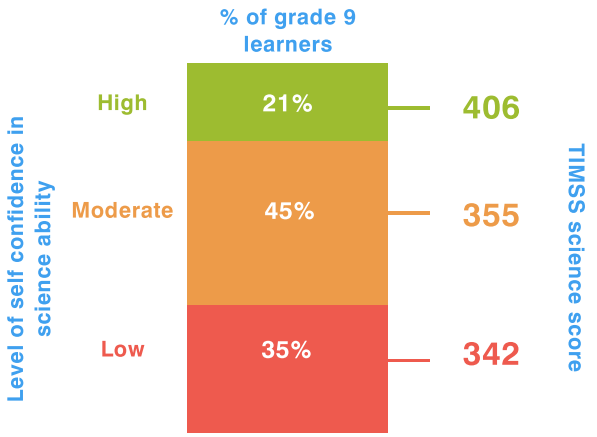
Believing YOU CAN succeed in science

Aaliyah Ismail explains the functions of the human skeleton to her class mates in grade 5B at Westville Primary School in Mitchells Plain in the Western Cape. She already views natural science as one of her favourite subjects that she understands well. According to the TIMSS findings, this confidence in her science ability might support her academic performance as she progresses into high school.

"I think I can! I think I can!" -The well-known story of *The Little Engine That Could* , which overcame a seemingly impossible task, speaks to the role that motivation, confidence and belief play in our lives. This self-confidence in one's ability extends to performing science-related tasks and activities in the classroom. Researchers refer to this as a learner's "science self-efficacy." The strength of this belief has an impact on behaviour. Those who have higher levels are more likely to persevere in an activity until they succeed, no matter what the level of difficulty. Those who have low confidence in their science ability will believe that tasks are more difficult than they are. This belief might lead to stress and anxiety when facing tasks. Studies have shown that low confidence in science ability has a negative effect on academic achievement, and can, over time, create a self-fulfilling prophecy of failure. *Dr Andrea Juan* and *Sylvia Hannan* report.

In the 2015 Trends in International Mathematics and Science Study (TIMSS), only 21% of grade 9 South African learners reported high levels of confidence in their science ability, with 35% reporting low levels of confidence. Learners' confidence in their science ability was positively associated with achievement.



Those learners who had high levels of confidence in their science ability scored 64 TIMSS points higher in the science achievement test than those who reported low levels. While we cannot say whether high confidence in science ability leads to better performance in science or vice versa, we can say that they are positively related. If confidence in science ability matters for learners, then we need to understand how it can be developed.

Dineo Luescher and Daniëla Oosthuizen sharing knowledge about the human body.

Factors shaping learners' confidence

We examined three factors that are related to shaping learners' confidence in their science ability: engaging teachers, parental involvement and gender.

Engaging teachers

We examined teachers' instructional practices to assess classroom interactions between learners and teachers that might influence learners' attitudes and confidence in their science ability. Learners were asked whether they agreed with statements such as:

- *My teacher is good at explaining science.*
- *My teacher does a variety of things to help us learn.*
- *My teacher lets me show what I have learned.*
- *My teacher tells me how to do better when I make a mistake.*

Positive classroom interactions were significantly associated with increases in learners' confidence in their science ability, implying that we need to invest in approaches that inculcate positive attitudes and learning behaviours at school. As learners progress through school, teachers should enhance their confidence in their science ability from early on so that it is developed as a habit. Confidence in science ability and achievement may be enhanced through teaching practices that provide feedback to learners, promote self-evaluation, and goal setting. Strategies to improve confidence in science ability may be as simple as asking learners to solve problems out loud. This slows down the process of critical thinking and analysis, encouraging deliberate thinking and reasoning. Teachers can also pose open-ended, dialogic (in the form of a conversation) questions to learners rather than providing them with answers. Prompts that teachers might use are: "Tell me what you know about X" or "How might you break this problem up into smaller steps?" During this process teachers must also reinforce positive behaviour.

Parental involvement

Parental involvement in checking science homework was positively related to learners' confidence in their science ability and school practices should focus on encouraging parents' active involvement in the educational process. Our study also found that higher levels of home socio-economic status were related to more positive attitudes about science. Encouraging parental involvement, particularly for learners from households of a lower socio-economic status, is therefore critical for increasing learners' confidence in their science ability. We therefore need to promote strategies which encourage parental involvement, such as requiring that parents sign their children's homework books.

Girls require a boost

On average, grade 9 girls reported lower levels of confidence in their science ability than boys. This was the case even when girls and boys scored the same on the TIMSS science assessment. Increasing girls' confidence in their science ability may lead to higher achievement scores. If we are to close the observed "gender self-efficacy gap," we need to understand how the experiences of girls and boys differ in the classroom, and also how science is perceived by the public in general. Traditional gender roles, which are ingrained in society, are that science has been seen as a career for males rather than females. This low level of confidence in science ability may have future implications for subject choice and the representation of women in science, technology, engineering and mathematics careers. We should pay particular attention to gender inequalities in relation to the effectiveness with which schools, and societies as a whole, promote motivation and interest in science.

The need for holistic development

The South African National Curriculum Statement Grades R-12 aims to equip learners with the knowledge, skills and values needed for self-fulfilment, and their meaningful participation in society. This points to the need to focus on the holistic development of learners, rather than only on their academic abilities. The findings of our study highlight the need for policy makers, researchers, parents and teachers to acknowledge the role of attitudes in science achievement. They point to the importance of socialising children early on about the benefits of science, and of promoting interest and confidence in their science ability.

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