Improving students' school performance through positive psychology and personality targeting

Abstract

Around the world, studies and experiments have been conducted in schools to find best practices that help students perform well academically. Research ranges from helping students set goals to increasing parental engagement to personalized learning with digital materials. However, many of these approaches have not been tested with students from different upbringing cultures and educational systems in Asia. The present paper discusses two independent interventions that help improve school performance of middle school students from low-income families in Bangkok, Thailand. The first experiment modified previous research methods to study the influence of positive mood on mathematics tests of 75 students. The results show that students who were primed to feel happy scored significantly higher in their exam compared to their neutral peers (p-value = 0.01), and that the effect was more prominent among male students (p-value for female students: 0.03101 vs p-value for male students: 0.00036). The second study was inspired by marketing research on successful persuasive advertising through psychological targeting. Based on previous findings, the current study investigated the impact of personality-tailored text messages on school performance of 99 students. The results show that extroverted students receiving extroverted text messages performed better on their exam than introverted students receiving the same messages. Although the differences are not big enough to be considered statistically significant, there are many ways to improve the methodology in future studies.

Introduction

Various behavioral interventions have been tested and implemented with the goal of "nudging" people to make better decisions for their own good. Education is definitely one of the areas that can benefit from these interventions. Around the world, students are exposed to traditional teaching and learning methods that may or may not help them perform well in school. In the current study, two independent experiments were conducted to identify the approaches that had positive impact on students' performance.

The first study investigated the effect of a momentary feeling of happiness on students' test results. A similar study in the US was conducted previously where students were told to think about the happiest moment in their lives before taking math achievement tests, and they significantly outperformed the children in the no-treatment control group (Bryan et al. 1991). The subjects in the study were elementary school children who were identified to be at risk of

school failure, and junior high and high school students with learning disabilities. In the current study, the participants were middle school students from low-income families in Bangkok, Thailand. Those in the treatment group were primed to feel happy by their teacher right before their math exams and their test results were compared against the control group's. The experiment investigated how a different priming method from previous research would affect subjects from a completely distinct culture, upbringing, and education system.

In the second study, the question was whether text messages that were tailored to students' personality could improve students' school performance. Research demonstrates that persuasive messages are more effective when they are tailored to match the personality of the audience (Hirsh et. al 2012). Moreover, various promising text messaging interventions to nudge people into beneficial behaviors, from reminders in healthcare services (Schwebel et. al 2018) to SMS to increase parental engagement in school (Cortes et. al 2018), were continuously conducted. The present study attempted to build on previous research by combining the concepts of personality-targeting and reminder messages together in the experiment. The hypothesis was that messages that matched with students' personalities would motivate students to become more academically active than messages that did not match their psychological traits. The study also investigated the correlations between the students' school performance and their personalities.

Study 1: Priming students to feel happy before their math test

Research by Bryan et al. (1991) showed that students who were induced into a positive mood completed significantly more math problems correctly than their neutral peers. The study was conducted both with elementary school students who were identified to be at risk for school failure by their teachers, and with junior high and high school students with learning disabilities. The effect of positive priming on performance has not only been observed with young students, but also with medical doctors. In a study by Fredrickson et al. (1998), doctors were primed to be happy by receiving a candy before making a diagnosis. No consumption of the candy happened in the experiment to ensure that the results were not affected by the heightened sugar levels. The research found that doctors in the positive-mood treatment group showed almost three times more intelligence and creativity during the diagnosis than the neutral subjects. In the current paper, study 1 tested whether middle school students would perform better in their math tests if they were induced into a positive mood right before the tests.

