

Characteristics of High-Achieving Students and the Effectiveness of a Low-Cost Program in Three New Zealand Universities

Pam Millward, Christine Rubie-Davies,
and Janna Wardman
The University of Auckland

This article reports on the final phase of a three-phase project and investigates the characteristics of high-achieving students at a university. It also reports student evaluations of a low-cost program aimed at supporting them, assesses their levels of satisfaction, and evaluates the applicability of the program across three institutions in the tertiary sector in New Zealand. Quantitative data were collected from 126 participants prior to the introduction of the program and 55 participants were interviewed. End-of-year data were gathered via a questionnaire and one focus group interview. The findings indicated that the participants appeared to have stronger intrinsic motivation, resilience, and self-belief when compared with participants from other undergraduate groups participating in international studies. Interviewed participants expressed pleasure at being identified as high-achieving, appreciated their involvement in the study, and as a consequence were considering transitioning to postgraduate study. We concluded that this low-cost program was an effective strategy for supporting high-achieving undergraduate students across three different universities' departments and that other tertiary institutions might find the strategy useful.

This article reports on the final phase of a three-phase project investigating the support of high-achieving undergraduate students. Phase One explored the supports for high-achieving students across four large departments within one New Zealand university (Garrett & Rubie-Davies, 2014). The original study arose over anecdotal concerns in one department that high-achieving students were becoming bored with the standard program and that several had "dropped out." Within this same department a staff survey showed that, overall, academic staff were unaware of who their high-achieving students were and had no strategies in place to extend them. The second phase looked more closely at the on-going experiences of high-achieving students within the department that had no existing supports (Millward, Wardman, & Rubie-Davies, 2016). A low-cost program, introduced as part of Phase Two, was designed to formally recognize the achievements of the high-achieving students and to enable peer support groups. At program completion, the high-achieving students reported greater levels of satisfaction with their overall university experience. The students expressed appreciation that their achievement was privately, yet formally, recognized and celebrated. Many noted that the program provided opportunities that enabled them to establish motivational and supportive study groups with their high-achieving peers. A number of the students expressed interest in continuing studies at postgraduate level: something they had not considered prior to the program. The program included the following:

1. A congratulatory letter sent to students who achieved an A grade average across all of their courses
2. An invitation to attend a celebratory morning tea which provided the high-achieving students

with opportunities to network with other high-achieving students in their department

3. Invitations to attend academic seminars and public lectures (normally restricted to postgraduate students and staff)
4. Invitations to apply to become mentors for other undergraduate students
5. Advertisement of summer scholarships, opportunities to work with researchers as paid research assistants, and postgraduate scholarships

The primary goal of the final phase of the project was to introduce the same program across three universities located in different New Zealand cities in order to ascertain if this simple low-cost program had the potential for wider applicability across the tertiary sector in New Zealand.

Background

High-achieving students in a university setting may exhibit characteristics that differ from those of other less academically successful students. According to Subotnik, Olszewski-Kubilius, and Worrell (2011), certain psychosocial skills can act as enhancers or delimiters to talent development. Enhancing psychosocial factors include optimal motivation such as envisioning a better future for themselves and increased self-efficacy, grasping opportunities for talent development, having a productive mind-set that keeps them striving to achieve goals, development of psychosocial strength that sees them overcoming potential barriers to goal achievement, and having good social skills which involves ensuring they are well organized and able to collaborate effectively with peers

and colleagues. Conversely, psychosocial factors can act as delimiters to talent development. Delimiting psychosocial factors include low motivation, an unproductive mind-set, low levels of psychological strength, and poor social skills. Subotnik et al. (2011) reported high-achieving students as displaying enhanced psychosocial skills, as well as displaying emotional strength, early psychological independence, intellectual risk-taking, and resilience.

Subotnik et al. (2011) recognized the role of serendipity in academic success. Chance factors such as positive financial, social, and cultural resources can act as enhancers to talent development. Similarly, negative chance factors may act as delimiters and limit resilience. Limiting chance factors include financial restraints such as poverty, or the need to work and support others while studying. Limiting social factors include early exit from school, resulting in a lack of tertiary entry qualifications or school transience as a result of parents' frequent relocations. Cultural limiting factors might include belonging to an under-represented group at the tertiary level or being the first in a family to attend a university. Individuals experiencing limiting chance factors have to overcome challenges that may limit their ability to succeed at the university.

Nevertheless, resilience has been shown to contribute to successful academic and other achievement (Blackwell, Trzesnewski, & Dweck, 2007; Dweck, 2009). Phase Two of our study (Millward et al., 2016) indicated that many of the participants exhibited high levels of resilience or grit enabling them to pursue their studies and achieve very high standards, despite some experiencing limiting chance factors. Hence, resilience may be a factor that enables high-achieving students to overcome otherwise delimiting factors. Thus, we sought to explore the levels of persistence or grit displayed by participants involved in Phase Three of the study.

