1. Sex: Sex is only related to biological sex differences and the subjects were divided to either boy or girl, and it was coded either 1 (boy) or 2 (girl).
2. Grade: The criterion for grade was the grade that the subjects were studying during data gathering, and it was coded either as 3rd, 4th, 5th and 6th.
3. Socioeconomic status: The socioeconomic status of the subjects was determine by father's occupation, as stated by the subjects. Then, it was coded according to the Australian National University six-point scale of occupation (Broom, Jones, Jones & McDonnell, 1977). This variable was coded either 1 (unskilled), 2 (semiskilled), 3 (skilled), 4 (clerical), 5 (managerial), or 6 (professional).
4. Family size: Family size is the total number of brothers and sisters who live with the subject.
5. Language background: This variable was measured by this question: "Do you speak any other language besides English at home?" If his or her answer was 'yes' he or she was categorized as 'non-English language background', otherwise he or she categorized as 'English language background'. This variable was coded either 1 (non-English-language background) or 2 (English-language background).
6. Mother's work: On the basis of a question the subjects' mother was categorized as working mother or non-working mother, and it was coded either 1 (working) or 2 (not working).
7. Locus of control: Locus of control was measured by Nowichi-Strickland questionnaire. The total score on this questionnaire shows the extent of externality. Therefore, this variable was coded in direction of externality.
8. Academic achievement: Academic achievement is defined in terms of two Australian standardized group achievement tests. The first one is a mathematics test (PATHMATH) and the second one is a reading comprehension (TORCH). The sum of two standardized scaled scores, both of them have the same mean and the same standard deviation, was coded for this variable.

Sampling

Subjects of this study were selected from Year 3 through 6 in primary public school in the Illawarra region. The method of stratified random sampling was employed and the following procedures were used for selecting the subjects.

The Illawarra region was divided into two parts on the basis of family

income: families who earned less than \$15,000 and above \$15,000 annually, in terms of previous research (McDonald & Wilson, 1991). The postcode of each area was then identified and the location of each primary public school on the map of the Illawarra region in relation to

the above two categories was determined. The list of primary-public schools that was printed in the local Telephone Directory in 1993 was used for sampling selection. The total number of primary-public schools thus printed was 64 distributed throughout the region. Then, three schools from the upper-income level and three schools from the lower-income level were selected randomly.

However, in terms of previous researches, the Illawarra region tends to be below average in socioeconomic status; therefore reference should be made to state average indicators rather than local ones to ensure that the sample of schools is representative in this regard.

After the selection of the schools, some educational experts who are experienced in determination of socioeconomic status were asked to verify the socioeconomic status by the name and/or geographical location of selected schools.

As was expected, according to judges the six schools that were selected tended toward low-socioeconomic status. However, as a result of the experts' advice, one of these six schools, from low income level, was omitted and then from the areas that tend toward upper-socioeconomic status one school was selected randomly.

Therefore, after following the above procedure, it is assumed that the sample in this study is representative of the state of New South Wales.

In each school, one class in each year (Years 3, 4, 5, and 6) was selected for the purposes of this study. In the schools in which there was more than one class in each year, the experimental class was selected randomly from among them. In total, the sample size consisted of 502 students, 235 boys and 267 girls.

Instruments

In order to measure the variables of this study, four instruments were administered to the subjects. They are as follows:

1. Family background questionnaire

This questionnaire contains seven questions which mainly measure family backgrounds of the subjects including grade, sex, family size, family language background, father's occupation and mother's job status.

2. Reading comprehension achievement test

The Tests of Reading Comprehension (TORCH) were used for measuring the reading comprehension of the students (Mossenson, Hill & Master, 1987).

3. Progressive Achievement Tests in Mathematics (PATMATHS). This test is adopted in Australia in order to evaluate the level of mathematics achievement of students.

4. The Nowicki-Strickland locus of control scale, based on Rotter's definition of external-internal control of reinforcement, was used in order to measure students' locus of control. This standardized questionnaire is consisted of 40 questions that can be answered either 'yes' or 'no'.

Procedures

1. Permissions

In order to gather data from the selected schools and to administer the instruments, permission from several sources had to be obtained. The relevant organizations and persons were New South Wales, Department of School Education, South Coast Region, Human Experimental Ethics Committee, Publishers or authors of standardized instruments, principals of the schools, and parents of the students.

2. Statistical procedures

In order to test the effect of the independent variables in predicting the dependent variables, and also to determine direct and indirect effects of each independent variable on each dependent variable, the procedure of path analysis was employed. In other words, the model that was presented before was tested by path analysis.