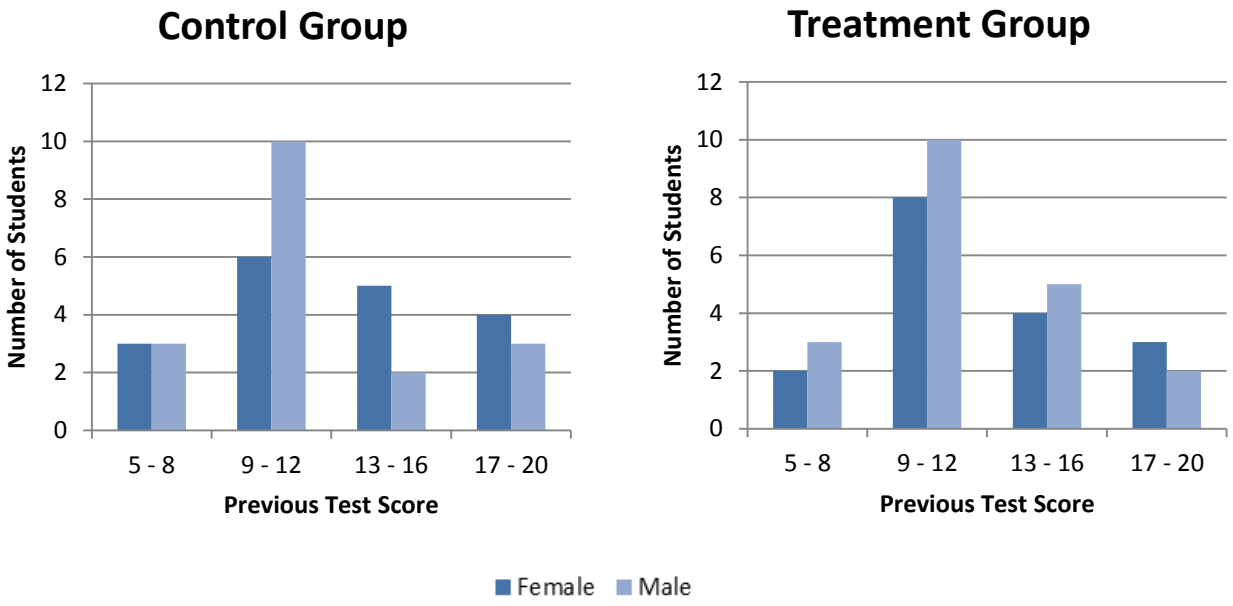
Method

Two separate experiments were conducted at a middle school for low-income families in Bangkok. The first one was done with 35 7^{th} graders who belonged to the same classroom, meaning that they studied every subject together, and the second one with 38 students from 8^{th} grade. Both classrooms were taught math by the same teacher. In both experiments, students were randomly split into a treatment and a control group. The groups' averages of previous test

scores and gender distributions were checked to be similar. Before the test in each experiment, the math teacher, with the help of another teacher, separated the students into two different exam rooms, in order to make sure that the students in the control group did not know about the priming conducted with their peers. Each of the students in the treatment group was hugged and given encouragement and candy (without consumption) by their math teacher before the test. At the end of the test, the neutral students were also given candy.

	Average score of previous test (control)	Average score of previous test (treatment)	# of students (control)	# of students (treatment)
7th Grade	13.47	13.50	17	18
8th Grade	10.79	10.74	19	19

Distributions of Previous Test Scores and Gender



Results

The results were evaluated using Welch two sample t-test to find the statistical significance in the difference of group means. For the 7th graders, students who were primed scored significantly higher in their math test (p-value = 0.03). For the 8th graders, although the difference in group means was less significant (p-value = 0.07), the treatment group also performed better. Combining the results from both experiments, the p-value when testing for difference between group means decreased to 0.01.

	t	degree of freedom	p-value	95% confidence interval	control group mean	treatment group mean
7th Grade	-2.228	28.179	0.03404	-5.2744632 -0.2222688	12.52941	15.27778
8th Grade	-1.878	34.359	0.06889	-2.8486490 0.1118069	10.57895	11.94737
Combined	-2.527	64.666	0.01395	-3.5689824 -0.4179457	11.61765	13.61111

Furthermore, the degree of the priming influence between genders was analyzed. The data showed that positive-mood induction had more significant effect among male students than female students. Combining the data from the two classrooms together, Welch two sample t-tests were conducted to test the mean of the difference in current test scores and previous test scores. The results are displayed on the table below.