The researchers were also interested in other psychosocial factors that may contribute to the success of high-achieving students. For example, there is evidence that high-achieving students in the compulsory schooling sector have high academic self-concept (Marsh, 1987; Marsh & Yeung, 1997). It would be useful to more fully explore the characteristics of such students because if high-achieving students demonstrate high levels of motivation and self-regulation, then this information could be used to develop programs for other students in order to increase positive self-belief and motivation. To some extent, the quantitative part of this study was exploratory and designed to identify the demographic characteristics of high-achieving students. The research around high-achieving students at the tertiary level is limited (Abeysekera, 2008; Moltzen, 2008). Further, there were no studies available related to the psychosocial characteristics of high-achieving students.

In order to determine how their motivation compared with that of regular students in tertiary settings, the questionnaire responses of the high-achieving students in the current study were compared with those of students in the original validation studies. Hence, Phase Three was designed to learn more about the psychosocial and demographic characteristics of high-achieving undergraduate students from different New Zealand universities. A further aim of the study was to establish whether or not the low-cost program trialed in Phase Two enhanced high-achieving students' experiences at university. Evidence from Phase Two indicated that high-achieving students benefited from having their achievements formally recognized, as well as from having opportunities to network with other high-achieving students. Learning opportunities facilitated by mentoring other students, attending academic seminars, and working with academics on research projects were also perceived as beneficial (Millward et al., 2016). The program was not designed to further increase already high-achieving students' grades, but to explore more fully any demographic characteristics associated with the high-achieving students and to explore in-depth their psychosocial characteristics.

The Current Study

Through both quantitative and qualitative methods, the study was designed to gain a deeper understanding of the characteristics of high-achieving students. A further purpose was to conduct a small-scale evaluation of the program to determine its effectiveness. Hence, the research questions that underpinned the study were:

- 1) What are the psychosocial and demographic characteristics of high-achieving students?
- 2) How does the motivation, grit, and self-concept of high-achieving students compare with that of other students?
- 3) Does a low-cost program enhance the learning experiences of high-achieving tertiary students?

Method

Participants and Setting

The three departments involved in Phase Three were comprised of two departments of education and one department of science. Participants were studying for Bachelor of Education, Bachelor of Science, or conjoint degrees. All students achieving an A range average across all of their courses were invited to participate in the study ($N = 496$). One hundred and twenty-six high-achieving undergraduate students volunteered to participate. The five-pronged, low-cost program trialed

in Phase Two and described in the Introduction was introduced across the three sites.

Measures

In order to gain a deeper understanding of the psychosocial characteristics of high-achieving tertiary students, the 126 participants completed a questionnaire and 55 were interviewed across the three sites. In order to evaluate the effectiveness of the program in enhancing the learning experiences of the high-achieving tertiary students, one focus group was conducted, and a small group completed a survey.

Quantitative Measures

All participants completed a questionnaire at the beginning of the study that collected demographic data, as well as information related to students' prior educational backgrounds and previous experiences of being identified as high achievers. Students self-reported whether they had entered university directly from school or entered via the special admissions program. In New Zealand, anyone over the age of 21 can attend a university, but if they have not gained automatic entry from high school, most enter a special admissions program to prepare them for university-level study. The questionnaire also measured student motivation, grit, self-concept, and self-regulation.

Motivation. Motivation was measured using the Academic Motivation Scale (AMS; Vallerand, Blais, Brière, & Pelletier, 1989). This scale has adequate reliability ($\alpha = .81$) and measures student intrinsic, extrinsic, and amotivation in relation to why the student attends a university. Intrinsic motivation is measured using three subscales: intrinsic motivation to know, intrinsic motivation toward accomplishments, and intrinsic motivation to experience stimulation. Intrinsic motivation to know relates to student curiosity and intrinsic intellectuality, (e.g., "Because I experience pleasure and satisfaction while learning new things"). Intrinsic motivation toward accomplishments relates to student mastery of skills and wanting to feel competent, (e.g., "For the pleasure I experience while surpassing myself in my studies"). Intrinsic motivation to experience stimulation relates to engaging in an activity in order to experience sensations such as sensory pleasure, excitement or fun, (e.g., "For the pleasure that I experience when I read interesting authors"). Extrinsic motivation also consists of three subscales: external regulation, introjection, and identification. External regulation relates to behavior engendered through external sources such as rewards and controls, (e.g., "In order to obtain a more prestigious job later on"). Introjected regulation relates to students being motivated to perform in a particular way based on

previous experience, (e.g., "To prove to myself that I am capable of completing my university degree"). Identification is regarded as the highest form of extrinsic motivation and relates to the student internalizing his or her extrinsic motivation, (e.g., "Because eventually it will enable me to enter the job market in a field that I like"). Finally, amotivation measures feelings of lacking competence and controllability, (e.g., "Honestly, I don't know; I really feel that I am wasting my time at [the] university"). There are four items for each subscale measured on a 5-point Likert scale ranging from 1 = Does not correspond at all (to me) to 5 = Corresponds exactly.

