Cyberbullying and Student Learning

An Analysis of Student Achievement in Eighth Grade Using TIMSS 2019 Data

SUMMARY

Bullying generally has been shown to have a number of negative outcomes for student well-being. IEA's TIMSS (Trends in Mathematics and Science Study) 2019 data shows that cyberbullying is correlated with traditional forms of bullying and is particularly relevant in more recent times. The relationship between the two forms of bullying is strong and varies considerably among the participating TIMSS 2019 countries. Evidence from TIMSS reveals that, while cyberbullying has a relatively high incidence in all educational systems, it also reflects regional and gender differences with boys experiencing higher levels of cyberbullying than girls. Importantly, overall, cyberbullying is negatively associated with mathematics achievement in the eighth grade.

IMPLICATIONS

- With technological advances, cyberbullying poses a significant obstacle to the right to education. Unlike its physical counterpart, cyberbullying is not bound by geography. It can be anonymous, and difficult to detect and support the victim.
- Data from TIMSS 2019 shows achievement scores in mathematics are negatively impacted when correlated with cyberbullying.
- The variability in responses to the cyberbullying questionnaire items across the educational systems in TIMSS 2019 will need to guide national policy development strategies.
- Traditional bullying and cyberbullying are closely linked. Intervention and prevention strategies that address both types of bullying are deemed effective.
- Legislative provisions and developments in cybercrime law play a role in protecting students at the national level.
- At the school level, an inclusive environment with a zero-tolerance approach to discrimination and raising awareness of the issue can lead to minimizing the impacts and frequency of cyberbullying.

INTRODUCTION

Bullying, the intentional aggressive behavior by a person or persons against a peer who typically cannot readily defend themselves, is a significant issue for schools. Examples of bullying may manifest in a variety of ways and include such things as physical aggression (including punching, shoving, or kicking); theft of, or seizure, or damage to personal property; verbal, (including racism and/or ridicule) and relational, (including gossip or ostracization). Typically, bullying behaviors occur over time with some students experiencing these behaviors and others on a daily basis. As has been reported (Jimerson et al., 2010; Rutkowski & Rutkowski, 2016), bullying affects students of all ages, across the socioeconomic spectrum, regardless of academic abilities, and in all countries and regions of the world.

Impacts of bullying

Bullying affects student mental health. In a meta-analytic study, Moore et al. (2017), reported that anywhere from 10-35% of adolescents may experience bullying, with the most commonly reported problems being depression, anxiety, self-harm, and suicidal behavior. Similarly Eyuboglu et al. (2021) reported increased self-harm behavior for pure victims, pure perpetrators, and victim-perpetrators.[1] For the latter two, the percentage of occurrence is higher than for the first group. These outcomes are the same for cyberbullying, where the percentage of student self-harm is even higher.

Students who are more often involved in school bullying, regardless of their role, may also experience depression, anxiety, self-esteem, and psychosocial difficulties (Eyuboglu et al., 2021). In 2015 the Youth Risk Behavior Surveillance System data in United States reported that 20% of students in the ninth–twelfth grades had been bullied at school, and 15% were bullied online a year earlier. The 2015 data also showed that nearly 18% of bullied high-school students had suicidal ideation and seriously considered suicide, with nearly 9% of the students making actual attempts. Another study (Hinduja & Patchin, 2019), found that victims of school bullying and cyberbullying were twice as likely to have attempted suicide than those not involved in any form of bullying. The association of cyberbullying victimization with suicidal thoughts and behaviors was stronger than the association between school bullying victimization and suicidal thoughts and behavior. The issues that may arise from bullying of all types are many, complex, and varying in severity (Hinduja & Patchin, 2019).

Previous IEA studies have shown a strong association between the different types of bullying behavior and student achievement (Rutkowski & Rutkowski, 2020). Meta-analyses from Nakamoto and Schwartz (2010) and Gardella et al. (2017) also points out that bullying is negatively associated with educational outcomes regardless of the subject taught. Further, cyberbullying is associated with various educational issues, including educational outcomes, regardless of the subject, just like non-cyberbullying (Gardella et al., 2017).