	Average score of previous test (control)	Average score of previous test (treatment)	# of students (control)	# of students (treatment)	t	degree of freedom	p-value	95% confidence interval	control group mean of score difference	treatment group mean of score difference
Female	12.33	12.76	18	17	-2.254	32.846	0.03101	-2.749 -0.140	-0.444	1.0
Male	11.78	11.5	18	20	-3.972	33.435	0.00036	-3.881 -1.253	-0.667	1.9

Study 2: Sending text messages that are tailored to students' personality to encourage them to prepare for their school work

Research by Hirsh et. al (2012) showed that participants had more positive attitudes and higher tendency to purchase when the marketing message cohered more with their personality profile. In a similar study by Matz et. al (2017), psychological characteristics predicted from people's digital footprints were used to target audiences on Facebook. Customized advertisements were created using pictures and messages that were aimed at customers characterized by different levels of openness as well as extraversion. The result showed that

matching advertisements with customers' traits significantly increased the number of clicks and purchases. Moreover, various studies from the Behavioural Insights Team in the UK found text messaging to be an effective means to nudge students into a beneficial direction; one particular study showed that sending weekly simple motivating text messages and planning prompts to college students significantly reduced the overall drop-out rate at the end of the semester. Based on these previous findings, Study 2 investigated how text messages tailored for extroverts affected school performance of middle school students who came from low-income families in Bangkok. The study also analyzed any correlations that existed between personality traits and school performance.

Method

The experiment was conducted with 99 7th graders from a low-income middle school in Bangkok (a different school from Study 1). They belonged to four different classrooms, but all studied math with the same teacher. The students first completed a questionnaire that measured two pairs of the Myers–Briggs personality types: Extraversion (E) vs Introversion (I) and Judging*[1] (J) vs Perceiving*[2] (P). For each personality pair, the students answered 10 questions that had two choices each. Each choice translated into a score for E or I (or J or P). The students were then separated into four different groups based on their E/I score. Students belonged to the "extreme extrovert" group if they chose at least 7 (out of 10) extraversion answers and to the "extreme introvert" group if they chose at least 7 introversion answers. The rest were considered "neutral" for the E/I personality.

Extroverted students receiving extroverted text messages (E got E): There were a total of 17 students who belonged to the "extreme extrovert" group. Students in this group received extroverted text messages that encouraged them to prepare for school every Sunday at 10am for six weeks. Each text was sent in the name of their math teacher.

Introverted students receiving extroverted text messages (I got E): There were a total of 25 students who belonged to the "extreme introvert" group. Students in this group received the same text messages at the same time as those in the *E got E* group.

Neutral students receiving extroverted text messages (N got E) and neutral students receiving neutral text messages (control): After creating the two groups above, there were 57 neutral students remaining. They were randomly split into two groups; table showing gender and classroom representations for each group can be found below. The *N got E* group received the same extroverted messages as the *E got E* and *I got E* groups. The *control* group received a neutral message that did not mention school or homework every Sunday at 10am. The messages were also sent in the name of their math teacher. Examples of the treatment and control messages are available in the Appendix.

*[1] Judging - preferring a more structured and decided lifestyle
*[2] Perceiving - preferring a more flexible and adaptable lifestyle

Treatment group	Number of students	Number of Male / Female	Number of students in classroom 4 / 5 / 6 / 8	Average midterm score
E got E	17	10 / 7	2 / 3 / 5 / 7	5.21
I got E	25	7 / 18	5 / 9 / 6 / 5	5.30
N got E	31	12 / 19	3 / 9 / 13 / 6	5.52
Control	26	12 / 14	2 / 8 / 8 / 8	5.54

The treatment and control groups were created this way in order to enable the results from the *E got E*, *I got E*, and *N got E* groups to be compared, and the results from the *N got E* and *control* groups to be compared. For the groups *E got E*, *I got E*, and *N got E*, the students' school performance were evaluated to check whether students receiving messages that matched their extraversion personality would perform better than their peers. For the groups *N got E* and *control*, the purpose was to find out whether sending text messages about school work would affect the students' performance at all. The *control* group was sent neutral messages instead of no messages at all in order to prevent the feeling of being neglected by their teacher.

Results

Since the averages of midterm scores were not comparable across the different treatment groups, the results were evaluated using Welch two sample t-test to find the statistical significance in the difference in difference of group means. Looking at the table below, the results were mostly in the expected direction. The score difference for the *E got E* group was more positive than those of the *I got E* and *N got E* groups. Also, as hypothesized that text messages about school and homework would have more effect on students' school performance than neutral messages, the score difference for *N got E* group was more positive than the *control* group.