Grit. The Grit Scale (Duckworth, Peterson, Matthews, & Kelly, 2007) contains 12 items that measure student long-term interest in, and effort towards, goals. The Grit Scale has good internal consistency ($\alpha = .85$) and has been shown to predict success in academic areas over and above measured intelligence. The Grit Scale contains items that relate to long-term interests (e.g., "I often choose a goal but later choose to pursue a different one" reverse scored) and perseverance (e.g., "I have overcome setbacks to achieve an important challenge"). All items on the Grit Scale were measured in a 5-point Likert scale ranging from 1 = Does not correspond at all to 5 = Corresponds exactly.

Self-concept. Self-concept was measured by including the mathematics, verbal, problem solving and academic subscales of the Self-Description Questionnaire III (SDQ-III; Marsh & O'Neill, 1984) designed to measure student self-concept at the tertiary level. Each subscale has 10 items, with 5 items worded positively and 5 negatively. The scale has good reliability ($\alpha = .89$). Mathematics self-concept relates to perceptions of competence in mathematics, (e.g., "I find many mathematics problems interesting and challenging"). Verbal self-concept relates to perceptions of competence in language skills, (e.g., "Relative to most people, my verbal skills are quite good"). Problem-solving self-concept relates to perceptions of competence with solving problems, (e.g., "I enjoy working out new ways of solving problems"). Finally, academic self-concept concerns ideas about all academic subjects, (e.g., "I am good at most academic subjects"). All items on the SDQ-III were measured on a 6-point Likert scale ranging from 1 = False to 6 = True.

Qualitative Measures

Two forms of qualitative data were collected. First, data were collected during individual semi-structured interviews with students. The interview questions were designed to explore more deeply the psychosocial characteristics of the high-achieving participants. One example is, "What are the factors that have enhanced/hindered your learning experiences?"

Table 1
Coding Themes

Enhancing psychosocial factors	Limiting psychosocial factors
Optimal motivation <ul style="list-style-type: none"> • Increased self-efficacy • comes with success • Scholarships applied for • Taken leadership role 	Low motivation <ul style="list-style-type: none"> • Hated school, left as soon as possible • Failed preferred course entry
Productive mindset <ul style="list-style-type: none"> • Vision for a better future 	Unproductive mindset <ul style="list-style-type: none"> • Just leave school and have a family
Developed psychological strength <ul style="list-style-type: none"> • Resilience • Grit • Hard working 	Low level of psychological strength <ul style="list-style-type: none"> • It was just too hard
Developed social skills <ul style="list-style-type: none"> • Organizational skills • Collegial collaborative work ethic 	Poor social skills <ul style="list-style-type: none"> • I just didn't fit in socially
Enhancing chance factors	Limiting chance Factors
Educational enhancers <ul style="list-style-type: none"> • Identified as gifted and offered extension pathways • Great lecturers/tutors • Positive peer group support • Second option opened new opportunities and interests • University Entrance qualification • Loved school – positive school experiences • Previous positive tertiary experiences 	Educational delimiters <ul style="list-style-type: none"> • Negative school experiences • Early exit from school • Bullying • Transience • Low teacher expectations • Boring course content • Failed entry into course of choice • Lack of challenge • Part time study
Financial enhancers <ul style="list-style-type: none"> • University Scholarships • Student loan scheme • Student allowance • Affluent parents • Paid employment 	Financial delimiters <ul style="list-style-type: none"> • Living in or from low Socio- economic group • Children to support • Need to work whilst studying • Mortgage to pay
Social enhancers <ul style="list-style-type: none"> • Positive family influences • Positive prior work experiences • Positive overseas travel and work experience 	Social delimiters <ul style="list-style-type: none"> • Unsupportive parents • Unsupportive partner • Abandoned by parents • Abusive relationships/ environment
Cultural enhancers <ul style="list-style-type: none"> • Strong identification with ethnic origins • Speaker of Te Reo (Maori) or other language of ethnic origin • Not first in family to attend university 	Cultural constraints <ul style="list-style-type: none"> • Under-represented group (Female, mature aged, ethnic minority, special admissions pathway) • First in family to attend university

A follow-up focus group assessed students' perspectives of the value of the project. In addition, a follow-up survey from a random selection of participants ($n = 27$) collected data on the detail of participation in the program, opportunities, and their worth.

