



PREDICTING ACADEMIC DEVELOPMENT: THE ROLE OF PSYCHOSOCIAL AND FAMILY FACTORS

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PREDICTING ACADEMIC DEVELOPMENT: THE ROLE OF PSYCHOSOCIAL AND FAMILY FACTORS

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ABSTRACT

This longitudinal survey of 646 students (214 males and 432 females) between the ages of 17 and 25 across their three years university career aimed to identify psychosocial and family factors that predict educational achievement. In year one students were assessed on family environment, achievement motivation, problem solving style, optimism and end of year grade point average (GPA). The measures of achievement motivation, problem solving style, optimism, and GPA were repeated in years two and three. Analysis using hierarchical multiple regression (HMRA) and structural equation modelling (SEM) show that mother's education, family growth, problem-solving self-efficacy, intrinsic motivation and optimism predicted academic attainment in terms of their final degree grade.

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INTRODUCTION

Those who are interested in educational attainment have recently switched their focus from the measurement of academic outcome at a single point to the more interesting issue of academic development or gain (Anderman, Gimbert, O'Connell, & Riegel, 2015). This is based on the recognition that it is the value-added aspect of education which is the real indicator of success and the challenge for educators is to understand and enable the development of a culture of academic growth and development (Anderman, Anderman, Yough, & Gimbert, 2010; Ballou, 2005). The reality that students do not all enter higher education at the same level despite the standardisation of the school curriculum has only recently been recognised by educational researchers (Rubin, & Kazanjian, 2011). This lack of a level playing field is exasperated by widening of access to education (Brooks, 2012). If we can explicate the psychology of development or gain perhaps we can make more headway in engaging students in the pursuit of intellectual advancement (Dweck, 2015; Masters, 2013).

The gain or development approach argues that a simple final GPA measure may miss the value-added effect of education as it assumes a common starting point. Thus while some students may not attain the highest grades this may be because their

academic ability was lower on entry; they may nevertheless have shown substantial advance academically (Anderman et al, 2015).

Academic gain has largely been investigated in school children and has been associated with a number of predictor variables including optimism (Hoy, Hoy, & Kurz, 2008; Pajares, 2001), intrinsic motivation (Gottfried, Fleming, & Gottfried, 2001; Gottfried, Marcoulides, Gottfried, Oliver, & Guerin, 2007; Lepper, Corpus, & Iyengar, 2005; Long, Monoi, Harper, Knoblauch, & Murphy, 2007), problem-solving style (Elliott, Godshall, Shrout & Witty, 1990; Ketelhut, 2007), and self-efficacy (Adeyemo, & Torubeli, 2008; Ahmed, & Bruinsma, 2006; Valentine, Dubois, & Cooper, 2004). While these variables have been applied in higher education to some extent (Cassidy & Giles, 2009) their role in predicting academic gain has attracted little attention (Elliot, Murayama, Kobeisy, & Lichtenfeld, 2015). Cassidy and Giles (2012) show that intrinsic motivation and problem-solving self-efficacy predicted academic performance and mediated the impact of family background and socioeconomic status. In addition, they demonstrate that both intrinsic motivation and problem-solving self-efficacy show growth over time in relation to academic performance. In relation to academic performance it appears that intrinsic motivation produces deeper engagement in learning activities (Vansteenkiste, Lens, & Deci, 2006).

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A review by Richardson, Abraham and Bond (2012) identify performance self-efficacy as a key factor in predicting academic success. Some of the studies reviewed show that optimistic attributions are also predictive of academic success and are associated with stronger motivation (p. 359). Richardson *et al* (2012) include under motivational factors, locus of control, optimism, academic intrinsic motivation, approach goal orientation, and avoidance goal orientation all of which contribute to the prediction of academic success. Other studies also link self-efficacy and optimism with academic performance (e.g. Alivernini, & Lucidi, 2011; Chemers, Hu & Garcia, 2001). The explanatory style of optimism uses past experiences to predict future outcomes and would seem to be central to development (Peterson & Steen, 2002).

