



# Teaching Math with Confidence - Recommendations for Improving Numeracy from the Lens of Confidence Building

Based on the Study: Testing the Relationship Between Confidence and Effort: A Behavioral Finance Perspective on the Problem of Financial Literacy.

Despite the vast amount of literature surrounding the topic of financial literacy and related problems, there is still no universally accepted solution to this issue because the main factors causing financial literacy problems are still not fully understood both by researchers and current policy-makers. A possible new approach was discovered by Skagerlund et al. (2018), as their research suggested that financial literacy is driven by numeracy (the ability to process and perform basic numerical concepts and calculations) rather than direct knowledge about financial concepts. Given that numeracy is an effort based task, this policy brief provides a list of recommendations for developing numeracy from the standpoint of motivating effort to practice and improve the numeracy and mathematical skills of people for them to have the tools necessary to become financially literate, which may be more effective than creating a dedicated course on the topic of financial literacy. The results of the study confirmed that effort is indeed motivated by higher levels of confidence. Furthermore, information, particularly feedback regarding performance, plays a crucial role in shaping future confidence and, by extension, future levels of motivation and effort. Guided by these findings, this brief proposes the following policy recommendations:

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## Policy Recommendations

- 1. Personalize programs regarding numeracy to improve confidence and belief patterns.** The study finding proves that poor confidence stems strongly from poor beliefs about your abilities. To combat this problem in the context of numeracy, the curriculum should take into account a degree of personalizing the content towards topics that are familiar and interesting to the participants. The result should break the belief cycle of numeracy being an unapproachable and unlearnable topic for under-confident people because it is constantly associated with other topics that the participants do have confidence in and thus should increase their desire to exert effort in numeracy.

**2. Develop feedback mechanisms that inform areas of improvement with impact on motivation in mind.** The study’s findings show that when information is presented to participants, even in a neutral manner or without intent to harm or improve confidence, it still has a demotivating effect, especially on individuals with high confidence levels, when the information involves revealing mistakes. Correcting mistakes and providing critical feedback will always be important for building skills such as numeracy, but it is important to devise mechanisms that consider that the default impact of this information is likely to be demotivating. Thus, the manner in delivering feedback should be adjusted to provide the most useful information for improvement, while minimizing the possibility of participants being demotivated when mistakes and errors are exposed.

**3. Increase accessibility to numeracy development programs such as math clinics, whether online or offline.** Assuming the findings of Skagerlund et al. (2018) hold, financial literacy is a problem today because numeracy and motivation are already poorly developed. It is important that as methods of teaching numeracy evolve, these new ways of thinking and approaching the topic of numeracy remain accessible for those who are already out of schooling and are working. Creating channels such as math clinics to help individuals easily build their motivation for numeracy allows the present and future generations to benefit from this new way of learning.

**Introduction**

Our study empirically tests and validates the positive and causal relationship between confidence and effort under close to real-world settings. The results of our study show that greater levels of self-confidence cause greater levels of effort and that information about personal ability is instrumental in shaping confidence and, by extension, effort level. These findings are applicable in a wide variety of motivational studies and contexts, such as in school or workplace environments.

One such field could be in developing financial literacy by improving numeracy. Given that numeracy is an effort-based skill, any program that seeks to develop it is contingent upon encouraging individuals to exert more effort willingly. Hence, this policy brief provides recommendations for motivating the practice of numeracy by improving people’s beliefs about their abilities in the said skill using feedback mechanisms and curriculum design.

**Model Specification and Results**

This study applied an OLS regression and robustness checks using other methods, namely the Tobit model and instrumental variable (IV) regression model using Tobit estimators, to confirm the causal relationship between confidence and effort.

Table 1  
*OLS/Tobit Regression Results, N=85*  
*Dependent Variable: Effort*

Variable	OLS 1	OLS 2	Tobit
Stage 6		0.62***	
Confidence (Median) (Per 10%)	0.61** * (0.000)	(0.000)	1.561*** (0.000)
Touchpad		-0.239 (0.777)	-1.169 (0.592)
Phone		-0.861 (0.176)	-2.710 (0.142)
Constant	0.667* ** (0.003)	0.982** (0.021)	-4.822 (0.001)
Adjusted R <sup>2</sup>	0.3633	0.3763	

\* significant at  $\alpha = 0.05$   
 \*\* significant at  $\alpha = 0.01$   
 \*\*\*significant at  $\alpha = 0.005$

The results of the experiment showed that participants that have more self-confidence choose to exert more effort. The effort level was measured by the number of extra slides volunteered by participants in Stage 5 of the experiment. This result validates the initial hypothesis that confidence has a motivational value that causes more effort exertion.

Table 2  
 OLS Regression N=85  
 Dependent Variable: Stage 6 Confidence

Variable	Info	Info + Gender
Information	-22.387** *	-24.019** *
	(0.001)	(0.001)
Gender		13.357* (0.56)
Constant	0.667*** (0.003)	34.484*** (0.000)
Adjusted R <sup>2</sup>	0.1127	0.1310

\* significant at  $\alpha = 0.05$   
 \*\* significant at  $\alpha = 0.01$   
 \*\*\* significant at  $\alpha = 0.005$

Table 3  
 Average Number of Extra Slides Answered Per Group

Informed (N=40)	1.95
Uninformed (N=45)	2.98
Male	1.92
Female	3.14

Information was also proven to be a valid instrument and has a causal effect on reported confidence. On average, informed participants reported ~23% fewer percentage points of confidence compared to uninformed participants. This is explained by a large number of overconfident participants in the data set (77 out of 85 participants were considered overconfident). As a result of being informed about their true abilities, confidence dropped.

This change in confidence as a result of being informed had a measurable impact on the effort exerted. Participants who were informed volunteered ~33% fewer extra sliders on average in Stage 5 than uninformed participants. This finding confirms the second hypothesis that information can affect confidence and as a result, indirectly affect motivation and effort exertion.

Interestingly, it was also found that gender plays a significant role as an instrumental variable that indirectly affects effort exertion through its direct effect on confidence. Women reported much higher levels of confidence, on average, ~13.36 higher percentage points of confidence than male participants. The average effects between genders confirmed that this difference in confidence led to more effort exerted as women answered almost 50% more effort than men did.

## Conclusions and Recommendations

Our findings confirm that there is a causal relationship between confidence and effort, and that information, in the form of performance feedback, may affect this dynamic. Considering that confidence plays a significant role when it comes to motivating an individual to exert effort, and that information greatly shapes one's confidence, then implications to influencing future motivation may be made. In this light, we recommend that policy-makers start taking into account the motivational value of confidence and information. These may be utilized to inform and aid in the development of programs that motivate effort and nurture an affinity for practicing numeracy. The idea is that building motivation for individuals to develop numeracy will allow them to learn how to apply these skills to financial literacy even without being taught directly about specific financial concepts. For this to succeed, policy makers must remember to take into account that feedback may also lead to demotivation, particularly if individuals are initially overconfident. Hence, these alternative programs must center around the objective of providing feedback to maximize growth and minimize demotivation.

## References

Skagerlund, K., Lind, T., Strömbäck, C., Tinghög, G., & Västfjäll, D. (2018). Financial literacy and the role of Numeracy—How individuals' attitude and affinity with numbers influence financial literacy. *Journal of Behavioral and Experimental Economics*, 74, 18-25.

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