[Insert Table 1 about here]

Results

1. Prediction of LOC from independent variable

In Table 2, the results of the multiple regression analysis regarding LOC as a dependent variable in relation to the independent variable of the study is presented. In this regression analysis, it has been shown

that three independent variables of the study made significant contributions in predicting LOC. According to the standardized regression coefficient, grade, socioeconomic status and language background of the family made significant contributions in predicting LOC, respectively according to the size of effects. In this analysis, sex, family size and mother's work had no significant contribution in predicting LOC. The coefficient determination (R-Square) indicated that 7.4 percent of variation of LOC is explained by the independent variables of the study.

[Insert Table 2 about here]

2. Prediction of academic achievement from the independent variables (including LOC).

The LOC as an independent variable was added to the previous independent variables (grade, sex, socioeconomic status, family size, mother's work and language background) and then the multiple regression analysis was employed in order to predict academic achievement. The aims of this analysis were first, to determine the contribution of each independent variable in predicting academic achievement, and secondly, to determine how much the coefficient of determination for academic achievement would be increased by adding the LOC variable.

[Insert Table 3 about here]

The result in Table 3, showed that all of the independent variables, except family size and mother's work, had a significant contribution in predicting academic achievement. The results showed that among the independent variables, the best predictor of academic achievement was

LOC and then socioeconomic status of the family, grade, sex, and language background, respectively. In addition, the coefficient of determination (R-Square) showed that 22.6 percent of variation of academic achievement can be explained by the independent variables.

In order to test the model that was presented in Figure 1, two multiple regression analysis were used, also the intercorrelation between independent variables was calculated for determining the relationship between exogenous variables. The results of these two multiple regression analyses have already been shown in Table 2 and Table 3. Also the results of intercorrelation among the independent (exogenous) variables is presented in Table 4.

[Insert Table 4 about here]

In order to test the model that was presented in Figure 1, each of the variables that have a significant contribution in predicting both LOC

or academic achievement shows in the model by a unidirectional arrow from independent (exogenous) variable towards dependent (endogenous) variables. It should be noted in this model independent or exogenous variables are grade, sex, family size, socioeconomic status, mother's work and language background. In this model dependent or endogenous variables are LOC and academic achievement. Therefore, the unidirectional arrows show causal direction from each exogenous variables toward each endogenous variables.

On the other hand, interrelationships between exogenous variables are indicated by arrowheads at both ends among independent or exogenous variables. It should be noted that in this model the LOC is an exogenous variable in the first stage, while it is conceived as an independent or exogenous variable in the second stage or an exogenous variable in relation to academic achievement.

Stated differently, in order to calculate the path coefficients for causal inferences depicted in the model first, variable 7 (LOC) is regressed on variable 1, 2, 3, 4, 5, and 6 and secondly, variable 8 (academic achievement) is regressed on variable 1, 2, 3, 4, 5, 6, and 7.

After the analysis of the data, all of the significant coefficients (both correlation coefficients and path coefficient) are shown in Figure 2.

[Insert Figure 2 about here]

As shown in this Figure, among the exogenous variables, three of them had significant direct effects on the determination of LOC. these three variables were grade, SES, and language background. As is shown in the Figure, the other remaining exogenous variables, family size, sex and mother's work, have indirect effects on LOC through their significant correlations with the other exogenous variables. For example, family size, sex, and mother's work had indirect effects on LOC through their significant correlations with SES, or mother's work had indirect effect on the LOC through its significant correlation with language background.

On the other hand, regarding academic achievement, sex, SES, grade, language background and LOC had significant direct effects on determination of academic achievement. Surprisingly, when the path coefficients of these variables were compared to each other, the direct effect of LOC on academic achievement was greater than were the effects of each of the other exogenous variables, even more than SES. After the

LOC, SES, grade, sex and language background had significant direct effects on academic achievement.

Again, the remaining exogenous variables, family size and mother's work, had indirect effects on academic achievement through their significant correlations with the other exogenous variables. For example, family size and mother's work had indirect effects on academic achievement through their significant correlations with SES, or mother's work had an indirect effect on academic achievement through its significant association with language background.

