

»» Investment backlog in schools hampers educational performance

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School buildings belong to the core of municipal infrastructure. They account for a good one third of municipal building floor space. Accordingly, municipalities spend high amounts of money on the construction, maintenance and modernisation of school buildings. Around 20 % of planned investment goes to school and educational facilities, according to responses provided by municipal treasurers under the KfW Municipal Panel 2016.

Modern schools are important for an effective education system. Besides modern furnishings and equipment, the climate, lighting and acoustics of school classrooms demonstrably have an effect on educational success. Still, in 2015 expenditure on school buildings was only around 25 % of total municipal expenditure on mainstream and vocational schools, whereas 20 years ago it was still over 45 %. That means Germany is investing less in its educational facilities than the international average. Moreover, investment levels vary widely from one federal state and region to another.

The sluggish modernisation of school buildings has resulted in a significant backlog of investment in many municipalities, communities and regional districts. New investment requirements have been emerging across the nation. Modern forms of teaching, the expansion of all-day schools, the inclusion of children with intellectual and physical disabilities and the integration of children of migrants have created additional demands on school buildings. German municipal treasurers estimate the need for investment in Germany's school infrastructure to be around EUR 34 billion. The trend of growing investment backlogs must be broken in order to make the educational system fit for the future and raise the educational level in the long term.

A highly effective education system is essential to future-proofing the German economy and to social cohesion. A good education system is a major prerequisite for a national economy's growth potential and long-term prosperity. The educational attainment of the population as measured in international student comparisons such as PISA, for example, is one of the most important long-term drivers of a society's economic development.¹ This especially applies to developed economies such as Germany, where educational success, innovation and efficiency enhancements are key to enduring and sustainable growth.²

Education is also a major prerequisite for social advancement and empowerment. Particularly in Germany, income from work depends to a very high degree on educational competence.³ Research findings also suggest that education is a dynamic process in which each stage of progress builds on the previous one.⁴ That means early stages of education such as pre-school and school education are of particular importance.

The present paper argues that educational success is also dependent on infrastructural conditions which must be created by municipalities, in particular, through the construction and maintenance of school buildings. When the substance of these educational facilities suffers, so does educational success. It is for this reason that the current level of investment in school buildings and their condition need to be viewed critically.⁵

Germany's education system is effective but facing substantial challenges

In the past years, Germany's school education system in particular has been characterised by significant challenges such as the implementation of the G8 reform, which reduces schooling to 12 years, all-day schools and the inclusion of children with special needs. The enrolment of migrant children will also require additional efforts if new arrivals are to be successfully integrated on a long-term basis.⁶ International comparisons such as the PISA outcomes, for example, show that the German school system is more competitive than average but still lags significantly behind the top countries.⁷

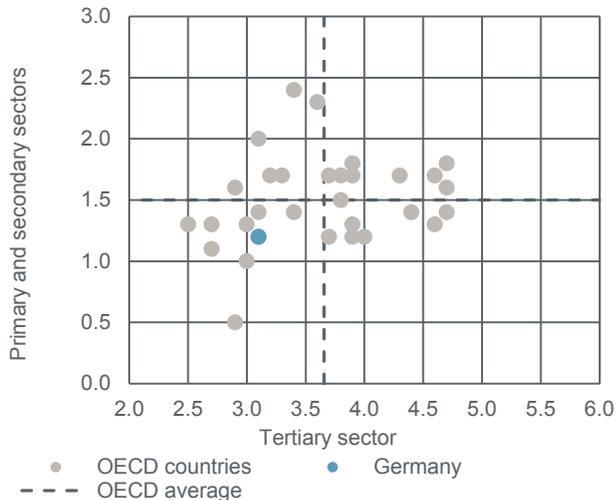
Germany spends less on education than the international average

In relation to its economic strength, Germany currently spends less on its education system than the average (cf. Figure 1).⁸ This is true both of the school sector (primary and secondary education) and of advanced educational provision such as universities (tertiary sector). Germany's expenditure on education is below the OECD average in both categories.

The available data also show that the OECD countries that are ahead of Germany in the PISA results spend more on education in relation to their GDP. As these countries (e.g. the Netherlands, Canada and South Korea) are not deemed to have particularly inefficient administrative procedures (and thus high costs), the (relatively) low expenditure in Germany is probably less the result of efficiency advantages but rather

an indication that more money should be spent on Germany's education system in the future.

