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# I can do it well because I did it well: The effect of promoted self-efficacy through induced success performance in junior high school students

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**Author Contributions**

Both authors contributed to the study design, the data collection, the data analysis, and the interpretation. K. M. wrote the manuscript and H. K. approved the final version of the manuscript for submission.

**Declaration of Conflicts**

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

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# in junior high school students

Abstract

Kudo and Mori (2015) used a presentation trick to covertly present a set of easier anagram tasks to 20 junior high school students while their 60 classmates observed more difficult tasks. These two samples were selected randomly, and their IQ scores counterbalanced. The target students outperformed their classmates, and showed greater self-efficacy after their success. However, they did not examine the relationship between this self-efficacy and performance two months later on another set of anagram tasks. Here, we analyzed their data in this regard. We found those students whose self-efficacy was raised by the former task performed better than the control students whose self-efficacy ratings were in the middle range. These findings suggest that students with high self-efficacy performed better than their classmates did on new anagram tasks, even when adjusting for IQ. (133 words)

Keywords: self-efficacy, junior high school students, induced success performance, a randomized control experiment, a presentation trick

Bandura (1977; 1997) theorized about the central role played by perceived self-regulatory efficacy in one's academic self-development and functioning. In his theory, perceived self-efficacy affects one's motivation, which in turn leads to self-regulated learning. This sequence eventually can produce a desirable situation with various positive outcomes. For example, it may lead to self-monitoring of one's activities and the cognitive and social conditions under which one engages in them. It might also increase the adoption of proximal goals that guides one's strategies for realizing the challenges set for oneself. Furthermore, it can engage self-influence, including self-motivating incentives and social supports to sustain one's academic pursuits (Caprara, Fida, Vecchione, Del Bove, Vecchio, Barbaranelli, & Bandura, 2008). Given the myriad benefits of self-efficacy, it is unsurprising, then many researchers have investigated "self-regulatory efficacy," the use of self-efficacy for self-regulated learning (for a review, see van Dinther, Dochy, & Segers, 2011).

But most of the literature on self-efficacy has shown only the correlational contributions of various factors. Thus, a student's high level of self-efficacy might have been a result rather than a cause. For example, a student may have felt highly self-efficient because he or she performed well in school. This fundamental question—whether successful performance leads to high self-efficacy—has no experimental support in school settings.

Some experimental studies showed that a variety of manipulations might enhance a student's self-efficacy (e.g., Schunk & Swartz, 1993; van Dinther et al., 2011). Recently, O'Neill (2016) reported that a four-year teacher education program elevated the self-efficacy of trainee teachers with respect to managing a classroom. Yet even this study has obvious

alternate explanations. For instance, trainees with high self-efficacy may have performed better simply because they improved their actual skills for classroom management, not because of elevated self-efficacy.

Bouffard-Bouchard (1990) examined the effect of increasing self-efficacy alone by providing bogus positive or negative feedback to college students, regardless of their actual competence on verbal tasks. The bogus positive feedback induced positive self-efficacy, and the negative feedback, negative self-efficacy. But increased self-efficacy did not translate into increased performance: those with induced higher self-efficacy performed no better than those with induced lower self-efficacy.

To address this “chicken-and-egg” puzzle between measured self-efficacy and actual performance, Mori and Uchida (2009) developed an experimental procedure that hinges on an optical trick (the MORI Technique; Mori, 2007). That is, anagram tasks could be presented such that target students would see a set of easy anagrams while their classmates see difficult ones. Mechanism for this trick draws on simple physics. Two different anagrams, a difficult one and an easy one, were presented on the same screen but filtered with two different directions of polarization. A participant who wore one type of polarizing sunglasses would see only one of the images, while another participant with a different type of sunglasses would see only the other. Because the two types of polarizing sunglasses look identical to the naked eye, participants do not notice the duality of the images, nor the relative difficulty. The procedure could thus help to dissociate the competence and self-efficacy of participants. Indeed, in experiments with 207 junior high school students, Mori and Uchida raised students' self-

efficacy.