As well as these psychological factors other socialisation factors also come into play, including socioeconomic status (SES), mother's education, and parent involvement in the student's education (Cassidy & Giles, 2012; Cassidy & Lynn, 1991; Davis-Keane, 2005; Dubow, Boxer, & Huesmann, 2009; Sirin, 2005). Educated mothers tend to provide more academically encouraging and supportive family environments which in turn produce more academically motivated children (Dubow, Boxer, & Huesmann, 2009). The SES link with academic achievement continues to generate debate and as Willingham (2012) argues articulately a direct causal link seems illogical. If SES has a direct causal effect other interventions are unlikely to have any effect. The evidence suggests that when parental education, parental support and school are factored out SES has only a small impact on academic attainment (Peterson, 2012). Parental education, support, and income are also related to the psychological factors described above, through the child's developmental experience (Cassidy & Giles, 2012), suggesting a model whereby socialisation factors may be mediated or moderated by psychological variables and ultimately predict educational attainment and academic development.

Aims of study

Evidence suggests that a combination of motivation, problem solving style, self-efficacy and optimism levels in the context of socioeconomic status and family background should be useful predictors of academic development and overall academic attainment. Using the measures described in the methods below we measured intrinsic and extrinsic motivation, problem-solving self-efficacy, problem-solving approach and problem-solving avoidance (similar to approach and avoidance goal orientation), and optimism. The study therefore sets out to test a model combining these variables (see Figure 1) and its effectiveness in predicting graduate academic gain.

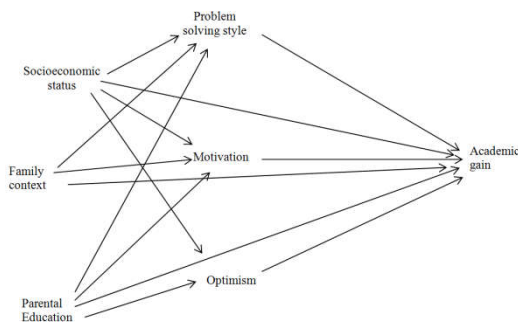


Figure 1 Conceptual Model of Predictors of Academic Gain

METHODOLOGY

Design

The study was a longitudinal survey design, using questionnaire data collection techniques to access the psychosocial predictors of academic development in University students.

Participants

Participants were 646 students (214 male and 432 female) between the ages of 17 and 25. The National Statistics Socio-economic Classification system was used to code SES and the distribution of this and educational status of parents is shown in Table 1. Family size including parents and siblings ranged from 3-9, and 190 came from non-intact homes while 456 came from two parent homes.

Table 1 Educational and Socioeconomic Status

Educational Status	Mothers	Fathers
a) No formal education;	276	211
b) Up to O' Level education	149	141
c) Up to A' Level education	58	102
d) Degree level education	92	157
e) Postgraduate education	71	35
Socioeconomic Status (SES)		N
1. Higher managerial and professional		49
2. Lower managerial and professional		78
3. Intermediate		127
4. Small employers and own accounts		66
5. Lower supervisory and technical		146
6. Semi-routine		83
7. Routine		62
8. Unemployed		35

Measures

Measurement occurred at 3 time points, Spring term year 1 (T1), Spring term year 2 (T2), and Summer term year 3 (T3). Stage at which each measure was administered is indicated by T1, T2 or T3 in brackets.

A demographic questionnaire was used to obtain information on age, gender, parental education and employment, family size and socioeconomic status (SES) (T1).

Participants then completed the following standardised measures.

