Abstract

Male students tend to value achievement only when effortless. In many school subjects this ‘effortless achievement’ leads to male underachievement. In other subjects, like Dutch physics education, male students still achieve higher grades than female students while working much less for it.

In a large scale quantitative study of pre-academic high school physics students, I have compared some definite ‘effortless achievement’ students (*N*=28) with the rest of the male advanced physics students (*N*=987).

The ‘effortless achievement’ students were exceptionally talented while hardly working for it. These students were from schools with significantly more challenging tests. Challenging testing could have a positive influence on the achievement of highly talented male students, presumably by providing these students with feedback on the accuracy of their physics knowledge, which they lack through other (home)work.

Introduction

'Whatever you do, you will never get them to work', a teacher's lament concerning male physics students (Cottaar, 2012). Some male students only value effortless achievement. Jackson (2002) called this attitude ‘laddishness’ and associated it with a combination of 'self-worth protection' and 'avoiding to be seen as feminine'. In many school subjects, this leads to male underachievement in comparison with female students (Dutch Advisory Council for Education Strategies, 2009; Jackson & Dempster, 2009; Kristjana & Sigrun, 2012; Younger, Warrington, & Mclellan, 2002).

In other subjects, like high school physics in the Netherlands, males still achieve more than females in spite of their low effort (Cottaar, 2012; Meelissen & Drent, 2009). Therefore I propose that these lessons stimulate the idea of ‘effortless achievement’. And as one of the Dutch physics teachers I interviewed comments: 'These students are potentially able to determine the general work etiquette in the whole class... In general, those (other students) work harder, but achieve less. This is frustrating!'

In a previous study (Cottaar, submitted) I investigated the perceived self-efficacy (people’s beliefs about their capabilities to produce designated levels of performance) relative to physics achievement, the so-called relative self-efficacy. In accordance with the social cognitive theory of Bandura (1994), I defined an optimal level of relative self-efficacy in a group of similar students (e.g. the group of male advanced physics students); this was the level of relative self-efficacy at which the students achieved optimal grades for physics compared to their general capability (relative achievement). I associated a higher level of relative self-efficacy with overconfidence and a lower level with lack of motivation to work for physics. Thus, I could define three self-efficacy groups as shown in Figure 1: lack of motivation, optimal, and overconfident.

2.5% of the male students did not fit in this self-efficacy model: they had an extremely low relative self-efficacy - they hardly worked for physics at all - but they achieved extremely high grades for physics compared to their general capability (left column in Figure 1). These

students are ‘effortless achievement’ personified and I analyzed the data of these students to get to know their characteristics.

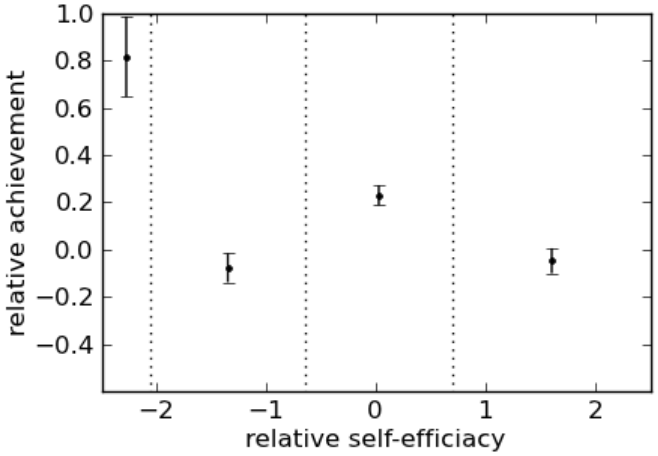

Figure 1

Mean relative achievement for four self-efficacy groups of male advanced physics students: from left to right the groups are called ‘effortless achievement’; ‘lack of motivation’; optimal; and overconfident. The two parameters are standardized over the whole sample of male advanced physics students.

Objectives

My goal was to determine in which aspects of Dutch physics teaching male ‘effortless achievement’ students differ from other male students.

Method

The data are derived from a large scale survey among academic freshmen in science related fields of study, including medical studies, during the academic year of 2008-2009. This survey was conducted in the beginning of the academic year and concerned the students' experiences with physics education in their last two high school years (Cottaar, 2012). All students were in the highest level of education in the Netherlands, both in high school and university. They were around 18 years old at the time of the survey.

In this study, only the advanced physics ‘effortless achievement’ students (N = 28) are compared with other advanced physics students (N = 987). I refrained from using any regular physics data because the number of ‘effortless achievement’ students (N = 8) was to low for reliable statistical analysis. Furthermore, the data of the regular and advanced physics students could not be combined because their exams and their physics education experiences don’t match and cannot be compared reliably (Cottaar, 2012).