Procedures

Permission to conduct the study was obtained from the Human Participants Ethics Committees of each institution. The program was then introduced to talented undergraduates who agreed to participate. The program remained as in Phase 2, that is, students were sent a congratulatory letter, and they were invited to attend a celebratory morning tea, to attend seminars and postgraduate workshops, to act as mentors for other undergraduate students, and to apply for summer scholarships to work alongside an academic on a research project. Interviews were carried out once the program was underway, and the focus group was conducted following completion of the project.

Data Analysis Design

Means were calculated for the quantitative measures, and, using independent t -tests and ANOVAs, these were examined for specific groups to ascertain differences. Means were also used to examine the responses of participants compared with the original means developed for each scale where these were available. This enabled comparison between our high-achieving tertiary group and groups of students who were participants when the scales were originally employed. This methodology was selected because the study was cross-sectional, and so there were no other groups in the study with whom the questionnaire responses could be compared. Comparing the results with the groups involved in the original scale validation provided some basis for determining whether the participants had means that were similar to, above, or below those of the original groups and, therefore, could provide some indication of which psychosocial variables may be worth fostering in other students.

The qualitative data were analyzed using a theoretical framework developed from Subotnik et al. (2011) that identified enhancing or delimiting psychosocial or chance factors that participants perceived affected their participation and performance in their undergraduate studies. A coding framework was developed from this theoretical framework. Two broad themes—enhancers and delimiters to talent development—were identified, and these were further divided to identify psychosocial or chance factors that impacted talent development (Table 2).

Results

Quantitative Analysis

The quantitative data were analyzed in two ways. First, where possible, the means for our sample were compared with the means in original validation studies for each instrument. This enabled us to assess whether or not our participants held differing beliefs from those in the original validation studies. That is, the beliefs of high-achieving students were able to be compared with other groups of students who were not necessarily high achievers. Second, we examined our data by comparing groups within our sample in order to see if there were differences in beliefs between specific groups.

Comparisons with Means for the Original Validation Studies

Where means were provided for the original scales, independent t -tests were calculated in order to determine differences between the students in the current study and those in the validation studies. Means and standard deviations for those scales for which they were available and for the current sample may be found in Table 2.

In terms of motivation, there was a statistically significant difference between the two groups for amotivation ($t = 5.44$; $p < .001$), introjected regulation ($t = 7.66$; $p < .001$), identified regulation ($t = 18.27$; $p < .001$), intrinsic to know ($t = 19.01$; $p < .001$), intrinsic to accomplish ($t = 12.79$; $p < .001$), and intrinsic for stimulation ($t = 10.12$; $p < .001$). There was no statistically significant difference between the groups for external regulation. For all statistically significant differences, the means for the high-achieving students were greater than those of the original samples, and, particularly for intrinsic motivation, these differences were large. Hence, the talented students were more amotivated, more extrinsically motivated (introjected and identified regulation), and much more intrinsically motivated than the students in the validation studies.

In relation to the 12-item Grit Scale, Duckworth et al. (2007) provided means for several groups used in the validation of the scale. We used the group mean from Duckworth et al.'s study that most closely reflected our high-achieving group, Ivy League undergraduates. The students in Duckworth's study scored in the top 4% of undergraduates entering their university and hence were similar to the students in the current study. There was a statistically significant difference in grit scores for our participants compared to the Ivy League undergraduates, ($t = 4.87$; $p < .001$). Our participants showed higher levels of grit than the original sample.

Table 2
Means and Standard Deviations for a Contrast Group and the Current Participants

Scales	Contrast group		Current sample	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Amotivation	.95	.58	1.17	.45
External regulation	3.11	.72	3.17	.99
Introjected regulation	2.42	.83	3.17	1.09
Identified regulation	3.13	.54	4.19	.64
Intrinsic motivation– knowledge	2.81	.54	4.09	.75
Intrinsic motivation – accomplishment	2.39	.74	3.55	1.01
Intrinsic motivation- stimulation	1.86	.79	2.76	.97
Grit	3.46	.61	3.67	.48
Mathematics self-concept	3.94	1.22	3.87	1.19
Verbal self-concept	4.13	.79	4.62	.74
Problem solving self-concept	4.03	.69	4.20	.75
Academic self-concept	4.19	.76	4.84	.65

The third component of the questionnaire related to mathematics, verbal, problem solving, and academic self-concept (Marsh & O'Neill, 1984). Means were not provided in Marsh and O'Neill's (1984) article, so we were unable to compare the means from that study with our own. However, in another New Zealand study (Rubie-Davies & Lee, 2012), a random sample of 929 undergraduate students completed the SDQ-III. Hence, because the students were New Zealand undergraduates, we used their means to compare with the current sample. There were statistically significant differences between the two groups for verbal self-concept ($t = 7.377$; $p < .001$), problem solving self-concept ($t = 2.52$; $p = .006$) and academic self-concept ($t = 11.14$; $p < .001$). There was no statistically significant difference between the two groups for mathematics self-concept. In all instances of statistically significant difference, the means for the current group were higher than those in the Rubie-Davies and Lee study (2012).

