Does Paired Mentoring Work? A Study of the Effectiveness and Affective Value of Pairing Students Aged 16 with Undergraduate Students in England

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Abstract

Within England there is a growing aim to improve the lives of secondary school students who are defined as disadvantaged as well as supporting these students' attainment and improving their attitudes towards secondary school science. This project was designed to support disadvantaged students who were taking their compulsory public General Certificate of Secondary Education (GCSE) science examination in their final year of secondary education in England (Year 11 – aged 15 to 16) by pairing them with undergraduate mentors from a university. The study, set up as a randomized control trial, involved 86 disadvantaged students across four secondary schools with half being involved in the intervention and half in the control – drawing on an inter and intra school comparison. The mentoring lasted for 23 weeks with an intensive six-hour mentoring session just prior to their GCSE examinations. Data was collected from the Year 11 students' mock and actual GCSE examinations results as well as questionnaires from both Year 11 and undergraduates. The results found that mentored students did statistically better in terms of their attainment both in mock and actual GCSE examinations as well as a statistically greater improvement in their attitudes to science than un-mentored students. These findings demonstrate the impact and value of academically asymmetrical paired mentoring projects.

Keywords: *Paired Mentoring; attitudes; summative assessment; secondary school;*

1. Introduction

In England there is a growing need to improve the lives of disadvantaged students where their secondary schools obtain additional funding to ''to raise the attainment of disadvantaged pupils of all abilities and to close the gaps between them and their peers'' [1]. In England, a student is classified as disadvantaged if they are:
Pupils in year groups reception to year 6 recorded as Ever 6 FSM [eligible for free school meals (FSM) in any of the previous 6 years]: Pupils in years 7 to 11 recorded as Ever 6 FSM: Looked-after children (LAC) defined in the Children Act 1989 as one who is in the care of, or provided with accommodation by, an English local authority: Children who have ceased to be looked after by a local authority in England and Wales because of adoption, a special guardianship order, a child arrangements order or a residence order [2].
There have been numerous government initiatives to widen participation and increase the number of students continuing onto science related courses at further and higher education level. This need is greater, however, with regards to Pupil Premium students in comparison to their wealthy peers with statistics showing that the formers are far less likely to obtain high marks in their GCSE results [3] whereas the latter are twice as likely to pursue higher education [4]. Additional funding has been given to schools in order "to raise the attainment of disadvantaged pupils and close the gap between them and their peers" [3]. There has not been any specific initiative to address that issue of raising disadvantaged students' attainment in GCSE exams aiming, at the same time, to improve their attitudes towards studying post compulsory science and pursuing a science career.

Over the last 40 years, educators have examined strategies to improve and benefit the learning environment for all students of all backgrounds – and especially those whose background is deemed as disadvantaged. These approaches aim to either improve academic performance or help students develop skills and positive attitudes. Inherent in much of the literature available on these strategies is an acknowledgement of the multiplicity of the terms used which is indicative of the intended outcome (academic improvement or attitude development) and the relationship between the students and the person who acts as the helper. Whilst we recognize the variation in the terminology used in the

literature we believe that the most appropriate term to describe the relationship between a more experienced individual and a less experience one is that of 'mentoring' which includes helping mentees prepare for and achieve academic advancement (which is actually the focus of peer-tutoring) whilst at the same time mentees can also benefit from the mentors' help in developing an awareness of resource availability (which is what the role of a sponsor is all about). We generally use the term mentoring here to refer to all the one-on-one or small group teaching activities in which a more experienced individual tutors a less experienced or younger student.

1.2 Mentoring: Its role and benefits

The cognitive processes involved in such a mentoring relationship have been investigated by various authors over the years and many of them have emphasized the value of the verbal communication and questioning [5]. The mentoring relationship could be more fully understood through a social and cultural constructivist view of cognitive development [6]. In this sense, it could be seen as an exploration through social interaction with a more knowledgeable and experienced person within the mentee's zone of proximal development (ZPD). Vygotsky defined the ZPD as "[t]he distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" [7].