Uchida, Michael, and Mori (2018) replicated the findings on a larger sample of 7th-grade students. Moreover, they found that students whose self-efficacy was elevated by the MORI technique also showed increased scholastic achievement one year later. It is especially noteworthy that these students were randomly assigned to the easier and harder anagram tasks. In other words, successful performance led to higher self-efficacy, irrespective of actual ability.

Kudo and Mori (2015) adopted the same experimental procedure as Mori and Uchida (2009) but with a different sample of the 7th-grade students to examine the effect of vicarious experience on self-efficacy. Like the Mori and Uchida procedure, randomly selected target students wore one type of polarizing sunglasses to observe an easier set of anagram tasks and control students wore the other type of sunglasses to see a more difficult set of tasks. The target students outperformed their counterparts and elevated their self-efficacy. To examine the possible effect of vicarious experience of success, Kudo and Mori also randomly selected another set of students to pair with the target and to cheer up while their partners performed the anagram tasks. According to Bandura (1977; 1997), a vicarious success experience would be a source of self-efficacy. Then, the cheerers of the target students would promote their self-efficacy through experiencing a successful performance of their partners. However, Kudo and Mori (2015) found that although the target students raised their self-efficacy, their cheerers did not.

Because Kudo and Mori (2015) focused on a main research objective to address the effect of vicarious experience on self-efficacy, they reported only the results related to the

performances of the vicarious performers, or the cheerers. But meanwhile, they administered a new set of anagram tasks to the same participants two months later, as a follow-up. An analysis of the follow-up data would help address a new question: would the students who had experienced success and shown greater self-efficacy perform better than their classmates on an entirely new set of anagram tasks? Here, we report the results using the follow-up data. We expected that the students who experienced success would perform better on these new anagram tasks, even though their high self-efficacy was only experimentally-induced.

## Method

### *Participants*

All the participants in Kudo and Mori (2015) and one additional boy participated in this follow-up study. They were all the 7$^{th}$-grade students (84 boys and 80 girls, 12-13 years old) in five classes with approximately 32 students in each class. The socioeconomic status of the students varied within a narrow middle-class range, and all of them were native Japanese.

### *Experimental Design*

Because the present study was a follow-up of Kudo and Mori (2015), we first describe the experimental design. There were two experimental variables: 1) The effect of success on self-efficacy: Success vs. Control (those who performed an easy set vs. a difficult set, respectively), and 2) The effect of performance of anagram tasks: Performer vs. Cheerer (who performed vs. not performed the anagrams, respectively). Therefore, there were four groups,

as follows.

*Success-Performers:* Ten boys and ten girls were randomly selected from the 26th-50th percentile IQ range (Mean ISS[1)] = 51.6).

*Success-Cheerers:* Eleven boys and ten girls were randomly selected from the 26th-50th percentile IQ range to match Success-Performers (Mean ISS = 51.6). Each of them was paired with one Success-Performer and instructed to cheer up his/her partner during the anagram session.

*Control-Performers:* Thirty boys and 30 girls were randomly selected from the 1st-25th and 51st-99th percentile IQ ranges (Mean ISS = 54.7) and presented with a set of difficult anagram tasks.

*Control-Cheerers:* Thirty boys and 29 girls (Mean ISS = 53.3), were paired with the Control-Performers based on their IQ scores, were to cheer up their partners.

Please note that the Success groups and the Control groups were chosen from different IQ ranges. It was because the Control groups were meant to serve as background rather than genuine control. The Kudo and Mori (2015) study's primary purpose was to compare the Success-Performers and the Success-Cheerers. Therefore, they took them randomly from the same middle IQ range to match their intelligence levels. Meanwhile, they chose the Control groups from the residuals of the two Success groups. In this way, they examined the effect of actual and vicarious success experience by assessing their self-

1) The students' IQ were assessed with *Kyoken-shiki Shin-Gakunenbetsu Chinokensa* (Okamoto, Shibuya, Ishida, & Sakano, 1987). The ISS stands for Intelligence Standard Score.

efficacy two-week before the anagram task, just after, and two-week later. In the present study, we examined the effect of their experiences on a new anagram task performance. Therefore, we used the same experimental groups as above but with a different research purpose with the additional data.