The final scale was the SRQ (Miller & Brown, 1991). Miller and Brown did not provide means and standard deviations in their validation document. They did provide ranges that indicated high, medium, and low levels of self-regulation. According to their criteria an overall mean of 4.38 for our group of students would indicate medium levels of self-regulation.

Overall, through examining the means for this high-achieving group versus those for students in the original studies, the psychosocial characteristics of high-achieving students were revealed. The high-achieving students showed more extrinsic motivation than the contrast groups and were more intrinsically motivated on all scales. They also showed more grit even though the validation group was also high-achieving. Further, the high-achieving group had more confidence in their verbal, problem-solving, and overall academic abilities than a random sample of New Zealand tertiary students.

Comparisons by Group

A series of one-way analyses of variance (ANOVA) were carried out in order to ascertain any demographic differences among the high-achieving students. Where there were more than two groups, post hoc Tukey tests were employed: Tukey HSD tests where group numbers were similar and Tukey-Kramer tests where the group numbers were unequal. Because a large number of tests were carried out across the 13 factors from the four scales, only those that were statistically significant are presented below. Some caution is needed in the interpretation of the results given a large number of tests on the same data and the increased probability of a Type I error. Because of the possibility of a Type I error being responsible for statistically significant differences rather than any true differences in the data, effect sizes were also calculated. Effect sizes using Cohen's d provided an indication of the meaningfulness of the difference between means as defined by Cohen (1988, p. 22).

Sex. There was a statistically significant difference between males and females for academic self-concept ($F(1,122) = 5.69$, $p = .02$, $d = .65$) and problem solving self-concept ($F(1,122) = 5.53$, $p = .02$, $d = .65$). In both cases the differences were large. Males showed higher levels of problem-solving and academic self-concept.

Ethnicity. Because the numbers of Māori (the indigenous group) and Pasifika students (those originating from the Pacific Islands) were low, their data were combined for the purposes of analyses. Similarly, the group "Other" was combined with the Asian group. There were no statistically significant differences in the self-beliefs of students by ethnic group.

Age. Students' beliefs were compared by age group bracket (<20 years, 20-26 years, >26 years). There was a statistically significant difference between

the oldest and youngest students in terms of external regulation ($F(2,122) = 5.62, p = .005, d = .71$). The post hoc Tukey test showed that the youngest students were more externally regulated than the oldest students ($p = .007$), and the effect size was large.

Admission. Student beliefs were compared by admission criteria. Students who gained entrance to the university through school achievement showed more external regulation than students who came in through the special admissions program ($F(1,111) = 7.61, p = .007, d = .58$). Conversely, special admissions students scored more highly on the grit scale than did those who entered the university through their academic achievement ($F(1,111) = 4.74, p = .03, d = .49$). Both these differences constituted a medium effect size.

Program. The beliefs of students depending on their program (education, science, conjoint/other) were compared. There was a statistically significant difference in intrinsic motivation to accomplish ($F(2,120) = 3.62, p = .03, d = 1.06$). The post hoc test showed that this difference was between the conjoint and science students ($p = .02$). Conjoint students were far more motivated by accomplishment than were the science students, and the effect size was very large. There was also a statistically significant difference between the groups in amotivation ($F(2,120) = 5.24, p = .007, d = .57$). The science students were more amotivated than the education students ($p = .005$).

University sites. Students' beliefs were compared according to the university they attended. There was a statistically significant difference between the groups for amotivation ($F(2,119) = 3.62, p = .03, d = .51$). The students from the science department were more amotivated than the students from the large education department ($p = .03$), and the effect size was medium. However, particular caution is needed in interpreting this result since it is more likely a reflection of the different programs that the students in the science department (science and conjoint) were enrolled in, as compared to those from education.

Semi-Structured Interviews

The 55 interview transcripts were coded using a framework developed from Subotnik et al.'s (2011) model of talent development (Table 1). The transcripts were independently coded by two research assistants who had not been involved in the data gathering process. Twenty-three transcripts were coded by both research assistants, and 100% agreement was reached

regarding coding according to enhancing and delimiting chance and psychosocial factors (Table 3).