The Family Environment Scale (Moos & Moos, 1986) (T1). This is a 90-item scale which measures 10 first order factors of family environment, *cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious orientation, organisation and control*. The scales are scored so that a higher score indicates more experience of the specific factor within the family. The 10 first order factors can be grouped into 3 second order factors, 1) *family relations* (Alpha=0.88) (cohesion, expressiveness, and conflict), 2) *personal growth* (Alpha=0.84) (independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, and moral-religious orientation) and 3) *systems maintenance* (Alpha=0.81) (organisation and control).

The Cassidy-Lynn Achievement Motivation Questionnaire (Cassidy & Lynn, 1989) (T1 & T2). This is a 49-item scale developed particularly for researchers interested in achievement motivation. The scale contains 49 items which measures the 7 factors of achievement motivation outlined by

Cassidy and Lynn (1989); work ethic, acquisitiveness, dominance, pursuit of excellence, competitiveness, status aspiration and mastery. Participants are scored using a likert 3-point response scale 0-3. A second order factor analysis allows for a two-factor solution of extrinsic motivation (Status aspiration, acquisitiveness and dominance - Alpha=0.79) and Intrinsic motivation (work ethic, mastery, competitiveness and pursuit of excellence- Alpha= 0.88) The scale has shown high internal consistency in University student participants (Cassidy & Lynn, 1989) and individuals in full time employment (Ward, 1997).

The Cassidy-Long Problem-solving Style Inventory (Cassidy & Long, 1996) (T1 & T2). This is a 28 item measure of problem-solving style which measures 6 factors, *helplessness* (Alpha=0.80), *control* (Alpha=0.71), *creativity* (Alpha=0.75), *confidence* (Alpha=0.78), *approach style* (Alpha=0.73), *avoidance style* (Alpha=0.71) and *support-seeking* (Alpha=0.73). Higher scores on the scale indicate a problem-solving style where the person feels less helpless, more in control, more confident, more creative, more likely to approach and less likely to avoid problems. The scale has been used in a number of studies (e.g. Baker, 2003; Cassidy & Dhillon, 1997; Cassidy, 2004) where it has been shown to be reliable and valid as well as practically useful. A second order factor solution produces 3 factors, *problem-solving self-efficacy* (combining helplessness, control and confidence - Alpha=0.83), *approach style* (combining creativity and approach - Alpha=0.78), and *avoidance* (combining avoidance and support-seeking - Alpha=0.76).

The Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994) (T1 & T2). This consists of 10 items, 3 statements described in a positive manner, 3 statements described in a negative manner, and 4 non-scored items. The 3 positive items were used to measure optimism. Participants responded to the statements by indicating the extent of their agreement along a 5-point Likert scale, ranging from "strongly agree" to "strongly disagree." The internal reliability (Cronbach's alpha=.78) and test-retest reliability (r=.68 over a four-week interval, r=.60 over twelve months, r=.56 over twenty-four months, and r=.79 over twenty-eight months) for the unidimensional use of the LOT-R has been shown to be adequate.

End of year grade point average (GPA) at the end of year 1, year 2, and year 3 was obtained from the student records. Academic development was measured as the difference between GPA in year 3 and GPA at the end of year 2.

Procedure

During the spring terms (February-March) of four different years, 1,230 first year students at university in the UK were asked to participate in the study. All were provided with an information sheet, which explained the basics of the study and explaining the procedure, and a consent form. They then completed the measures above. A secure data base was set up which listed the student's registration number which was used as a means of identifying questionnaires and in order to carry out a follow up assessment. A total of 976 completed questionnaires were returned at T1. Participants who completed measures were assessed one year later (T2) in the spring terms (February-March) of the four years 2004-2007. Of the original 976, 646 usable questionnaires were returned.

RESULTS

As the aim of the study was to identify predictors of academic development the first stage in analysis calculated descriptive statistics and Pearson correlations between variables for the 646 completers as shown in Table 2. Three different levels of academic development were considered, i.e. year 1 to year 2, year 1 to year 3 and year 2 to year 3. Overall GPA correlated strongly with academic development from year 2 to year 3 (r=.63, p<.001) but only weakly with academic development from year 1 to year 3 (r=.20, p<.001) and in fact negatively with academic development from year 1 to year 2 (r=-.15, p<.01). The latter may reflect a tendency for grade inflation in year 1. This would also suggest that academic development from year 2 to year 3 is the better measure.