Figure 1: Total public education expenditure in international comparison (for the year 2013)



The illustration shows the ratio of education expenditure to GDP for the OECD countries. The dashed lines show the OECD average. Countries that lie in the bottom left quadrant have a below-average investment ratio in the primary and secondary as well as in the tertiary sector.

Source: OECD Educational finance indicators, own rendition.

Educational success depends on many different factors, including the condition of school buildings

A highly effective education system requires not just well-trained and motivated teachers but regular investment in appropriate school infrastructure and resources, such as modern buildings, classrooms and up-to-date teaching materials. The political agenda therefore includes not just teaching staff but an effective education infrastructure. This is all the more important as a large number of empirical studies have established a correlation between school resources and major success parameters for school education. Among other things, they have identified higher test scores of students and fewer absences of students and teachers when the quality of school buildings and classrooms improved.⁹

Appropriate and modern classroom resources and furnishings are not the only thing that plays a role. Many of the analysed infrastructure variables address direct physical characteristics of school buildings. Numerous empirical findings confirm the influence of the classroom environment in particular (e.g. CO₂ concentration and temperature).¹⁰ But other factors, such as room lighting and acoustics and the overall condition of the school building (influenced by various levels of maintenance intensity, for example), can affect learning outcomes.¹¹ The physical condition of school buildings is therefore another important factor that influences educational attainment. This shows that investing adequately in the existing school building stock is necessary and important.

School building construction and maintenance are municipal tasks in Germany

The distribution of power between the federal government, the state governments and the municipalities poses a particular challenge. The responsibilities for mainstream and vocational schools are divided between the municipalities and federal states but in some areas this division differs widely from state to state. Municipalities are usually the authorities in charge of school buildings, resources and administrative personnel.¹² The states, for their part, are responsible for providing the teachers. While the lower secondary schools are often under the authority of the district municipalities, responsibility for (vocational) upper secondary schools lies with the regional districts. Cities with district status are in charge of all the schools offered.¹³

Key data on the German school sector

In 2013/2014, around 8.4 million students were enrolled in mainstream schools and 1.4 million in vocational schools.¹⁴ Expenditure on mainstream schools was higher than on vocational schools. An average EUR 6,800 was spent on each student (in mainstream schools) across Germany.¹⁵ However, expenditure per student varied significantly by type of school (EUR 7,900 in 'Hauptschulen' (vocational general schools) and EUR 5,400 in elementary schools). Expenditure also varies significantly between the federal states (EUR 8,500 in Thuringia and EUR 6,000 in North Rhine Westphalia). While personnel costs of teachers account for the bulk of expenditure, spending on construction measures is only around 12.5 % on average across Germany (materials and equipment only around 4.7 %).¹⁶

School buildings are among the largest areas of municipal expenditure

For the municipalities as the authorities responsible for the buildings, capital expenditure on construction measures in the school sector is one of the largest areas of expenditure after expenditure on roads. In 2015, municipalities spent around EUR 2.9 billion on construction measures on mainstream and vocational schools.¹⁷ That was a moderate increase in construction activity of around EUR 115 million on the previous year (cf. Figure 2).

At the same time, however, construction measures have been on the decline in the long term. With the exception of the special effects created by economic stimulus packages, construction investment in the school sector has fallen continuously over the past years. The result: despite the moderate increase, construction measures in 2015 were around EUR 1.3 billion below the 1995 level.

This development can also be seen in the share of construction expenditure in total municipal expenditure on mainstream and vocational schools (line in Figure 2).¹⁸ Whereas construction expenditure in 1995 still accounted for more than 45 % of total expenditure on schools, this rate was down to a mere 25 % in 2015.

Figure 2: Municipal expenditure on construction measures in mainstream and vocational schools 1995–2015



Source: Own calculations on the basis of data from the Federal Statistical Office.