*Measures*

*Anagram tasks.* A new set of 30 anagram tasks with five Japanese *hiragana* letters was prepared and used in the present study. The difficulty levels were matched with those of the anagrams used for the Control-Performers in Kudo and Mori (2015). The anagram tasks were configured initially by Mori and Uchida (2009). Most of the Japanese five-hiragana words were combinations of two- and three-hiragana lexical elements. Accordingly, there were two difficulty levels of anagrams; easy ones replaced the two word-elements, and difficult ones replaced each hiragana letter. An English equivalent example is "INPUT," which can be encrypted into "PUTIN" (easy level) or "UPNIT" (difficult level). In the present study, we used 15 of the two levels of anagrams, equivalent to the Control-Performers in Kudo and Mori (2015).

*Self-efficacy ratings.* As a follow-up study of Kudo and Mori (2015), we used the same single-item self-efficacy assessment in the present study. The participants were asked to rate the applicability of the statement, “I can perform the letter rearrangement game well” on a 5-point rating scale, with anchors 1: Low, 5: High, and 3 being the middle.

Kudo and Mori (2015) used the single-item self-efficacy assessment because their pilot

study showed that only the single self-efficacy item for anagram tasks was significantly correlated with the actual anagram task performance. Although Bandura (1997, p. 44) did not recommend using a single-item self-efficacy assessment, researchers evaluated the single-item measurement procedures positively for a variety of psychological traits. (Skoogh, Ylitalo, Larsson Omeróv, Hauksdóttir, Nyberg, Wilderäng, et al., 2010; Yohannes, Dodd, Morris, & Webb, 2011).

*Procedures*

*Anagram tasks.* The anagram tasks were printed on sheets of paper and administered in the class by the students' classroom teachers. The participants had 7.5 minutes to solve the 30 anagram tasks. After the session, answer sheets were collected and marked by the experimenters. The number of anagrams that each participant solved correctly was recorded and used as the performance measure. The anagram scores were fed back to the participants.

*Self-efficacy ratings.* Participants' perceived self-efficacy was assessed with the same self-efficacy questionnaire used in Kudo and Mori (2015) three times; on the same day after the newly administered anagram session, two weeks after, and two months after.

## Results

*Overview*

In Kudo and Mori (2015), the Success-Performers (ten boys and ten girls) outperformed the Control-Performers (30 boys and 30 girls) because they solved an easier set of anagram

tasks. As a result of this manipulation, Success-Performers raised their self-efficacy and maintained high levels, even before the present follow-up. Meanwhile, the other three groups (Control-Performers, Success-Cheerers, and Control-Cheerers) had rated their self-efficacy in the middle range before the present study (see the left half of Fig.2).

We now turn to the primary question here: would the effect of these past experiences be reflected in students' performances of a new set of anagram tasks and new self-efficacy ratings? To answer this question, we analyzed the anagram scores and self-efficacy ratings in the four experimental groups.

*Anagram scores*

We calculated mean anagram scores, classified them by the four experimental groups, and display the data in Figure 1. As the figure shows, Success-Performers received the highest score (21.20), while scores of the other three conditions were similar.