Table 2 Bivariate correlations between GPA, Academic gain and study variables

	GPA	Gain T1-T3	Gain T1-T2	Gain T2-T3
GPA final year	1.0	.20***	-.15**	.63***
Mother's education	.56***	.03	-.07	.43***
Family Size	.08*	.12**	.01	.18**
Socio-economic Status (SES)	-.04	-.06	-.01	-.07
Family Growth	.53***	-.01	-.13**	.30***
Family Systems	.08*	.01	.04	.01
Family Relations	.22***	.01	.01	.21***
Optimism T1	.47***	-.18**	-.23**	.31***
Intrinsic Motivation T1	.22***	.01	-.15**	.22***
Extrinsic Motivation T1	.31***	.18**	.16**	.16**
Problem-solving Self Efficacy T1	.12**	.06	.09*	-.07
Problem-solving Avoidance T1	-.28***	-.07	.03	-.21***
Problem-solving Approach T1	.28***	-.12**	-.17**	.19**
Optimism T2	.22***	-.11**	-.28***	.21***
Intrinsic Motivation T2	.71***	-.02	-.28***	.61***
Extrinsic Motivation T2	-.07	.14**	.08	.04
Problem-solving Self Efficacy T2	.66***	-.04	-.23***	.49***
Problem-solving Avoidance T2	.01	-.08	-.14**	.07
Problem-solving Approach T2	-.01	.27***	.13**	.05

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

Both GPA and academic development from year 2 to year 3 showed significant direct correlations with mother's education, family growth, family relations, intrinsic motivation (T1 and T2), problem-solving efficacy (T2), problem-solving approach (T1), and optimism (T2), and a significant inverse relationship with problem solving avoidance (T1).

To further explore these relationships, hierarchical multiple regression analysis (HMRA) was used to test the predictors of academic development from year 2 to year 3 (see Table 3). On the first step father's education, mother's education, SES, and family size were entered as independent variables and between them accounted for 23% of the variance. Mother's education and family size were the only significant predictors. SES did not reach significance on this step. On step 2 family growth, family systems and family relations were entered and these added a further 3% explanatory power. Family relation was the only significant predictor at this stage. On step 3 the T1 measures of optimism, intrinsic motivation, extrinsic motivation, problem-solving efficacy, problem-solving avoidance and problem-solving approach added a further 8% to the variance explained. Extrinsic motivation was not significant. In the final step the T2 measures of optimism, intrinsic motivation, extrinsic motivation, problem-solving efficacy, problem-solving avoidance and problem-solving

approach were entered and added a further 19% to the variance explained. Extrinsic motivation and problem-solving avoidance were not significant predictors. Overall 53% of the variance was accounted for and provided a basis for developing and testing a structural model.

deducting year 1 values from year 2 values. These growth indicators were then used in HMRA to test their predictive power as shown in Table 4. Growth in intrinsic motivation, problem solving self-efficacy and optimism demonstrated significant explanatory power and a model using these