Treatment group	Average midterm score (out of 10)	Average final score (out of 30)	Average of normalized* score difference
E got E	5.21	13.50	-0.71
I got E	5.30	12.93	-0.99
N got E	5.52	12.05	-1.50
Control	5.54	11.86	-1.59

However, as indicated in the table below, none of the differences were large enough to show statistical significance.

Treatment groups	t	degree of freedom	p-value	95% confidence interval
E got E vs *I got E*	0.33299	32.571	0.7413	-1.449233 2.016135
E got E vs *N got E*	0.93929	33.147	0.3544	-0.924412 2.510497
N got E vs *Control*	-0.13943	52.614	0.8896	-1.338306 1.164361

* Normalized by dividing by 3 to make the final scores in the same scale as the midterm scores

Difference in differences regressions were also run to double check whether the results would be statistically significant when controlling for other factors such as students' gender and classroom. The directions of effects and p-values were similar to the Welch two sample t-tests as shown in the tables below.

Coefficients for *E got E* vs *I got E*:

	Estimate Std.	Error	t value	Pr(>|t|)	
(Intercept)	3.28726	1.29155	2.545	0.01298	*
E_got_E_or_I_got_E	-0.84884	0.65869	-1.289	0.20147	
Midterm_or_Final	-0.98933	0.56369	-1.755	0.08332	.
GenderM	-0.06479	0.53058	-0.122	0.90314	
work_rate	0.03769	0.01168	3.226	0.00186	**
classroomfive	0.66126	0.75869	0.872	0.38622	
classroomfour	-2.23143	0.73361	-3.042	0.00324	**
classroomsix	-1.24658	0.63206	-1.972	0.05227	.
Interactive_variable	**0.28345**	**0.88601**	**0.32**	**0.74992**	

Residual standard error: 1.993 on 75 degrees of freedom
Multiple R-squared: 0.3437, Adjusted R-squared: 0.2737
F-statistic: 4.911 on 8 and 75 DF, p-value: 6.702e-05

Coefficients for *E got E* vs *N got E*:

	Estimate Std.	Error	t value	Pr(>|t|)	
(Intercept)	5.186379	0.958372	5.412	0.000000544	***
E_got_E_or_N_got_E	-0.501909	0.683337	-0.734	0.46462	
Midterm_or_Final	-1.498925	0.541505	-2.768	0.00689	**
GenderM	-0.447665	0.472917	-0.947	0.34646	
work_rate	0.00719	0.009973	0.721	0.47283	
classroomfive	0.692636	0.76128	0.91	0.36543	
classroomfour	-0.14151	0.827574	-0.171	0.86463	
classroomsix	-0.10403	0.580931	-0.179	0.8583	
Interactive_variable	**0.793042**	**0.90991**	**0.872**	**0.38585**	

Residual standard error: 2.132 on 87 degrees of freedom
Multiple R-squared: 0.112, Adjusted R-squared: 0.03039
F-statistic: 1.372 on 8 and 87 DF, p-value: 0.22

Coefficients for *N got E* vs *Control*:

	Estimate Std.	Error	t value	Pr(>|t|)	
(Intercept)	4.667919	0.760948	6.134	1.53E-08	***
N_got_E_or_Control	-0.079842	0.494905	-0.161	0.87214	
Midterm_or_Final	-1.585897	0.512369	-3.095	0.00252	**
GenderM	-0.131033	0.360443	-0.364	0.71694	
work_rate	0.005143	0.007053	0.729	0.46745	
classroomfive	1.097743	0.594139	1.848	0.06747	.
classroomfour	0.794708	0.683949	1.162	0.24789	
classroomsix	0.67594	0.464251	1.456	0.14838	
Interactive_variable	**0.086973**	**0.694767**	**0.125**	**0.90062**	

Residual standard error: 1.847 on 105 degrees of freedom
Multiple R-squared: 0.1874, Adjusted R-squared: 0.1255