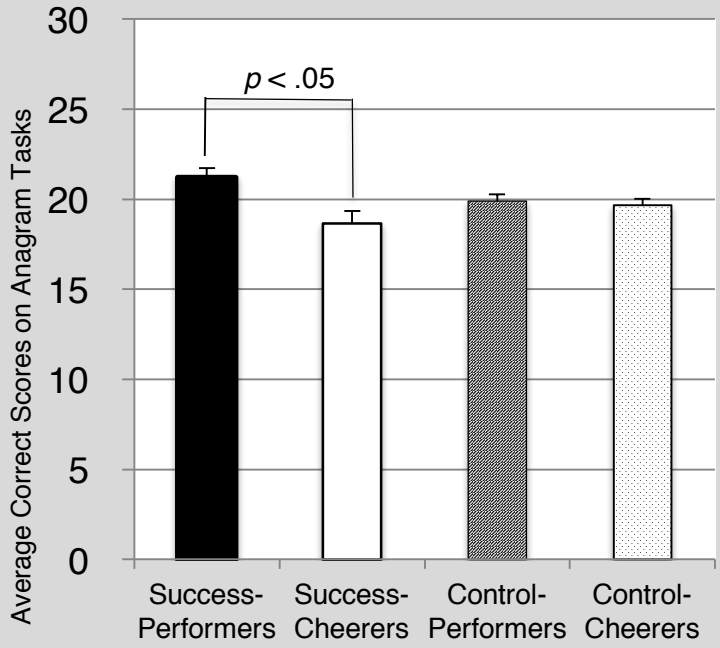


Fig.1. Average anagram task scores of the four experimental groups. The maximum and minimum scores are 30 and 0, respectively. The vertical bars indicate the standard errors.

More specifically, a two-way (Success-Control x Performer-Cheerer) ANOVA revealed that the interaction was

statistically significant ($F_{(1,156)} = 4.72$, $p < .05$, $\eta^2 = 0.03$). The main effect of Success-Control was not significant ($F_{(1,156)} = 0.10$, ns.), while that of the Performer-Cheerer was significant ($F_{(1,156)} = 6.96$, $p < .01$, $\eta^2 = 0.03$). Multiple comparisons using Holm's method revealed that the score of Success-Performers was significantly higher than the scores of Success-Cheerers ($F_{(1,156)} = 11.57$, $p < .01$, $\eta^2 = 0.03$) and showed nearly significant differences from the other two groups ($F_{(1,156)} = 3.13$, $.05 < p < .10$, $\eta^2 = 0.03$). There was no significant difference between Control-Performers and Control-Cheerers.

*Self-efficacy scores*

We next calculated mean self-efficacy scores, classify them according to each of the four experimental groups at three assessing periods, and display those results in Figure 2. For the purposes of comparison, we also report scores assessed in Kudo and Mori (2015). We then conducted separate one-way ANOVAs to examine the changes over the four periods—before, on the day of, two weeks after, and two months after the anagram tasks—for each experimental group. The self-efficacy scores assessed in Kudo and Mori (2015) were used as the indices for the self-efficacy levels before the anagram session.

The self-efficacy scores of the Success-Performers dropped significantly after the anagram tasks ($F_{(3,57)} = 3.95$, $p < .05$, $\eta^2 = 0.03$). Multiple comparisons revealed that only the difference between the scores before and just after the anagram tasks was significant. Once they dropped, but the self-efficacy increased again after that, diminishing the statistical differences from the initial level. This change probably occurred because students faced a

difficult series of anagrams. But self-efficacy had risen after the "contrived" successful performance on the anagram tasks and remained high after that. Therefore, it seemed natural that their self-efficacy went down after the poorer performance in this study. Nevertheless, they recovered from this fall afterward.

The self-efficacy ratings of the Control-Cheerers showed a similar pattern, but of a lesser magnitude ($F_{(3,174)} = 4.39$, $p < .01$, $\eta^2 = 0.03$). There was also a decline after the anagram performance, but a considerable comeback later. Multiple comparisons revealed that only the scores before and just after the anagram tasks were significantly different. Control-Performers also showed lowered self-efficacy after the second anagram session and showed a moderate recovery thereafter ($F_{(3,177)} = 3.60$, $p < .05$, $\eta^2 = 0.03$). Multiple comparisons showed the same tendency.