Other general findings of the study showed that:

- 1) Girls' academic achievement was higher than boys' academic achievement; while, there is no significant difference between girls' LOC and boys' LOC.
- 2) Grade of the students has a positive effect on academic achievement. In other words, students from higher grades had better achievement scaled scores than students from lower grades. In regard to LOC, it has been indicated that grade of the students has a negative effect on LOC. In other words, with increasing age, externality will decrease.
- 3) In regard to SES, it has been shown that academic achievement increases with SES from low to high levels. Regarding LOC, the internal LOC attitude increases with SES from low to high levels.
- 4) The mean of academic achievement of scaled scores of English-speaking students were significantly higher than the mean of non-English-speaking students. Also, the non-English-speaking students had a more external LOC attitude than English-speaking students.
- 5) Regarding the intercorrelation among independent variables of the study, the significant negative correlation between family size and SES has indicated that the number of children in a family decreases with SES from low to high levels. The correlation between sex and SES shows that the number of girls in high SES is greater than the number of boys. In regard to significant correlation between family size and mother's work, it has been indicated that among families whose mother were working, the number of their children was greater than families whose mother were not working. The significant correlation between SES and grade of the students showed that SES from low to high levels increases with grade of the students. Regarding significant negative correlation between SES and mother's work, it has been shown that the number of students whose mother were working in high SES was greater than the number of students whose mother were not working. Finally, the significant negative correlation between mother's work and language background means that the number of students whose mother were working in non-English-speaking group was greater than the number of students whose mother were not working, by comparison with English-speaking group.

Discussion

The above result 'LOC is the best predictor of academic achievement' is unexpected. However, there are some explanations for this finding.

It should be noted that this result does not necessarily mean causation, because many variables were involved in the model that each of them may have shared their variances with another variable that was not included in the present model. Also, students' LOC attitudes may be developed through school activities. In other words, effective

interactions between teachers and students may help students to develop internal LOC attitudes, and as a result this internal LOC affect their academic achievement. In this regard, in a recent longitudinal study, it was found that interaction between class and teacher had more substantial effect than home background on student achievement (Rowe, Hill & Holmes-Smith, 1994). In Rowe's et al study it was shown that interaction of students and their teachers in the classroom accounting between 28.1 to 45.6 percent of the variance in student achievement (Rowe, Hill & Holmes-Smith, 1994). Therefore, it may be concluded that affective interaction between students and their teachers help students to perceive the consequences of their behaviours and as a result to develop internal LOC attitude.

Further research is needed to clarify the total effects of each variable on academic achievement. Furthermore, there might be a simultaneous relationship between LOC and academic achievement that should be investigated by further analysis.

This study might have several educational implications. LOC variable could be considered by teachers, administrators, and educational planners as an alternative variable that can influence the academic achievement of the students. Also, the results showed that SES and language background have significant effects on both LOC and academic achievement. These findings might suggest that individualized instruction can be compensated the deficiencies in academic achievement among students from lower SES and non-English-speaking background. In addition, such individualized instruction might help the students to perceive the consequences of their behaviour, and as a result to develop a more internal LOC attitude.

Figure 1: Causal model of academic achievement

Table 1
Stages and variables in path analysis

Stage	Dependent variable	Independent variable
1	Academic achievement	Sex
background		Grade SES Language
control		Mother's work Family size Locus of
2	Locus of control	Sex
		Grade SES Language background Mother's work Family size

Table 2: Regression coefficient and standard error (in parentheses) of the independent predictors of the locus of control

Predictors level	Unstandardized coefficient	Standardized coefficient	Sig.
Grade	-.711 (.189)	-.172	.0002
Sex	.305 (.413)	.034	No sig.
SES	-.413 (.12)	-.16	.0006
Family size	.095 (.18)	.024	No sig.
Mother's work	.089 (.429)	.01	No sig.
Lang. back.	-1.056 (.517)	-.094	.05
Intercept	20.933		
n	460		
R	.272		
R-Squared	.074		

Table 3

Regression coefficient, standard error (in parentheses) of the independent predictors (including LOC) of the academic achievement

Predictors level	Unstandardized coefficient	Academic achievement	
		Standardized coefficient	Sig.
Grade	2.69 (.64)	.178	.0001
Sex	5.572 (1.379)	.17	.0001
SES	1.944 (.405)	.207	.0001
Family size	-.641 (.601)	-.045	No sig
Mother's work	-.855 (1.43)	-.025	No sig.
Lang. back.	6.096 (1.732)	.148	.0005
LOC	-.781 (.157)	-.214	.0001
Intercept	72.281		
n	460		
R	.467		
R-Squared	.226		

Figure 2: Modified causal model of academic achievement

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