Although the ZPD was developed as a way of viewing what children are coming to know, Vygotsky also noted that students become able to solve problems beyond their actual development level if they are given support and guidance in the form of prompts or leading questions from someone more advanced. We suggest that this more advanced individual could be a mentor whose help and support could make students able to internalize the new information and become more able to perform independently in a next similar situation. The student accesses knowledge and expertise through the mentor, whose role is more that of a facilitator rather than that of a teacher [8]. This view of mentoring focuses on a communicative nature of learning in which advancement is achieved through one-on-one communication and negotiation between the mentor and the mentee. In comparison to other, more traditional approaches paired mentoring enables students to become more actively involved in the teaching by having greater ownership of the learning process with opportunities to respond, make errors and be corrected being high. In Tinto's words: "Students who are actively involved in learning, that is who spend more time on task especially with others, are more likely to learn, and in turn, more likely to stay." [9].

1.3 Rationale of the programme

Although there is evidence in the literature regarding the effectiveness of mentoring programmes, most of such initiatives implemented in the past were self-evaluated by the participants (mentors, mentees and programme coordinators) with corroborative data not being available in terms of their effectiveness in improving academic skills and educational prospects of students [10]. Similarly many of the studies on the effectiveness of mentoring and tutoring projects for disadvantaged students implemented in the past lack the breadth, depth and rigor of data that would permit conclusions to be drawn in comparison with other types of educational interventions [9].

2. Methodology

The study was set up as a randomised control trial and involved 86 Pupil Premium students. These were students from low-income families who are eligible for free school meals, or had been looked after for more than six months, or whose parent(s) are currently in the Armed Forces. Four school were recruited. The schools were similar in terms of the proportion of free school meals, GCSE 5A*-C measures and value-added performance to reduce the likelihood of any effect being attributable to factors other than mentoring.

Secondary school students were recruited from four different schools and were randomly assigned to either the experimental or control group with half in each group. The secondary school students in the experimental group were mentored for one hour per week for 23 weeks up until their GCSE examinations with an additional intensive six hour mentoring session just prior to those examinations. Data were collected from the Year 11's target (predicted grades) and actual GCSE examination results as well as questionnaires from Year 11 on their attitudes towards science.

3. Results

Using the test for independent samples, it was found (see Figure 1) that students who were mentored achieved better in their GCSE examinations (M = 5.95, SE = .143) than predicted and also outperformed those in the control group (M = 5.30, SE = .161). The difference was significant t (78) = −2.67, p < 0.001 and the difference, according to Cohen [11] guidance, represented a medium-sized effect (r = .3).
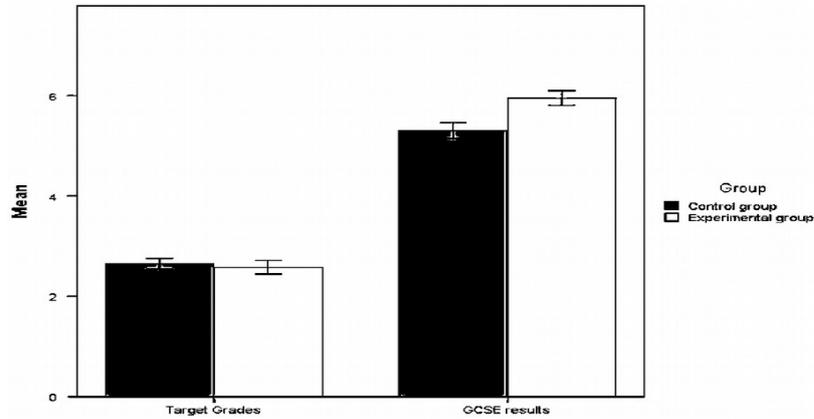

Figure 1: Means of target/predicted and GCSE exam grades in science for both groups.