Meanwhile, only the Success-Cheerers showed a different pattern. Their self-efficacy ratings remained in the middle range throughout the four assessment periods. The

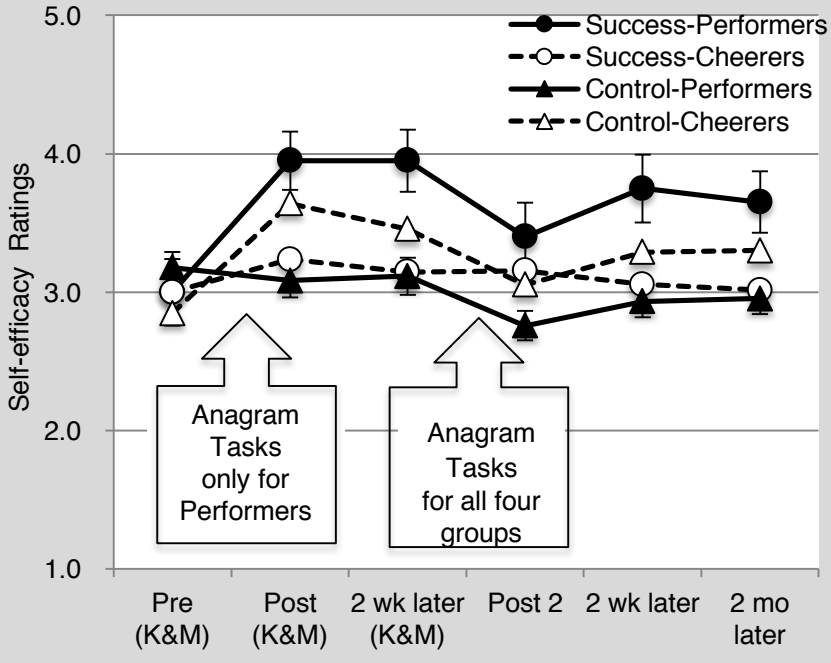


Fig.2. Self-efficacy scores assessed in Kudo and Mori (2015) and in the present study: before (Pre), just after the initial anagram task (Post), two weeks later, just after the new anagram tasks (Post 2), two weeks later, and two months after of the second anagram session. The vertical bars indicate the standard errors, only shown for Success-Performers and Control-Performers.

ANOVA revealed no statistical differences ($F_{(3,60)} = 0.23$, ns.). These students did not show decreased self-efficacy even after having experienced the anagram tasks. For them, neither the vicarious experience of cheering the Success-Performers nor their own performance affected their self-efficacy ratings.

## Discussion

*The effects of elevated self-efficacy on the later performances*

Success-Performers were led to raising their self-efficacy in Kudo and Mori (2015) by having experienced success in the initial anagram tasks. Even though the elevated self-efficacy was a contrived one, Success-Performers solved the new anagram tasks more than their counterparts (Success-Cheerers). Although they did not reach significant levels, the anagram scores of Success-Performers were higher than those of Control two groups. It was noteworthy that Success-Performers performed better despite that their IQ levels being lower than those of Control groups.

Meanwhile, Control-Cheerers did not perform well even though they had raised their self-efficacy as well after the previous anagram session. Their self-efficacy was not increased by their own successful performance but by observing the relatively poorer performance of their partners. Consequently, their self-efficacy did not seem high enough to affect their performance.

These results fit with the idea that inducing higher self-efficacy would be associated with better performance down the track. They extend the literature by providing new empirical

support to Bandura's (1997) claim that the "enactive mastery experience" is the strongest source of self-efficacy—but vicarious experience is a weaker source of self-efficacy. Many researchers have found data suggesting that mastery experiences can be a powerful source of self-efficacy (Pajares, Britner, & Valiante, 2000; Kupermintz, 2002; Lau & Roeser, 2002; Britner & Pajares, 2006; Usher & Pajares, 2009).