These figures indicate a shift in investment and expenditure priorities in the school sector to the detriment of construction. In the past, municipalities were unable to undertake all necessary investment in the more than 53,500 municipal school buildings (which account for 34 % of municipal building space alone)¹⁹, which is why the municipal investment backlog now amounts to some EUR 34 billion, according to findings of the KfW Municipal Panel 2016.²⁰

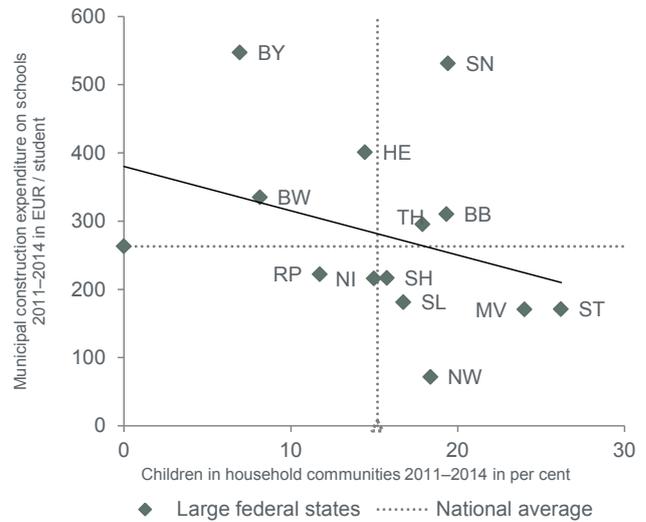
Investment levels vary significantly between federal states

Apart from the generally declining trend in municipal construction activity, there is evidence of great heterogeneity between the municipalities in the large federal states (cf. Figure 3).²¹ Municipal construction expenditure on mainstream and vocational schools ranges from a high EUR 547 to a low EUR 72 per student on a multi-year average from 2011 to 2014.²²

The question is to what extent these differences may reflect different needs within the municipalities of the federal states²³. It can be assumed that investment in education is particularly important in municipalities where a high proportion of the population is socially disadvantaged. Good educational opportunities in these regions give the children prospects for social participation and can thus counteract self-reinforcing and self-perpetuating precarious social structures.

A look at the actual figures is all the more surprising. Figure 3 shows, for example, that in states with a high proportion of families in need (measured by the proportion of children receiving 'Hartz IV' benefits according to Social Code Book II) there is a tendency to spend less rather than more money on school infrastructure. This development is alarming because the low expenditure on education weakens the basis for such a catching-up process particularly in the states that should be catching up economically and socially. This threatens to further exacerbate existing regional differences between the states.

Figure 3: Municipal expenditure on mainstream and vocational schools and children in household communities in 2011–2014 by federal state



Core and non-core households without city-states, share of children under the age of 15

Source: Own calculations based upon data from the Federal Statistical Office and the Federal Employment Agency.

Different budgetary situation may explain differences in expenditure – and further exacerbate disparities

There are various reasons for the wide differences in school expenditure between the federal states. The differences in expenditure may mean that investment requirements vary from one state and municipality to another. These requirements essentially depend on the condition of existing buildings and the need for new ones. Structural conditions of classrooms and demographic characteristics (population density, number and type of schools, classroom sizes, population growth, etc.) also have an impact on expenditure. Rising numbers of students in growing communities and city districts, for example, may lead to significantly higher investment requirements. This may, in part, explain higher expenditures in prosperous municipalities in southern Germany, for example.²⁴

Peculiarities of the official statistic may also contribute to the noticeable differences because capital expenditure between the states and municipalities is de facto not always captured as such in the same manner. One reason for this lies in the definition of the concept of investment and another reason is the change in accounting methods.²⁵ The practice of outsourcing municipal functions into private-law organisations also has a strong impact.²⁶ In these cases it may occur that the expenditure can no longer be clearly attributed to the construction and maintenance of school buildings. The same may also apply to alternative funding and procurement forms such as PPPs.²⁷

Despite the statistical uncertainties, the observable differences in expenditure on school buildings between the federal states are so significant that purely organisational and statistical reasons are unlikely to be an adequate explanation. Rather, the level of municipal investment must also be seen

against the backdrop of municipalities' budgetary scope, as their capital expenditure depends on their financial situation. This means that municipalities with high budget surpluses and relatively low expenditure on social benefits have more funds at their disposal that could also flow into the construction and maintenance of school buildings. Municipalities with a strained budget, however, do not have this leeway. That means many structurally weak municipalities, which also include important large cities, have particularly severe fiscal limitations.