Bullying factors and the role of digital technologies

The growth in access to and the use of digital technologies has allowed cyberbullying to flourish, allowing perpetrators to remain anonymous and pose significant challenges for detection and remediation. Figures from UNESCO estimated that one in ten students had been bullied online (UNESCO, 2020). Moreover, a meta-analysis from Modecki et al. (2014) also shows that in-person bullying and cyberbullying are highly correlated. Students who experience one type of bullying often tend to experience the other too. Although the forms of the two types differ in their essence, the outcomes on students are versatile (Gardella et al., 2017). Consequently, cyberbullying can threaten the victims' rights to education and is likely to negatively impact educational achievement.

Cyberbullying in educational contexts depends on different factors like gender, race/ethnicity, and age (Gardella et al., 2017). It is impossible to encompass all factors related to cyberbullying in this brief. Thus, we chose student gender to test the differences in associations across the educational systems. The frequencies and types of cyberbullying between male and female students vary across the studies (Gardella et al., 2017) and likely, countries.

In this context, this brief will address the following questions:

1. What is the relationship between cyberbullying and traditional bullying as evidenced by TIMSS 2019?
2. What are the rates of cyberbullying among TIMSS 2019 participating countries at the eighth-grade level?
3. How is cyberbullying related to student achievement in mathematics and how does this vary by gender?
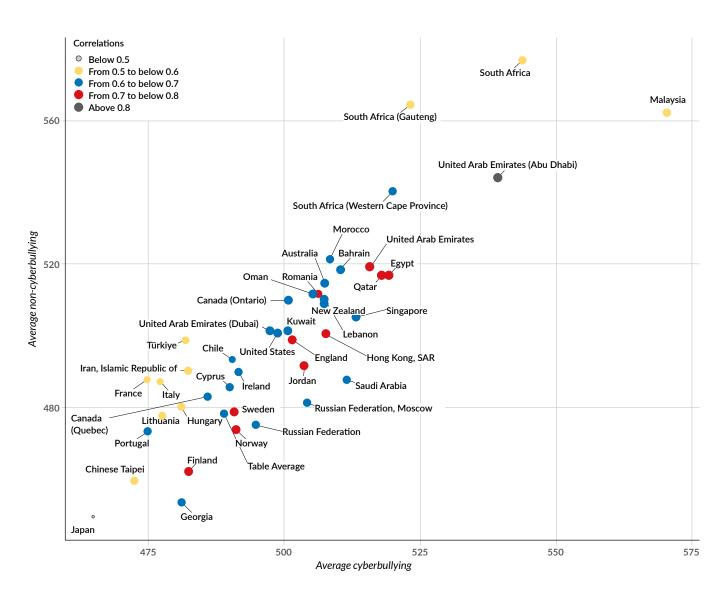
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[1] Pure victims are these who do not bully others but have only been bullied. Pure perpetrators are those who only bully but are not bullied. Victim-perpetrators are those who both bully others and are bullied.

METHODS

With the inclusion of three cyberbullying-specific items in TIMSS 2019 (see Figure 1 in Appendix 1), researchers may connect students' bullying experiences as previously conceived with achievement results in both assessed domains, mathematics and science (Rutkowski & Rutkowski, 2018), and examine the specific impact of cyberbullying.

In order to understand how cyberbullying is related to student achievement, we created two scales: (a) cyberbullying scale from the three cyberbullying items; and (b) traditional (i.e., non-cyberbullying) scale from the rest of the items. Technical details on the scale construction and the displays the assumed factor structure of the data can be found in Appendix 1.[2]

The relationship between cyberbullying and traditional bullying
The cyberbullying and bullying scales created from the TIMSS 2019 bullying scale were highly correlated, (see Table H in Appendix 2). The average correlation across all educational systems is $r = 0.65$. The strongest association, as with the previous analyses, is in UAE (Abu Dhabi), Jordan, Egypt, Qatar, UAE, and Hong Kong, SAR, where the correlation coefficients are above $r = 0.76$, with the strongest correlation in UAE (Abu Dhabi) ($r = 0.80$). The effect sizes of the correlations are rather high as well, with values above 0.45 in most of the countries (0.65 in UAE (Abu Dhabi)), showing that the relationships are meaningful. Higher levels of cyberbullying were associated with higher levels of traditional bullying.