We prepared our anagrams to match those used with Control-Performers in Kudo and Mori (2015) with the same difficulty level. Therefore, Control-Performers should have had an advantage by having worked with anagrams of similar difficulty before. By contrast, Success-Performers might have a disadvantage of being surprised by the difference of difficulty levels between the two anagram sessions. But our results suggest that prior exposure to similar anagrams advantage had little effect on the performance of Control-Performers, whose performance was no better than those of their counterparts (Control-Cheerers).

*Why did Success-Performers solve more anagrams?*

How should we understand why Success-Performers came to solve more anagrams? They were randomly chosen from the 26th-50th IQ percentile range. Their performances were relatively poor in class on most school subjects. And yes, although they had outperformed their classmates in the initial anagram sessions, it was because they solved an easier series of anagrams without being aware of it. Without these contrivances, they would have performed no better than their classmates whose IQ scores were higher. Nevertheless, the present results showed that they did perform better than the other students. But how?

The only plausible explanation is that they were motivated more strongly than their peers by their high self-efficacy. Even a difficult anagram presents limited patterns to rearrange. Therefore, unless students give up, a solution can be found eventually. This fact suggests one of the crucial factors in anagram-solving is persistence. If so, Success-Performers might have done well because their elevated self-efficacy led to persistence. They might have thought, "I can do it well because I did it well." They might have put their efforts into solving one more anagram than their counterparts. These are only speculations, but it is what Bandura theorized as the functions of self-efficacy. It would be desirable to further examine this hypothesis with a larger sample and a longer perspective.

*Limitations of the present study and remaining problems*

The present study used the data collected by Kudo and Mori (2015) and analyzed with a different research perspective. We should be cautious in making decisive conclusions from a *post hoc* data analysis. These results warrant an attempt to replicate the same experiment with statistically-stronger approaches, especially planned data collection. The sample size of the present study and that of Kudo and Mori (2015), was not decided appropriately based on the statistical power analysis recommended by Cohen (2013).

Uchida, Michael, and Mori (2018) conducted similar research on self-efficacy promotion utilizing the same experimental procedure with 315 students based on the power analysis. However, it took them three years to collect the data. We could not examine the gender effects in the present study. As the literature review revealed, few experimental studies on the

significances of self-efficacy were conducted. Moreover, most of them were by Mori and colleagues with the same experimental procedures. Finally, the fact that participants were all Japanese students suggests caution in generalizing to other populations.

## Conclusions

The present experiment followed up Kudo and Mori (2015) by examining whether the students with elevated self-efficacy would perform well on a new task. As predicted, the results showed that those who had performed well in the previous anagram task and raised their self-efficacy did perform better than their classmates. Meanwhile, those with high self-efficacy by a vicarious experience through watching the performance of peers did not perform well. These findings provided experimental support of Bandura's theorization on self-efficacy. We also found that three out of the four experimental groups showed a similar pattern of temporary fall and then recovery in their self-efficacy after having faced a relatively difficult set of anagram tasks. The reasons for this self-efficacy recovery tendency should be clarified through further studies using the present experimental paradigm developed in Mori and Uchida (2009). Uchida et al. (2018) showed that elevated self-efficacy through a contrived success affected academic performance one year later. The present results also provide a hopeful expectation that the promotion of self-efficacy through a contrived success may have a possible effect on new task performance in students with low self-efficacy. The present study suggests a promising example of a procedure for promoting self-efficacy in junior high school students. Schoolteachers might consider activities that let students experience success regardless of

actual performance. Then students may come to think "I can do it well because I did it well" on similar occasions in the future.

## References

Bandura, A. (1977) Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191–215. doi: 10.1037/0033-295X.84.2.191

Bandura, A. (1997) *Self-efficacy: the exercise of control.* Freeman: New York.