But since these regions are facing the same educational demands (and may even have significantly higher challenges to meet), it becomes increasingly important to ask about the long-term consequences which the differences in the levels of investment in the education sector may have – for the federal states, for the municipalities and for the students themselves. It is noteworthy that comparisons between school performance levels (such as the PISA-E Study) tended to show better outcomes in federal states that also invested more in school buildings.²⁸ If regions with a higher share of children and youths with special educational needs invest less in schools, regional differences in educational opportunities in Germany are at risk of being perpetuated.

Conclusion

Germany is already spending less on its educational facilities than the international average. Besides, major differences exist in the level of investment from one federal state to another. The current results of the KfW Municipal Panel 2016 indicate that the investment weakness of financially strained municipalities has not been mitigated on a sustainable basis despite the states' various consolidation and debt relief

programmes. Given the numerous challenges and the inadequate condition of school buildings in many places, the lack of investment is threatening the long-term effectiveness of Germany's education system.

Reducing the backlog of investment in the school sector will require a range of different measures. First, financially weaker municipalities must be put in a position to invest more in important infrastructure facilities again. All federal levels are called upon to make this possible. In the division of functions, the federal government must focus more strongly on the principle of apportionment of expenditures in financing, especially in the social area. The federal states must ensure that the municipalities are adequately funded through their compensation systems. In addition, special programmes to promote investment may also be helpful in reducing the backlog of investments.²⁹

The municipalities themselves must promote efficient and forward-looking investment by setting their priorities in a sound manner. Given the tight budget situation of many municipalities it is important to ensure that the investment measures have a long-term effect and are sustainable. Useful approaches could involve contracting professional building management services and exploring alternative forms of procurement and financing. Greater municipal coordination and cooperation, along with more flexible strategies for the use and planning of school buildings, could also provide additional savings potential that allows more investment. But not all municipalities will have the levels of expertise that will be required. Small municipalities in particular will need support (in the form of advisory or implementation services, for example). ■

¹ See for example Hanushek, E. A. and L. Wössmann (2012): 'Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes, and Causation', *Journal of Economic Growth* 17(4), p. 267–321.

² For a discussion of the effects of education on economic growth in Germany, see e.g. Borger et al. (2013): *Deutsches Wirtschaftswachstum in der Demografiefalle: Wo ist der Ausweg?* (Germany's economic growth in the demographic trap: Where is the way out? – our title translation, in German only), KfW Economic Research.

³ See e.g. Hanushek, et al. (2015): 'Returns to Skills around the World: Evidence from PIAAC', *European Economic Review* 73, p. 103–130.

⁴ See for example Cunha, F. and J. Heckman (2007): 'The Technology of Skill Formation', *The American Economic Review* 97(2), p. 31–47.

⁵ See e.g. RP Online: 'Umfrage unter Schulleitern: 85 Prozent der Schulen in NRW sind marode' ('*Survey among school headmasters: 85 per cent of schools in NRW are in disrepair*' – our title translation, in German only) dated 17 February 2016; *Die Zeit*: 'Unterricht in Ruinen' ('*Lessons in ruins*' – our title translation, in German only), dated 17 September 2015; or *Tagesspiegel*: 'Marode Schulen und Schülerstreik: Sanierungsstau an Berlins Schulen nimmt gewaltig zu' ('*Dilapidated schools and student strikes; backlog of modernisations at Berlin's schools is growing enormously*' – our title translation, in German only), dated 16 June 2016.

⁶ See e.g. Leifels, A. and J. Zeuner (2015): '[Influx of refugees to Germany requires investment in housing, schools and minds](#)', Focus on Economics No. 108, KfW Research.

⁷ See e.g. OECD (2013): *PISA 2012 – Results in Focus*.

⁸ See also the latest findings of the OECD: OECD (2016): 'Education at a Glance 2016: OECD Indicators', OECD Publishing, Paris.

⁹ The corresponding empirical findings are up-to-date (the essays analysed here are from the year 2005 or later) and are based on findings from a large number of developed countries such as the USA, Canada, the UK, Denmark and Finland. See endnotes 10 and 11 for examples.