Table 3 Predictors of academic gain from HMRA

	Dependent variable = academic gain from T2 to T3												ΔR^2
	Model 1			Model 2			Model 3			Model 4			
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β	
Fathers education	-.122	.163	-.028	-.165	.163	-.038	.067	.165	.016	.033	.143	.008	.23
Mothers education	1.778	.140	.445***	1.549	.154	.388***	1.342	.154	.336***	1.096	.151	.274***	
Socio-economic status	-.010	.112	-.003	-.098	.113	-.034	.085	.111	.029	-.101	.098	-.035	
Family Size	.899	.154	.204***	1.025	.159	.232***	.943	.154	.214***	.718	.135	.163***	
Family Growth				.253	.219	.049	-.119	.228	-.023	-.764	.198	-.150***	.03
Family Systems				.113	.176	.023	-.024	.170	-.005	-.151	.150	-.030	
Family Relations				.763	.207	.152***	.575	.203	.114**	.659	.175	.131***	
Optimism1							.683	.198	.128***	-.664	.195	-.125***	.08
Intrinsic Motivation 1							.611	.214	.100**	-.409	.208	-.067*	
Extrinsic Motivation 1							.285	.224	.050	.194	.195	.034	
Problem Self Efficacy 1							-.667	.258	-.093**	-.1043	.229	-.145***	
Problem Avoidance 1							-.876	.198	-.164***	-.176	.179	-.033	
Problem Approach 1							.999	.257	.136***	.378	.226	.051	
Optimism2										.840	.202	.155***	.19
Intrinsic Motivation 2										2.113	.194	.434***	
Extrinsic Motivation 2										-.037	.198	-.006	
Problem Self Efficacy 2										1.224	.196	.231***	
Problem Avoidance 2										.236	.123	.057	
Problem Approach 2										.522	.186	.097**	
R^2		.23			.26			.33			.53		

*p<.05 **p<.01 ***p<.001
 β = Regression coefficients R^2 =coefficient of determination ΔR^2 = Change in R^2

Based on the HMRA a number of models were developed and tested using Structural Equation Modelling with AMOS-22. The model shown in Figure 2 produced the best fit statistics. The model had a chi-square value of 3.80 with 2 degrees of freedom and was non-significant (p=.14). The comparative fit index (CFI), incremental fit index (IFI), goodness of fit index (GFI), and normed fit index (NFI) were all .99, and the root mean square error of approximation (RMSEA) was .03.

measures was tested as shown in Figure 3. The model was a good fit with a chi-square of 14.39 with 5 degrees of freedom and was non-significant (p<.06). The fit indices were strong (CFI=.99; RFI=0.99; NFI=0.99) and the RMSEA was 0.04.

Table 4 Predictors of academic growth from HMRA using psychological growth as independent variables

	Dependent variable = academic growth T2 to T3										ΔR^2
	Model 1			Model 2			Model 3				
	B	SE B	β	B	SE B	β	B	SE B	β	β	
Fathers education	-.122	.163	-.028	-.165	.163	-.038	.042	.145	.145	.010	.23
Mothers education	1.778	.140	.445***	1.549	.154	.388***	1.385	.149	.347***		
Socio-economic status	-.010	.112	-.003	-.098	.113	-.034	-.076	.100	-.026		
Family Size	.899	.154	.204***	1.025	.159	.232***	.889	.141	.201***		
Family Growth				.253	.219	.049	-.601	.203	-.118**		.03
Family Systems				.113	.176	.023	-.004	.156	-.001		
Family relations				.763	.207	.152***	.610	.182	.121***		
Optimism Growth							-.1008	.163	-.216***		.20
Intrinsic Motivation Growth							1.489	.154	.335***		
Problem solving Self Efficacy Growth							1.553	.155	.341***		
Extrinsic Motivation Growth							-.208	.137	-.050		
Problem solving avoidance Growth							.223	.105	.066		
Problem solving approach Growth							.336	.135	.082		
R^2			.23			.26					.46

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

β = Regression coefficients
 R^2 =coefficient of determination ΔR^2 = Change in R^2

Psychological growth considered growth in motivation, problem-solving style and optimism from T1 to T2 by