Figure 1: Relationship between traditional bullying and cyberbullying

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² The scales were created using data from all countries participating in TIMSS 2019 at the eighth grade, except Kazakhstan where unresolvable data issues related to the translation of the bullying questions were found.

Figure 1 represents the relationship between traditional bullying and cyberbullying. The plot presents the positions of the countries relative to their average scores of cyberbullying and non-cyberbullying. The size of the dots represents the strength of the correlations within the countries. As the plot shows, the countries with the strongest relationships tend to cluster around the middle of the plot, i.e., around the averages on both scales relative to other countries. The only exception is UAE (Abu Dhabi), where the correlation is the strongest, and the averages on the scales show a high frequency of bullying. In Finland and Georgia, on the other hand, the correlations are above the international average, but the means on the two scales are relatively low compared to other countries showing less frequency of bullying. South Africa, South Africa (Gauteng), and Malaysia, which have relatively weak correlations, appear in the upper-right corner, where there are high occurrences for both traditional bullying and cyberbullying. The strength of association between the two types of bullying is not always related to the frequency of occurrence.

What are the rates of cyberbullying among TIMSS 2019 participating countries at the eighth-grade level?

Figure 3 in Appendix 1 shows the extent of cyberbullying by country. The figure represents the averages by country for the cyberbullying scale along with 95% confidence intervals around the means. The resulting averages along with their confidence intervals are ordered from low to high by the averages of cyberbullying per country and compared to the average across all countries in the analysis. The averages for the majority of the countries are above the average of all countries with UAE (Abu Dhabi), South Africa, and Malaysia having the highest averages of cyberbullying. Although several countries have averages below the international average (most notably Japan), the collected data suggests that the challenge that cyberbullying represents to educators should not be underestimated.

How is Cyberbullying related to student achievement in mathematics and how does this vary by gender?

In this investigation scores from the new cyberbullying and traditional bullying variables were correlated with student achievement in mathematics at the eighth-grade level. In addition, correlations were also estimated by gender, to examine this fundamentally important policy relevant variable. In the tables below, results are sorted by the strength and the directionality of the correlations. The results for science, although not presented here, are similar to the ones for mathematics.

The relationships between cyberbullying and student achievement in mathematics

To fully explore and understand the complexity of cyberbullying within and among countries, frequencies at the item level were first estimated. These estimates are shown in Tables A to C in Appendix 2 where the first two categories of the questionnaire items ("At least once a week" and "Once or twice a month") were combined. As the tables show, in some education systems while there is some variation for the different types of cyberbullying the percentages generally are quite high. The highest percentages were found in Malaysia, South Africa, UAE (Abu Dhabi), and Egypt. It is worth noting that the percentages for sending nasty and hurtful messages are higher than the other bullying behaviours. The values in Japan are below one percent for all three types of cyberbullying behavior.

A more complete understanding of the dynamics associated with cyberbullying (and subsequent strategies for remediation) is evident when the variation in experience by student gender is examined. Tables D to F in Appendix 2 show the differences in being a victim of online bullying (receiving hurtful messages, sharing hurtful messages, and sharing embarrassing photos online) by student gender. As with the previous tables, the percentages are computed for the "At least once a week" and "Once or twice a month" categories only.

The tables show, in general, boys experience cyberbullying more often than girls. The most extreme cases are Egypt, Hong Kong, SAR, Jordan, Lebanon, Oman, Qatar, Saudi Arabia, Singapore, UAE, and UAE (Abu Dhabi) where the difference can reach 12% more cyberbullying for boys (Qatar) for sending hurtful messages online. For sharing embarrassing photos online there is an interesting result—in countries located in the west the percentages are higher for girls, whereas for countries located on the east the percentages are higher for boys. There are 10 countries from both east and west where the proportions are equal, but in both cases very low, below 5%.

Whereas the data at item level has exposed the differences in the pattern of cyberbullying within and among countries, correlations with achievement indicate the significance in terms of its association with learning outcomes for mathematics.