I compared the parameters listed in Table 1. Practically all of these were measured through my survey, only ‘difference exam grades advanced physics’ was calculated using the examination data of all Dutch 2008-graduates provided by the governmental institute for inspection of education (Inspectie van het Onderwijs). I refer to my earlier publications for further information about the validity and reliability of the survey questions (Cottaar, 2012;

Cottaar submitted). The 28 ‘effortless achievement’ students have been compared with the rest of the advanced physics sample (N = 1115) using PASW 18.0 independent sample t-tests.

Table 1

Measured parameters included in the different aspects of physics teaching.

Parameters	**scale**
Measures of students' work attitude	
Time invested in physics outside of the lessons *F, P*	minutes per week
Part of mandatory exercises completed *F, P*	0-1; 5 point
Frequency learning for tests through insight *F, P*	never – every lesson; 6 point
Frequency learning by rote for tests *F, P*	never – every lesson; 6 point
Self-evaluation: works hard for physics	not at all – very much so; 6 point
Self-evaluation: being challenged when difficult	not at all – very much so; 6 point
Measures of student's capability and achievement	
General Capability *(*Cottaar, 2012*)*	standardized (μ = 0; σ = 1)
Final exam grades for physics	0-10; 6=satisfactory for graduation
Relative achievement for physics final exam grades physics relative to the student's general capability.	standardized (μ = 0; σ = 1)
Frequency tests passed in high school	never – every test; 6 point
Self-evaluation: being intelligent	not at all – very much so; 6 point
Measures of characteristics of the physics teacher	
Teacher dominant in physics lessons *F, P*	not at all – very much so; 6 point
Teacher perceived as friendly towards student *F, P*	not at all – very much so; 6 point
Teacher perceived as structured *F, P*	not at all – very much so; 6 point
Teacher perceived as enthusiastic *F, P*	not at all – very much so; 6 point
Teacher giving positive (vs negative) feedback *P*	not at all – very much so; 6 point
Teacher and class understand each other *F, P*	not at all – very much so; 6 point
Teacher perceived as mastering profession *F, P*	not at all – very much so; 6 point
Teacher perceived as consequent (predictable) *P*	not at all – very much so; 6 point
Teacher's perceived variation in explaining *F, P*	not at all – very much so; 6 point
Age of the teacher *P*	< 30; 30-50; >50
Gender of the teacher *F, P*	0 = male; 1 = female
Aspect concerning the grading and difficulty of physics tests and exams	
Difference exam grades advanced physics Grades school based exams minus grades national exams (average over all students of a school - extended data)	grades: 0-10.
Relative grades high school Frequency grades tests being sufficient relative to final exam grades in physics.	standardized (μ = 0; σ = 1)
Measures of characteristics of the physics lessons	
Number of pupils in physics class *F, P*	<5; 5-10;...;25-30; >30; 7 point
Part girls in physics class	0-1; 6 point
Frequency (of) lessons being interesting/understood	never – every lesson; 6 point
Frequency (of) lecturing/explaining exercises *F, P*	never – every lesson; 6 point
Frequency (of) working for oneself/together *F, P*	never – every lesson; 6 point
Frequency (of) assigning home work	never – every lesson; 6 point
Frequency (of) use example other subject *F*	never – every lesson; 6 point
Frequency (of) labs during/outside of lessons *F, P*	never – every lesson; 6 point
Frequency (of) teacher demonstration *F*	never – every lesson; 6 point
Frequency (of) use textbook *F, P*	never – every lesson; 6 point

Mandatory exercises per lesson *F*	none; <2; 2-6; >6
Measures concerning the background/character of the student	
Number physics students	x 100
Number of inhabitants	x 1000
Dutch background *F, P*	0-1; 6 point
Parents' education *F, P*	none – academic; 5 point
Student's hobby: music/sports/reading/construction/puzzles	0 = no; 1 = yes
Student reports handicap (mostly dyslexia)	0 = no; 1 = yes

F – question based on FICSS (2003); P – question based on PRiSE (2007);
When not otherwise stated 6 point scales range from 0 to 5.

Results

Table 2 shows all parameters from Table 1 with a significant difference between the 'effortless achievement' students and the other advanced physics students. The physics lessons, physics teacher, and background are similar. The 'effortless achievement' students differ from the others in achievement and work attitude: they have a higher general capability; they achieve higher physics grades relative to this already high general capability; they pass more of their physics tests; and they understand their physics lessons more frequently. They achieve this with less effort as they hardly work for physics at all. The 'effortless achievement' students attend schools with tougher school based final physics exams (difference exam grades advanced physics).

Table 2

Differences between the 'effortless achievement' students and all other advanced physics students. Only the significant differences are reported.