Enhancing Chance Factors

Participants from the education departments frequently mentioned family as important in either supporting or driving their learning: "And my children are absolutely ecstatic. They are so proud of me and really encouraging. And it's like I can't let them down now."

The students from all three sites mentioned the positive impact of lecturers, tutors, and having a study plan as factors that enhanced their learning: "Most of the lecturers will let you talk to them whenever you need help. You just email them and most of them will email you back real fast." Peer mentoring opportunities at the science department were acknowledged as supporting participants' own learning:

But one of the things I enjoyed about one of my peer mentoring classes was one aspect of first year chemistry I struggled with, but I remembered how I best learned it so I tried to teach it the same way to them ..., and I felt really good about that.

Delimiting Chance Factors

Factors that were described as limiting success were diverse.

Participants from the education departments noted the lack of family support and financial constraints: "... [M]y mum wasn't there; she had left when I was eight and I thought she would come back; she didn't come back so we [me and my sister] just raised ourselves."

Another student was a mother who worked 35 hours per week in two part-time jobs, as well as studying full-time. Participants also mentioned institutional factors they believed hindered their learning. Examples from the two education departments included repetition of course content, lack of feedback on their assignments, the experience of being let down by their peers in group assignments, and feelings of isolation in a very big institution. Participants from the science department mentioned having too many assignments due in the same week, large class sizes in the first year, lecturers who were not able to teach effectively, and "partying too much."

Table 3
Number of Coded Chunks of Interview Text

Enhancing factors		Delimiting factors	
Psychosocial factors	Chance factors	Psychosocial factors	Chance factors
331	265	62	166

Enhancing Psychosocial Factors

Possessing optimal motivation, grasping opportunities, having a productive mindset, and developing good social skills were attributes displayed by all of the participants. Students from all sites described themselves as hardworking and resilient with high expectations of themselves:

I have high expectations of myself. I am a conscientious person who loves learning new things. I love getting A's. I enjoy exams. I like a challenge. I put in the hard yards.

Attitudes such as these were sometimes in contrast to their pre-tertiary experiences, for many of the high-achieving students' stories were previously shaped by feelings of failure. Many of the students from the education departments had left school prematurely before completing university entrance qualifications: "I didn't finish 6th form [Grade 11], I left to do home schooling." Others had attempted a tertiary qualification, but had not completed it: "I'm a mature student. So I have a family. I have two children at primary [elementary] school. I'm married. I attempted a degree when I was 18. I deferred in my third year." All of the students from the science department had achieved university entrance at school. Half of the students had completed a pre-specialist year of study, but they had not gained sufficient marks to continue in the highly competitive specialist field of study. The majority of these participants were completing a double major and were enrolled in either the second or third year of a four-year degree: "I'm doing zoology and ecology at the moment; I tried to do [specialized course] last year and missed out by like point three, which is a bit gutting."

These comments support the findings of the quantitative data which showed that high-achieving tertiary students in the current sample showed resilience and grit in setting and achieving their long-term goals, enabling them to persist and achieve success in the tertiary academic environment. Further, the students also seemed highly motivated to complete their current academic studies with high grades.

Post-Program Focus Group

"Recognition" was most appreciated by this group; they commented that the letter they received acknowledging their high achievement had kept them striving to achieve. Their families also appreciated the program. One student reported submitting four late assignments after her Poppa died and that her mother was concerned that she may be dropped from the

program as a result. The participants described feeling more comfortable about seeing themselves as "top achieving students." Their identification as such reinforced their self-belief, and they reported that they were now more willing to share work and help others. Focus group participants believed that the program had built collegial relationships within the course: "So I think it was interesting seeing other people who also had a personal like intrinsic motivation to want to do well."

Following their involvement in the study, most had begun to think about postgraduate study. One student completing her undergraduate program had already enrolled for an Honors degree, and she said, "The interview [in the study] was the deciding factor."

Post-Program Survey

A small group of randomly recruited participants ($n = 27$) responded to a final survey to evaluate the program. This provided a means of verifying responses from the focus group. Participants were asked if they had enjoyed their involvement in the study; 96.3% responded that they had. Participants were asked if they had attended any of the professorial addresses or seminars. Only 27% had taken advantage of this opportunity: "I found these to be motivating and encouraged me to think of what else I want to achieve, and where I see myself in the future." Students were asked whether, as a result of the program, they were now intending to continue to postgraduate study, and 76.2% agreed: "I plan on completing my masters specializing in an area such as dyslexia, gifted and talented-ness, twice exceptionalism. I want to move into the area of research and specialist programs at some time in my career."