Results presented in Table 1 show the strength of relationships between cyberbullying and academic achievement in eighth grade mathematics across educational systems. It can be seen that all of the countries exhibited a negative relationship between the two variables. Increased levels of cyberbullying were associated with lower student performance. The correlations are the strongest in UAE (Abu Dhabi), United Arab Emirates, and South Africa. In Portugal, Chinese Taipei,

Russian Federation, and Republic of Korea the correlation coefficients are insignificant and very close to zero. In all these countries, except for Singapore, the averages on the cyberbullying scale and its variances are very low, and the percentages for the separate bullying behaviors are very low as well. In the Russian Federation a non-linear relationship between cyberbullying and mathematics achievement was found, but the size of the coefficient shows no relationship. The effect sizes are below 0.20. Even for the countries where the correlations are strongest, the effect sizes are medium. There are other variables related with the variation in mathematics achievement.

Table 1: Correlations between mathematics achievement and cyberbullying

Educational system	R		Effect size	Educational system	R		Effect size
United Arab Emirates (Abu Dhabi)	-0.34	*	0.12	Norway	-0.11	*	0.01
United Arab Emirates	-0.28	*	0.08	Bahrain	-0.10	*	0.01
South Africa	-0.27	*	0.07	Finland	-0.10	*	0.01
Qatar	-0.26	*	0.07	Russian Federation, Moscow	-0.10	*	0.01
Oman	-0.25	*	0.06	Romania	-0.10	*	0.01
Egypt	-0.25	*	0.06	Lebanon	-0.09	*	0.01
Jordan	-0.22	*	0.05	Cyprus	-0.09	*	0.01
Saudi Arabia	-0.22	*	0.05	Malaysia	-0.09	*	0.01
South Africa (Gauteng)	-0.20	*	0.04	Italy	-0.08	*	0.01
South Africa (Western Cape Province)	-0.19	*	0.04	Hong Kong, SAR	-0.08	*	0.01
England	-0.16	*	0.03	France	-0.08	*	0.01
United Arab Emirates (Dubai)	-0.16	*	0.03	Chile	-0.08	*	0.01
Australia	-0.15	*	0.02	Canada (Ontario)	-0.07	*	0.01
Iran, Islamic Republic of	-0.15	*	0.02	Japan	-0.07	*	0.00
Hungary	-0.14	*	0.02	Lithuania	-0.07	*	0.00
Sweden	-0.14	*	0.02	Singapore	-0.06	*	0.00
Türkiye	-0.14	*	0.02	Georgia	-0.06	*	0.00
New Zealand	-0.13	*	0.02	Portugal	-0.05		0.00
Ireland	-0.12	*	0.01	Chinese Taipei	-0.03	*	0.00
Canada (Quebec)	-0.12	*	0.01	Russian Federation	0.00		0.00
United States	-0.12	*	0.01	Korea, Republic of	0.02		0.00
Kuwait	-0.12	*	0.01	Israel†	-		-
Morocco	-0.12	*	0.01	**Table Average**	**-0.13**		**0.02**

* Correlation is significant (p<0.05)
† All missing data for one or more items in the online bullying scale (score not estimated).

The relationships between cyberbullying and student achievement in mathematics by gender

The results presented in Table G in Appendix 2 shows the magnitudes of relationships between cyberbullying and academic achievement in mathematics overall, and for girls and boys separately. The tables shows similar trends as those observed for the general populations. First, higher levels of cyberbullying were associated with lower performance in most of the participating countries. Second, the Russian Federation showed a lack of association for both boys and girls, and a non-linear relationship between cyberbullying and mathematics achievement. The correlations between cyberbullying and mathematics are close to zero and statistically insignificant in Italy, Chile, Russian Federation, Republic of Korea, and Hong Kong, SAR (in Chinese Taipei the relationship is significant, but very close to zero) for girls, and in Canada (Ontario), France, Georgia, Lithuania, Chinese Taipei, Portugal, Russian Federation and Republic of Korea for boys.