F-statistic: 3.027 on 8 and 105 DF, p-value: 0.004228

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

In addition, various correlation tests were also run to investigate relationships between students’ personality traits, gender, homework turn-in rate, and midterm score. Pearson's Chi-squared test was used when testing categorical variables and Pearson's product-moment correlation was used when testing numerical variables. Out of the possible combinations, a significant correlation existed between the Judging / Perceiving score and the homework turn-in rate (t = 2.5182, df = 97, p-value = 0.01343). As the homework turn-in rate could be affected by a confounding factor such as the classroom a student is in (because students received the homework on different days of the week), a multiple regression analysis was performed to control for other factors that were collected during this experiment – gender, Extraversion / Introversion score, midterm performance, and classroom. As indicated in the table below, the Judging / Perceiving score was still statistically significant against the homework turn-in rate when controlling for other factors. The direction of this relationship was as expected that the more the students were described as Judging, the higher their homework turn-in rate was. Those students who planned ahead and preferred a more decided lifestyle were more likely to turn in their homework on time.

Coefficients:

	Estimate Std.	**Error**	**t value**	**Pr(>|t|)**	
(Intercept)	63.5497	13.3812	4.749	7.58E-06	***
GenderM	-10.9061	5.1902	-2.101	0.0384	*
E_I_score	0.2827	1.4	0.202	0.8404	
J_P_score	3.5988	1.5121	2.38	0.0194	*
Midterm	1.6885	1.0229	1.651	1.02E-01	
Classroomfive	-48.2289	6.8241	-7.067	3.11E-10	***
Classroomfour	-10.8479	8.9147	-1.217	0.2268	
Classroomsix	-1.8302	6.7805	-0.27	0.7878	

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 24.35 on 91 degrees of freedom
Multiple R-squared: 0.5018, Adjusted R-squared: 0.4635
F-statistic: 13.1 on 7 and 91 DF, p-value: 1.477e-11

Discussion

Study 1

In this study, the results showed that happy-mood priming positively affected students' test performance. However, priming could only lead to a short-term effect. In order to study whether being happier in general would help students in school in the long-run, the next stage of the research would be to raise the overall level of happiness of the treatment group and investigate whether this group performs better academically compared to their natural peers.

During the experiments, the teacher primed students to feel happy by giving them candy and words of encouragement. It was possible that the words of encouragement did not make them feel happier, but instead induced their growth mindset. This growth mindset effect potentially made the students want to try harder during the test when they encountered difficult problems, allowing them to score higher. It was not possible to analyze this factor individually by the setup of the study. In a future research project that I will be conducting with Saturday School, I want to perform correlational and experimental studies to understand the relationships between grit, growth mindset, and happiness levels.

Lastly, there were different statistical significance levels among different groups of students. Firstly, the results of the experiment with 7^{th} graders were more statistically significant than those from the experiment with 8^{th} graders. It could be because the positive-mood priming had more effect with younger students. The sample size would have to be larger with students from different grades to be able to address this point. Secondly, the overall results showed that the degree of the priming influence was larger for boys than girls. This could be a real gender difference or it could have resulted from regression to the mean, because boys generally had lower scores than girls in the previous test. A longer-term study that included more sequential tests had to be conducted to be able to determine whether regression to the mean played any role in the results.

Study 2

Although the numerical results of Study 2 were in the expected direction: 1) messages that matched students' personality were more effective than messages that did not match students' personality 2) messages about school work were more effective than neutral messages, they were not statistically significant. However, the premise of the study is still interesting and worth further exploration. The experiment can be improved by increasing the sample size, changing the psychological traits to which messages are tailored, and integrating graphics and pictures in the messages to make them convey the personality innuendo better (just texts alone might not be enough to deliver personality-tailored messages). In addition, studies by the Behavioural Insights Team in the UK have shown text messaging as an effective means in "nudging" students to perform better in school; they have used a variety of metrics to evaluate their interventions. Instead of using the final exam scores to evaluate the treatment as in this

experiment, different academic metrics such as school attendance or homework turn-in rate can be used. The homework turn-in rate seemed promising at first for this particular study, but because of the different schedule arrangement of assignments of each classroom, it was not used. In future studies, if the assignment factor could be better control, homework turn-in rates or homework grades could be used to test the experiment results.

Appendix

Words of encouragement

- พยายามทำให้ดีที่สุดนะคะ ครูเอาใจช่วย (Try your best. I'm rooting for you.)