Discussion

This paper explored the characteristics of high-achieving students and investigated whether a low-cost program was associated with positive benefits for students. Both the quantitative and qualitative data suggested that the high-achieving students were highly motivated, (particularly in regards to intrinsic motivation) and showed high levels of grit. Males also reported higher levels of problem solving and academic self-concept than females. These characteristics provide some clues as to the types of social-psychological traits that should be being fostered in universities in order to encourage success among all students.

Overall, the quantitative data showed that the high-achieving students were highly motivated intrinsically, characteristics which are likely to lead to them putting regular effort into their studies (Vallerand, Blais, Briere, & Pelletier, 1989). The qualitative data showed

that they were keen to learn and to master skills and that they gained pleasure from learning. They viewed a university qualification as a means of entering their chosen profession. The qualitative data also showed evidence of many participants having overcome significant personal difficulties. The students themselves reported being conscientious, having high expectations of themselves, and enjoying the challenge of learning. Interestingly, the quantitative data showed that amotivation was higher among these students than among the sample used for validating the scale (Vallerand et al., 1989). Several of the science students had entered the university with the intention of studying a particular specialist course, but having completed a preliminary first year, had not achieved the necessary grades in order to continue in the course. It may have been that these students had become amotivated as a result; they were unable to pursue their original goal, and so they may have been unsure of an alternative career. This was reinforced by the finding that science students were higher on amotivation as compared with education students.

The students reported high levels of grit—higher even than found for Ivy League students in the United States (Duckworth, et al., 2007). Several of the education students were mature students who had entered their course via the special admissions program and these students showed higher levels of grit than their younger counterparts who entered university directly from school. For many of these students, their enrollment in their teacher education program was a second chance and may have led to high levels of determination to complete their courses. Several reported their desire to make a difference to their families' lives and the pride that their success was engendering in their families. A desire to please their families, coupled with high grades, may have fostered strong ambitions to continue their success. Further, many of these students reported not having achieved at high levels in their previous schooling; some had been in tertiary education several years previously. Many experienced debilitating chance factors, yet somehow managed to develop sufficient resilience and determination that enabled them to achieve within the top 10% of their cohort despite ongoing challenging personal circumstances. These participants demonstrated strong psychosocial self-beliefs: they grasped opportunities, had strong self-beliefs, exhibited good social skills, and displayed optimal motivation (Subotnik et al., 2011). Many had set themselves challenging long term goals and were striving to maintain very high levels of achievement despite the existence of limiting chance factors. Conversely, the youngest students who entered university directly from school demonstrated higher levels of external regulation than the more mature students who came through the special admissions program. It seemed that the younger students were more

interested in moving into a well-paid, prestigious job following graduation. The older students were more focused on making their families proud and on making a difference in their communities. These results point to the need to foster student motivation (particularly intrinsic motivation), determination, and self-belief in order to increase achievement among all students.

A further finding from the quantitative data was that male students reported higher levels of academic and problem-solving self-concept. Similar findings have previously been reported among adult males compared to females, and Marsh (1989) proposed that these differences reflected gender stereotypes. It is important that at the tertiary level, teachers need to be aware of possible gender stereotyping, especially in the STEM (science, technology, engineering and math) fields where females are underrepresented and are often not made welcome (Xu, 2008).

A second purpose of the study was to evaluate students' perceptions of the effectiveness of the program. Although the program was easy to implement and was low-cost, it was important to determine if students had found it useful in contributing to supporting their studies. Multiple benefits were reported by the participants. The most highly appreciated aspect of the program was the simple recognition of their high achievement, as this was not something they felt had been acknowledged previously at the tertiary level. These findings support the findings from Phase Two (Millward et al., 2016), where students expressed surprise at their identification as high-achieving. It appears that not only were staff unaware of who the high-achieving students were in their departments, but the students themselves were not aware of the extent of their own academic prowess.

Participants sought opportunities to continue to grow and develop, and they were keen to continue to be informed of departmental seminars. The seminars provided valuable opportunities for the most capable students to be exposed to leading edge research, again providing opportunities for talented students to grasp developmental opportunities (Subotnik et al., 2011) and also providing the students with exposure to postgraduate opportunities. These opportunities increase the developmental opportunities for students with high levels of motivation, grit, and strong self-belief, and we encourage university departments to consider them.

Mentoring other undergraduate students provided the high-achieving students with opportunities to consolidate their own learning in key academic areas. Using capable students in this way benefits undergraduate students and academic staff. The high-achieving students exhibited a strong drive to maintain and extend their performance (Subotnik et al., 2011) and requested more feedback from the academic staff

so they could continuously improve. This simple strategy of providing mentoring opportunities and possibly opportunities to be mentored was reported as being beneficial, and other university departments are encouraged to facilitate these opportunities.