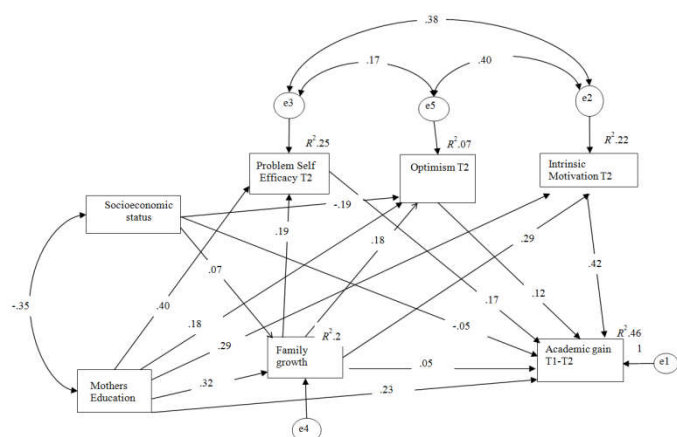


Figure 2 Path Model of Predictors of Academic Gain from Structural Equation Modelling. (chi-square (2)=3.80, $p=.14$; CFI=0.99; RFI=0.99; NFI=0.99; RMSEA=0.03)

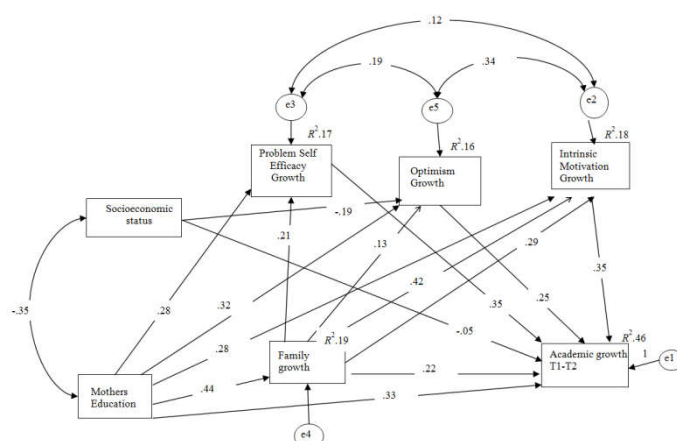


Figure 3 Path Model of Predictors of Academic Growth from Structural Equation Modelling with psychological growth as predictors. (chi-square (5) =14.39, $p=.06$; CFI=.99; RFI=0.99; NFI=0.99; RMSEA=0.04)

DISCUSSION

In the context of a changing HE arena particularly where access to education has been made available to a wider range of the general population and the competition for jobs has increased, there is now a greater need to better understand the determinants of educational attainment. Indeed, many decisions about curriculum development, pedagogy and policy are based on measuring value, and inevitably added value for the economic investment (Anderman, *et al.*, 2015). Recently, it has been acknowledged that academic gain is not only a better way of measuring educational attainment but non-cognitive psychological factors may be more important determinants. Certainly the focus on cognitive ability levels both as predictors and outcome measures has had limited success primarily because these measures are subject to ceiling effects. A review of the relevant research literature points to a potential conceptual model combining intrinsic and extrinsic motivation, problem-solving self-efficacy, problem-solving approach and problem-solving avoidance (similar to approach and avoidance goal orientation), and optimism in the context of socioeconomic status, parental education, and parenting (Figure 1). The findings reported here appear to support this model.

As can be seen in Figure 2, 46% of the variance in academic development as measured by student gain in grade between years 2 and 3 was explained. The strongest predictor of

academic development was intrinsic motivation measured in year 2 ($\beta =.42$). Problem-solving self-efficacy ($\beta=.17$) and optimism ($\beta=.12$) both measured in year 2 were also direct predictors. In essence students with higher levels of intrinsic motivation, optimism and self-efficacy in year 2 demonstrated greater academic development between years 2 and 3. This supports previous findings (Alivernini, & Lucidi, 2011; Chemers, Hu & Garcia, 2001; Richardson *et al.*, 2012) and provide direct evidence in the HE context. While previous studies have tended to explore these factors independently in this study optimism and intrinsic motivation ($\beta=.40$) and problem-solving self-efficacy and intrinsic motivation ($\beta=.38$) were inter-related suggesting that it is the interactive effect of these variables which is important.