Example text messages

- Control: สวัสดีครับ Name ช่วงนี้ฝนตกบ่อย อย่าลืมดูแลสุขภาพนะ // ครูเก่ง (It's raining quite often now; don't forget to take good care of yourself.)
- Treatment: สวัสดีครับ Name พรุ่งนี้ได้ไปสังสรรค์กับเพื่อนๆแล้ว อย่าลืมทำการบ้านก่อนไปโรงเรียนกันนะ // ครูเก่ง (You'll get to hang out with all your friends tomorrow. Don't forget to do your homework too.)

Personality tests

1. โปรดทำเครื่องหมายXหน้าข้อความที่ใกล้เคียงกับลักษณะนิสัยของคุณมากที่สุด

1.	ก. มักเลี่ยงฝูงชนและชอบความสงบ	ข. เสียงจอแจและฝูงชนไม่เป็นปัญหา
2.	ก. ฟังน้อยกว่าพูด	ข. ฟังมากกว่าพูด
3.	ก. สื่อสารด้วยความกระตือรือร้น	ข. เก็บความกระตือรือร้นไว้ในใจ
4.	ก. มีสมาธิดี	ข. เสียสมาธิง่าย
5.	ก. พูดคุยกับคนง่ายและชอบร่วมกิจกรรม	ข. เลือกพบคนและกิจกรรมที่จะเข้าร่วม
6.	ก. คิดดีแล้วค่อยพูด	ข. พูดโดยไม่ทันคิด
7.	ก. เติมพลังด้วยการสังสรรค์	ข. หยุดพักโดยลำพัง
8.	ก. ให้เวลาตัวเองเพื่อนั่งคิดถึงสิ่งที่ได้ทำไป	ข. อยู่ว่างไม่ได้ ต้องหาอะไรทำ
9.	ก. ชอบสังสรรค์ในกลุ่มเล็ก หรือทำงานเอง	ข. ชอบทำงานและสังสรรค์เป็นกลุ่ม
10.	ก. ชอบเป็นคนเด่นในงาน	ข. ชอบเป็นแนวร่วม

2. โปรดทำเครื่องหมายXหน้าข้อความที่ใกล้เคียงกับลักษณะนิสัยของคุณมากที่สุด

1. ก. อยากให้ชีวิตชัดเจน ตั้งเป้าหมายให้กับตัวเอง
   ข. หาวิธีปรับตัว และเรียนรู้จากสถานการณ์ที่เข้ามาในชีวิต

2. ก. ชอบการปรับตัว เข้ากับสถานการณ์ใหม่ๆ
   ข. ชอบรู้ล่วงหน้าว่า จะพบกับอะไร

3. ก. รู้สึกดีขึ้น เมื่อได้ตัดสินใจไปแล้ว
   ข. ชอบที่จะเปิดโอกาสไว้เสมอ

4. ก. สนุกกับการทำสิ่งต่างๆ ให้สำเร็จ
   ข. สนุกกับการเริ่มต้นสิ่งใหม่ๆ

5. ก. ใช้ชีวิตอย่างยืดหยุ่นเท่าที่จะทำได้ จะได้ไม่พลาดในสิ่งที่ผ่านเข้ามา
   ข. ทำงานเพื่อให้มีชีวิตที่ลงตัว เป็นไปตามแผน

6. ก. ชอบเรื่องประหลาดใจ และชอบการปรับในนาทีสุดท้าย
   ข. ไม่ชอบเรื่องประหลาดใจ ต้องการรู้ล่วงหน้า

7. ก. เห็นว่าเวลามีอยู่จำกัด และทำตามกำหนดการอย่างเคร่งครัด
   ข. เห็นว่าเวลามีอยู่เหลือเฟือ กำหนดการยืดหยุ่นได้

8. ก. ชอบการทำงานตามแผนให้เสร็จ
   ข. ไม่สนใจงานตามแผน ถึงแม้จะทำแผนไว้ก็ตาม

9. ก. รู้สึกดีขึ้นถ้าวางแผนไว้
   ข. อยากทำอะไรก็ตามที่ผ่านเข้ามามากกว่า

10. ก. เป็นคนคร่าวๆ ยืดหยุ่น และแล้วแต่สถานการณ์
    ข. เป็นคนลงตัวและเป็นระบบ

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