Limitations

This study used grades to identify high-achieving students, but we acknowledge that other criteria for inclusion might be appropriate. The size and design of the study means it is not possible to attribute causation or generalize from the findings. The results showed that the education students often had quite different views to those of the science students, and this may also be the case with other university departments. The findings and the effectiveness of the program pertain most to departments or schools where currently no assistance is offered to support high-achieving students.

Conclusion

Overall, it appeared that the program was appreciated by participants and encouraged them to consider future postgraduate study. The success of this program, first across one institution and now across three, signals its viability and usefulness. Departments in other universities may find this program a low cost, effective strategy in identifying and providing support for their high-achieving undergraduate students.

References

- Abeysekera, I. (2008, November). *Researching gifted and talented in tertiary education: Issues and directions*. Paper presented at the Australian Association of Research in Education Conference, Brisbane. Retrieved from <http://www.aare.edu.au/08pap/abe08844.pdf>
- Blackwell, L. S., Trzesnewski, K. H., & Dweck, C. S. (2007). Impact theories of intelligence predict achievement across an adolescent transition: A longitudinal study and intervention. *Child Development, 78*, 246–263. doi:10.1111/j.1467-8624.2007.00995.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*, 1087–1101. doi:10.1037/0022-3514.92.6.1087
- Dweck, C. S. (2009). Can we make our students smarter? *Education Canada, 9*(4), 56–6.
- Garrett, L., & Rubie-Davies, C. M. (2014). Talented tertiary students: A largely 'forgotten' group within the tertiary sector? *International Journal of Teaching and Learning in Higher Education, 26*, 78–89.
- Marsh, H. W. (1989). Age and sex effects in multiple dimensions of self-concept: Preadolescence to early adulthood. *Journal of Educational Psychology, 81*, 417–430.
- Marsh, H. W. (1987). The big-fish-little-pond effect on academic self-concept. *Journal of Educational Psychology, 79*, 280–295. doi.org/10.1037/0022-0663.79.3.280
- Marsh, H. W., & O'Neill, R. (1984). Self-description questionnaire III: The construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement, 21*, 153–174.
- Marsh, H. W., & Yeung, A. S. (1997). Causal effects of academic self-concept on academic achievement: structural equation models of longitudinal data. *Journal of Educational Psychology, 89*, 41–54.
- Miller, W. R., & Brown J. M. (1991). Self-regulation as a conceptual basis for the prevention and treatment of addictive behaviors. In N. Heather, W. R. Miller, J. Greeley (Eds.) *Self-control and the addictive behaviours* (pp. 3–79). Sydney, AU: Maxwell Macmillan.
- Millward, P., Wardman, J., & Rubie-Davies, C. (2016). Becoming and being a talented undergraduate student. *Higher Education Research & Development, 35*(6), 1242–1255.
- Moltzen, R. (2008). *Roger Moltzen - Tertiary teaching excellence profile. Ako Aotearoa Academy of tertiary teaching excellence community*. Retrieved from <http://ako.aotearoa.ac.nz/community/ako-aotearoa-academy-tertiary-excellence>
- Rubie-Davies, C. M., & Lee, K. (2012). Self-concept of students in higher education: are there differences by faculty and gender? *Educational Studies, 39*, 56–67. doi:10.1080/03055698.2012.671513
- Subotnik, R. F., Olszewski-Kubilius, P., & Worrell, F. C. (2011). Rethinking giftedness and gifted education: A proposed direction forward based on psychological science. *Psychological Science in the Public Interest, 12*, 3–54. doi:10.1177/1529100611418056
- Vallerand, R. J., Blais, M. R., Briere, N. M., & Pelletier, L. G. (1989). Construction and validation of the Motivation Toward Education Scale. *Canadian Journal of Behavioural Science Revue Canadienne, 21*, 323–34
- Xu, Y. J. (2008). Gender disparity in STEM disciplines: A study of faculty attrition and turnover intentions. *Research in Higher Education, 49*, 607–624. doi:10.1007/s11162-008-9097-4

PAM MILLWARD is in the School of Learning, Development, and Professional Practice, Faculty of Education and Social Work, The University of

Auckland. Correspondence concerning this article can be sent to Pam Millward, Private Bag 92019, Auckland 1150. Email: p.millward@auckland.ac.nz.

CHRISTINE RUBIE-DAVIES is in the School of Learning, Development, and Professional Practice, Faculty of Education and Social Work, The University of Auckland.

JANNA WARDMAN is in the School of Learning, Development, and Professional Practice, Faculty of

Education and Social Work, The University of Auckland.

Acknowledgements

AKO Aotearoa supported this project through a Regional Hub Project Funding Scheme grant to the third author. A report written by the authors and colleagues from the other two institutions involved in the project was published by AKO Aotearoa (2015). The current article has been extensively revised and rewritten for publication.