Solely based on the correlations results, several trends were observed with respect to gender and country. First, the results presented in Table G in Appendix 2 shows that the strength of the correlations was generally larger for boys than girls in all countries. This is also true for the effect sizes for the countries with strongest correlation coefficients–the effect sizes in these countries are at least twice as high for boys than for girls. The phenomenon where higher levels of online bullying were associated with lower performance was larger for boys than girls. Second, regardless of gender differences, UAE (Abu Dhabi), UAE, South Africa, Qatar, Oman, Egypt, Jordan, Saudi Arabia, South Africa (Gauteng), and South Africa (Western Cape Province) reported the strongest relationships between cyberbullying and mathematics achievement. In this case, higher levels of online bullying were associated with lower performance. These populations were also amongst the countries that performed below the TIMSS 2019 international average.

CONCLUSION

As the world becomes more technologically advanced, and students' access to electronic devices continuously improves, cyberbullying could potentially become an even bigger obstacle for the opportunity to learn and consequently impede positive educational outcomes. As such, policy makers may need to develop and monitor indicators that succinctly measure cyberbullying. These measures may be used to design policies that address cyberbullying and design strategies to mitigate the negative effects in terms of student well-being and learning outcomes.

The newly-introduced questions in the bullying scale have identified cyberbullying as a significant safety and well-being issue for schools. Data collected from the questions introduced in TIMSS 2019 contributes to a more nuanced understanding of bullying and how these behaviors are implicated in understanding learning outcomes, particularly for boys. Cyberbullying constitutes a clearly separate category of aggression which demands specific consideration and policy

response. It is important to stress that, in general, boys are victim to cyberbullying more often than girls, but there are geographical differences pointing that for some of the behaviors (e.g., sharing embarrassing pictures online) girls are more often subject to cyberbullying than boys, and this is important for national policies in different countries.

The results in this brief show unequivocally that just as with traditional bullying, cyberbullying is a widespread phenomenon which is negatively related to student achievement outcomes in mathematics—the more students are bullied online, the lower their achievement in mathematics tends to be. Cyberbullying also shows a strong relationship with non-cyberbullying, indicating that these two phenomena often do not appear in isolation. Students who are bullied online also tend to be bullied in school. Previous research (Eyuboglu et al., 2021) found that although traditional (i.e., non-online) bullying is more common than cyberbullying, both occur together.

POLICY IMPLICATIONS AND INTERVENTION PROGRAMS

It is important to note that many factors, likely relate to school bullying (cyber and non-cyber), including socioeconomic status, race/ethnicity, and age. This analysis presents just one variable of interest (student gender) as an example. A more thorough analysis at the country level which includes other relevant background and contextual factors may assist in tailoring policies for a particular national or local context.

Unlike the more physical forms of bullying, cyberbullying is likely to be more covert, more targeted, and largely undetectable through accidental encounters, and therefore much more difficult to eradicate. Cyberbullying is particularly insidious with no limits to participants (including the bully, the victim, and the bystander), is not bounded by geography, and because of being unsupervised, but also obscured from others' purview, reducing opportunities for intervention and prevention (Gardella et al., 2017), and is difficult to target through conventional methods.

The literature identifies different risks and protective factors for cyberbullying at individual, family, peer, school, and community levels. For example, Ansary (2020) summarizes the identified individual risk factors for cyber victimization: low self-esteem, self-control, social intelligence, empathy, high levels of anxiety, high levels of impulsivity, aggression, moral disengagement, but also being a victim in traditional bullying. Tarnikulu (2017) also adds having disabilities. On the other hand, the same individual factors predictive for cyberbullying perpetration are the same as the individual factors of being a victim.

Consequently, effective policy responses must consider and address each of these factors. While some general policy initiatives may be identified on the basis of the overall findings, country level policy priorities must be shaped by local circumstances including such things as the country level variability at the item level.

Legislative provisions related to harmful communications provide some protection for students and the general population alike at the national level. Many nations have addressed this issue or have taken this forward more recently. For example, the United Arab Emirates introduced a new law in 2021 (Federal Decree Law No. 34, or "Cybercrime Law"), which provides punishment for all actions of cyberbullying, and criminal sanctions for violations. The proscribed activities described in the legislation include insults, electronic extortion, defamation, and circulating images without one's consent (Elhais, 2022).