Family growth which is a measure of support and encouragement towards achievement and independence from family was also directly predictive of academic development ($\beta=.05$) but had a larger impact through its predictive relationship with intrinsic motivation ($\beta=.29$), problem-solving self-efficacy ($\beta=.19$) and optimism ($\beta=.18$). In other words, students who experienced stronger encouragement from family did exhibit stronger intrinsic motivation and problem-solving self-efficacy as well as more optimism. This supports and extends previous findings by Cassidy and Giles, (2012), Davis-Keane, (2005), Dubow, Boxer, and Huesmann, (2009) and Sirin, (2005).

Socioeconomic status (SES) was directly predictive of academic development ($\beta=-.05$) but only predicted a small percentage of variance and the relationship was mediated through optimism ($\beta=-.19$) and family growth ($\beta=-.07$). In other words, students from poorer backgrounds exhibited less academic development, less encouragement to achieve from family, and were less optimistic. This is further explained through the relationship with mother's education. Mother's education was directly related to academic development ($\beta=.23$), family growth ($\beta=.32$), intrinsic motivation $\beta=.29$), problem-solving self-efficacy ($\beta=.40$), and optimism ($\beta=.18$). Students with better educated mothers experienced more academic development and this was enhanced by increased encouragement to achieve, higher intrinsic motivation, more self-efficacy in regard to problems, and more optimism. In addition, mother's education was strongly related to SES ($\beta =-.35$), suggesting another route via which SES may impact on academic development. The way in which SES is mediated by mother's education, family growth and psychological attributes support Peterson's (2012) arguments while recognising the importance of tackling family poverty in any comprehensive approach to reducing educational inequality. Furthermore, the significant role played by mother's education and family support which are undoubtedly inter-related suggests engaging families from lower SES backgrounds in education should be a focus of policy. For example, it provides a good case for extending the investment in Family Learning (National Institute for Adult Continuing Education, 2013).

Interestingly, the relationship between intrinsic motivation, problem-solving efficacy, and optimism in year one and academic development was not significant suggesting that these characteristics may change and evolve across the first two years. In other words, intrinsic motivation, problem-solving

efficacy and optimism may be related to student experience and reflect their level of engagement and enjoyment of the programme. Hence the question begged is does growth in motivation, problem-solving and optimism from year one to year two predict academic development. This was tested in further analysis (see Figure 2); the model supports this prediction. Again mother's education and SES were related to family growth and are predictive of both psychological and academic development. The significance of this finding is that while background factors such as SES and mother's education are important, these personal attributes of intrinsic motivation, problem-solving efficacy and optimism do change across the educational experience and may provide useful indicators of how successful a programme is in engaging students.

To summarise, two of the key background factors in relation to academic development are SES and mother's education both of which have been shown in previous research as predictive of educational attainment and social mobility (Cassidy & Giles, 2012; Davis-Keane, 2005; Dubow, Boxer, & Huesmann, 2009; Sirin, 2005). These effects are mediated through the family environment in terms of levels of encouragement and support. The current study suggests that the process involves the socialisation of more intrinsically motivated children and young people who have a strong sense of self-efficacy in regard to solving problems and have a more optimistic explanatory style. It suggests that targeting the motivational, problem-solving and explanatory style of students may be efficacious in enabling academic development and ultimately academic achievement.

In line with Anderman *et al* (2015) we would argue that this study shows there are positive advantages to measuring academic gain as opposed to static achievement, and would add that it is also advantageous to measure psychological growth as a concomitant. In our study measures of motivation, problem-solving and optimism taken in year one at the start of their higher education journey would have led to a false conclusion that these variables had no noticeable impact on student academic development. It also belies the assumption that these variables are stable personality traits as the data shows they change over time. Growth seems to be the key word in terms of both academic development and concurrent psychological predictors.

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