Britner, S. L., & Pajares, F. (2006) Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching, 43*, 485-499. doi: 10.1002/tea.20131

Caprara, G. V., Fida, R., Vecchione, M., Del Bove, G., Vecchio, G. M., Barbaranelli, C., & Bandura, A. (2008) Longitudinal analysis of the role of perceived self-efficacy for self-regulated learning in academic continuance and achievement. *Journal of Educational Psychology, 100*, 525-534. doi: 10.1348/2044-8279.002004

Chen, J. A. & Usher, E. L. (2013) Profiles of the sources of science self-efficacy. *Learning and Individual Differences, 24*, 11-21. doi: 10.1016/j.lindif.2012.11.002

Cohen, J. (2013) *Statistical power analysis for the behavioral sciences*. Academic press.

Kudo, H. & Mori, K. (2015) A Preliminary Study of Increasing Self-Efficacy in Junior High School Students: Induced Success and a Vicarious Experience. *Psychological Reports*, *117*, 631-642. doi: 10.2466/11.07.PR0.117c22z4

Kupermintz, H. (2002) Affective and Conative Factors as Aptitude Resources in High School

Science Achievement. *Educational Assessment*, *8*, 123–137. doi: 10.1207/S15326977EA0802_03

Lau, S. & Roeser, R. W. (2002) Cognitive abilities and motivational processes in high school students' situational engagement and achievement in science. *Educational Assessment*, *8*, 139–162. doi: 10.1207/S15326977EA0802_04

Mori, K. (2007) Projecting two words with one machine: Presenting two different visual stimuli using just one projector without viewers' noticing the duality, *Behavior Research Methods*, 39, 811–815. doi: 10.3758/BF03192973

Mori, K. & Uchida, A. (2009) Can contrived success affect self-efficacy among junior high school students? *Research in Education, 82*, 60-68. doi: 10.7227/RIE.87.1.5

Okamoto, K., Shibuya, K., Ishida, T., & Sakano, Y. (1987) *Kyoken-shiki Shin-Gakunenbetsu Chinokensa.* [The Kyoken version of new intelligence scale by school year-grade.] Tosho Bunka Publishing, Tokyo.

O'Neill, S. (2016) Preparing preservice teachers for inclusive classrooms: Does completing coursework on managing challenging behaviours increase their classroom management sense of efficacy? *Australasian Journal of Special Education, 40*(2), 117–140. doi: 10.1017/jse.2015.10

Pajares, F., Britner, S. L., & Valiante, G. (2000) Relation between achievement goals and self-beliefs of middle school students in writing and science. *Contemporary Educational Psychology, 25*, 406-422. doi: 10.1006/ceps.1999.1027

Skoogh, J., Ylitalo, N., Larsson Omeróv, P., Hauksdottir, A., Nyberg, U., Wilderäng, U., ... &

Swedish-Norwegian Testicular Cancer Group. (2010) 'A no means no'—measuring depression using a single-item question versus Hospital Anxiety and Depression Scale (HADS-D). *Annals of Oncology, 21*(9), 1905-1909. doi: 10.1093/annonc/mdq058

Uchida, A., Michael, R. B., & Mori, K. (2018) An Induced Successful Performance Enhances Student Self-Efficacy and Boosts Academic Achievement. *AERA Open*. doi: 10.1177/2332858418806198

Usher, E. L. & Pajares, F. (2009) Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*, *34*, 89–101. doi: 10.1016/j.cedpsych.2008.09.002

van Dinther, M., Dochy, F., & Segers, M. (2011) Factors affecting students' self-efficacy in higher education. *Educational Research Review, 6*, 95-108. doi: 10.1016/j.edurev.2010.10.003

Yohannes, A. M., Dodd, M., Morris, J., & Webb, K. (2011) Reliability and validity of a single item measure of quality of life scale for adult patients with cystic fibrosis. *Health and Quality of Life Outcomes*, *9*(1), 1-8. doi: 10.1186/1477-7525-9-105