The students who were mentored (experimental group) also showed a statistically significantly greater improvement in their attitudes towards science than un-mentored students. A dependent t-test was used to compare the two means of attitudes coming from the experimental group before and after students had been mentored. This approach was adopted to examine whether, except from any differences in students' achievement, there was any impact of the mentoring in terms of their attitudes towards science.
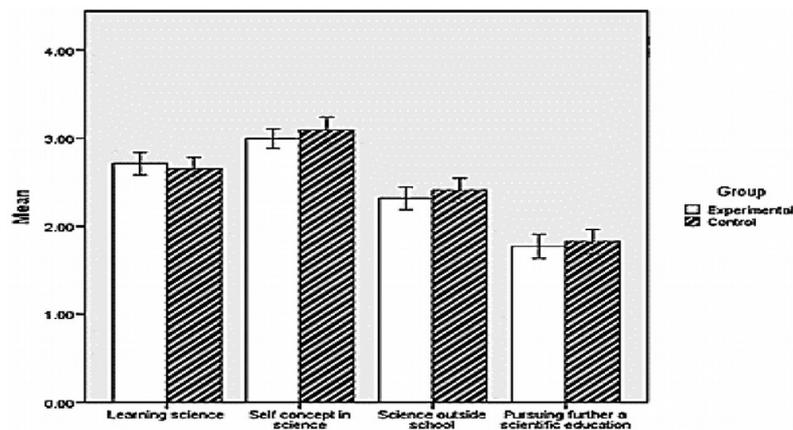

Figure 2: Pre-intervention students' attitudes towards science from both groups

Figure 2 presents the results of the comparison between the control and experimental group before the intervention, while Figure 3 shows the pre and post intervention for mentored students' attitudes towards science. The results from the statistical analysis of the data are shown in Table 1.
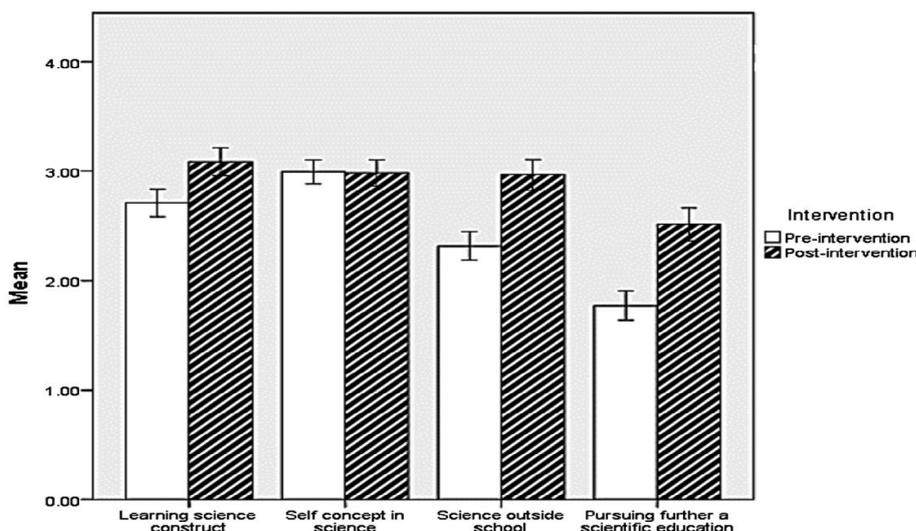
Figure 3: Post-intervention mentored students' attitudes towards science.

Attitude construct	Pre-and post-intervention	Means	Standard deviation	*t*-test	*p*-value
learning science	Pre	2.71	0.79	−2.25	0.031
	Post	3.09	0.78		
self-concept in science	Pre	2.99	0.69	0.07	0.946
	Post	2.98	0.73		
science outside school	Pre	2.31	0.80	−3.46	0.001
	Post	2.97	0.84		
Pursuing further a scientific education	Pre	1.77	0.84	−3.6	0.001
	Post	2.51	0.93		

note: a *p* value of less than 0.05 was considered statistically significant.

Table 1: Means, standard deviation, *t* and *p*-value for the experimental group pre- and post-intervention.

4. Conclusion

In conclusion, the findings demonstrate the value of academically asymmetrical paired mentoring for disadvantaged students within secondary school science. The impact of the intervention was that in its entirety, statistically significant both in terms of increased academic attainment and in terms of attitudes towards science.

For school teachers and university lecturers, there is a potential exciting challenge of how to maintain and encourage such partnerships to benefit all students and not only those who are disadvantaged.

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