Schools, parents, and the wider community can play a strong role in a non-tolerant approach to cyberbullying.

At the school level it requires the creation of an inclusive environment which does not tolerate discrimination, or discriminatory practices, which involves peers and parents in combating bullying of all types, and may include the training of educators in raising awareness of cyberbullying and its consequences. The provision of a clear (written) policy and reporting vehicle, both within school and for parents and students which also makes clear bystanders' responsible together with practical advice on managing privacy settings can help ensure instances of cyberbullying are minimized.

At the student level, two types of programs to combat cyber bullying–prevention and intervention may be effective. Previous studies (see Tanrikulu, 2017 for an overview) have found that both the online bully and the bullied person experience difficulties in their social relationships. One of the more widespread methods often considered to be effective is to provide adolescents with training in empathy. Further focusing on strategies for improving the relationship between the caregivers and children and validating asking for help from an adult after being cyberbullied is considered a positive intervention strategy.

Intervention programs may also include technical means as prevention strategies, these may include blocking the bullies' social media and e-mail and reporting offensive, intimidating behavior. Although technological means may prove to be effective and often present, practical and arguably immediate methods for prevention and intervention at the level of the individual, schools need to take the primary responsibility for prevention and intervention (Tanrikulu, 2017).

Effective intervention programs address both the traditional (i.e., in person) and cyberbullying programs simultaneously. Teams developing mitigation programs need to recognize that programs developed for traditional bullying can be effective for cyberbullying as well. As noted by Tanrikulu (2017), the two types of bullying are not isolated from each other and can be experienced in complicated patterns. Given the findings related to boys, a better understanding of whom is primarily using the cyberspace to bully and the nature of the targeted behavior (boy-boy, boy-girl, girl-girl, girl-boy) would assist in developing more targeted intervention strategies. Arguably however, an integrated approach bedded in existing legislative frameworks which combines strategies at the school, student, and community level are much more likely to be effective.

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Note from the authors

The authors would like to acknowledge the contribution of Kondwani Kajera Mughogho for their early work and contributions to the analysis for this *Compass Brief*.

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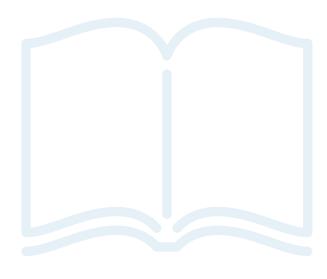
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ADDITIONAL RESOURCES

A variety of resources may be found online that can assist schools and parents in combating all types of bullying behavior including, and especially, cyberbullying. See for example:

Dealing with cyberbullying. (n.d) *Kelsi*. Retrieved from: https://www.kelsi.org.uk/child-protection-and-safeguarding/e-safety/cyberbullying/dealing-with-cyberbullying

Dealing with cyberbullying in schools: How to respond. (n.d) *Webwise*. Retrieved from: https://www.webwise.ie/trending/dealing-with-cyberbullying-in-schools-2/

Bullying prevention and response: a guide for schools. (n.d). Retrieved from: https//pb4l.tki.org.nz/content/download/261/1137/file/Bullying%20prevention%20and%20response%20A%20guide%20for%20schools.pdf

Concerns about the role of corporates in the dissemination of harmful content through digital media and consequent digital harm has resulted in attempts to moderate harmful communications and content at the corporate level. See for example:

Cornish, S. (2022, July 25). *Social media giants agree to 'first of its kind' code of conduct in Aotearoa.* Stuff. https://stuff.co.nz/national/129357992/social-media-giants-agree-to-first-of-its-kind-code-of-conduct

SCAN TO VIEW THE APPENDIX

IEA COMPASS

ABOUT IEA

The International Association for the Evaluation of Educational Achievement, known as IEA, is an independent, international consortium of national research institutions and governmental agencies, with headquarters in Amsterdam. Its primary purpose is to conduct large-scale comparative studies of educational achievement with the aim of gaining more in-depth understanding of the effects of policies and practices within and across systems of education.

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