Time invested in physics outside of the lessons	all others	28	***
	effortless achieve	11	
Part of mandatory exercises completed	all others	0.46	***
	effortless achieve	0.24	
Frequency learning by rote tests	all others	2.0	***
	effortless achieve	1.1	
Self-evaluation: works hard for physics	all others	1.8	***
	effortless achieve	0.5	
General capability (Cottaar, 2012)	all others	-0.02	**
	effortless achieve	0.64	
Final Exam Grade Physics	all others	7.3	***
	effortless achieve	8.4	
Achievement in physics relative to capability	all others	0.08	***
	effortless achieve	0.82	
Frequency tests grades sufficient in high school	all others	4.2	**
	effortless achieve	4.6	
difference exam grades advanced physics	all others	0.06	*
	effortless achieve	-0.15	
Frequency lessons being understood	all others	4.1	*
	effortless achieve	4.5	

* p<0.05; ** p<0.01; *** p<0.001

Discussion

The ‘effortless achievement’ students achieve very high grades in physics (and a little less high in other subjects), while hardly working for it. The very high grades for physics indicate that these students are exceptionally talented. An ‘effortless achievement’ student comments in his survey: 'Even though I hardly liked physics in high school, I have chosen to study the combination of math and physics at university. Even here [at university] I hardly have to work for it and in high school I did nothing at all. I skipped lessons quite a lot and was often bored...' This boy continues to argue that the level of physics taught in the Netherlands is disappointingly low.

‘Effortless achievement’ is a bigger problem than it seems considering that only 2.5% of the male respondents are detected as ‘effortless achievement’ students in this study: (1) some students, which now have been categorized in the ‘lack of motivation’ group (Figure 1) might be better classified as ‘effortless achievement’ students; (2) physics teachers complain that the one or two ‘effortless achievement’ students in their class tempt their less talented mates into working less too, rendering ‘effortless achievement’ more of a problem than the low number of real ‘effortless achievement’ students suggests.

Bandura (1994) describes the ‘effortless achievement’ students as those who only experience easy success and are now easily discouraged. He claims that a 'resilient' self-efficacy requires overcoming obstacles in order to persevere and eventually to achieve more. In this study, the significantly more challenging physics tests in the schools of the ‘effortless achievement’ students could be seen as such ‘obstacles’, but they do not challenge these students into putting more effort in the task and to persevere.

In my previous study, I showed that working on physics provides students with feedback on the accuracy of their physics knowledge (Cottaar, submitted) and that this has a positive influence on achievement. Students who hardly work need other sources of feedback in order to achieve according to their potential. I suggest that the ‘effortless achievement’ students in this study acquire the necessary feedback from the mistakes they make on their tests, while talented students in schools with less difficult testing lack this feedback. Thus, challenging testing could have a positive influence on the achievement of highly talented male students but further research is necessary to investigate how teachers can stimulate these students to work harder.

References

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998).

Cottaar (2012). Low (linear) teacher effect on student achievement in pre-academic physics education. Journal of Research in Science Teaching, 49 (4), 465-488.

Cottaar (submitted). Optimal relative self-efficacy for effective learning of high school physics; a promising perspective on gender differences. Resubmitted August 2012 at JRST.

Dutch Advisory Council for Education – Onderwijsraad (2009), Schedule of Activities 2010. Retrieved from http://www.onderwijsraad.nl/upload/dossiers/5/documenten/werkprogramma2010.pdf

FICSS (2003) – Factors Influencing College Science Success. Survey of Students in Introductory College Phyiscs, Harvard-Smithsonian Center for Astrophysics.

Jackson, C. (2002). 'Laddishness' as a self-worth protection strategy. Gender & Education, 14 (1), 37 – 51.

Jackson, C. & Dempster, S. (2009): 'I sat back on my computer … with a bottle of whisky next to me': constructing 'cool' masculinity through 'effortless' achievement in secondary and higher education. Journal of Gender Studies, 18 (4), 341-356

Kristjana S. Blondal & Sigrun Adalbjarnardottir (2012): Student disengagement in relation to expected and unexpected educational pathways. Scandinavian Journal of Educational Research, 56 (1), 85-100.

Meelissen, M.R.M., & Drent, M. (2009). Nederland in TIMSS advanced: Leerprestaties van 6 vwo-leerlingen in wiskunde B en natuurkunde. English: The Netherlands in TIMSS advanced: Performance of 12-grade pre-academic high school pupils in math and physics. Retrieved from: http://purl.org/utwente/68672.

PRiSE (2007) – Persistence Research in Science & Engineering. Survey of students in introductory college English, Harvard-Smithsonian Center for Astrophysics.

Younger, M., Warrington, M., & Mclellan, R. (2002): The 'problem' of 'under-achieving boys': some responses from English secondary schools. School Leadership & Management: Formerly School Organisation, 22 (4), 389-405