- ¹⁰ For the most recent findings see for example Shaughnessy et al. (2015): 'An assessment of indoor environmental quality in schools and its association with health and performance', *Building and Environment* 93, p. 35–40 and Toftum et al. (2015): 'Association between classroom ventilation mode and learning outcome in Danish schools', *Building and Environment* 92, p. 494–503.
- ¹¹ A comprehensive description of relevant factors of school buildings for educational attainment in the US, for example, can be found in National Research Council (2006): 'Green Schools: Attributes for Health and Learning', ISBN: 0-309-66372-5.
- ¹² See for example Bock, I. (2014): 'Gemeinde und Schule' ('*Community and school*' – our title translation, in German only). Gemeindetag Baden-Württemberg (editor), BWGZ 11–12 | 2014, Stuttgart, p. 609ff.
- ¹³ Schools for children with special educational needs and for those with learning difficulties are often under the authority of local government associations or special-purpose associations, which are then financed from levies.
- ¹⁴ Cf. Federal Statistical Office (2014): 'Bildung und Kultur – Allgemeinbildende Schulen – Schuljahr 2013/2014' ('*Education and culture – mainstream schools – school year 2013/2014*' – our title translation, in German only), Fachserie. 11, Reihe 1, Tab. 2.1, Wiesbaden, p. 11ff. and [...] 'Berufliche Schulen – Schuljahr 2013/2014' ('*Vocational schools – school year 2013/2014*' – our title translation, in German only), Fachserie 11, Reihe 2, Tab. 1.2, Wiesbaden, p. 10ff.
- ¹⁵ Data for 2012, cf. Malecki, A., Schneider, C. et al. (2016): 'Schulen auf einen Blick – Ausgaben 2016' ('*Schools at a glance – expenditure 2016*' – our title translation, in German only). Federal Statistical Office (editor), Wiesbaden, p. 48
- ¹⁶ Own calculations based upon data from the Federal Statistical Office. In 2011 around 20% of functions in the school sector were allocated to municipalities. Cf. Arnold, F., Boettcher, F. et al. (2015): 'Kommunaler Finanzreport 2015' ('*Municipal finance report 2015*' – our title translation, in German only), Bertelsmann Stiftung (editor), Gütersloh, p. 21.
- ¹⁷ This refers to gross capital expenditure. It does not take into account wear and tear and decline in value through depreciation. If we consider depreciations along with total municipal capital expenditure, net investment of all municipalities has been consistently negative since 2003. If we considered municipal education infrastructure only, we would probably see the same trend.
- ¹⁸ The federal states accounted for only minimal direct expenditure on construction measures in the school sector to the tune of some EUR 70-100 million per year. Our further analysis therefore focuses on the share spent directly by the municipalities. In 2015, municipal investment in physical assets totalled around EUR 24.7 billion, which corresponds to EUR 302 per inhabitant. Of the investment in physical assets, construction measures were the largest area of expenditure with EUR 18.0 billion (= EUR 220 per inhabitant). Data for core and non-core budgets, cf. Federal Statistical Office (2016): 'Finanzen und Steuern – Vierteljährliche Kassenergebnisse des Öffentlichen Gesamthaushalts 1.–4. Vierteljahr 2015' ('*Finances and taxes – quarterly cash results of the overall public budget 1st to 4th quarter 2015*') – our title translation, in German only)
- ¹⁹ It is estimated that EUR 8.2 billion in new mainstream and vocational school buildings will have to be constructed by 2020. The refurbishment of existing school buildings will require an even higher amount of around EUR 27 billion. This does not include other buildings and facilities such as gymnasiums. Cf. Clausnitzer, K., Fette, M. and Gabriel, J. (2011): 'Evaluation der KfW-Programme "KfW-Kommunalkredit – Energetische Gebäudesanierung", "Energieeffizient Sanieren – Kommunen" und "Sozial investieren – Energetische Gebäudesanierung"' ('*Evaluation of the KfW Programmes "Energy-efficient Refurbishment – Municipalities" and "Social Investment – Energy-efficient building Refurbishment"*) of the years 2007 to 2010' and *ibid* (2015): 'Wirkungen von Förderprogrammen der KfW im Bereich Nichtwohngebäude der Förderjahre 2011 bis 2014' ('*Impacts of promotional programmes of KfW in the area of non-residential buildings in the promotional years 2011 to 2014*'), KfW Group (ed.), Frankfurt am Main (both publications in German only). In contrast, the Federal Statistical Office puts the number of schools in the year 2014/2015 at 33,600, cf. Malecki, A., Schneider, C. et al. (2016): *loc cit.*, p. 48.
- ²⁰ Cf. Scheller, H., Schneider, S. et al. (2016): '[KfW Municipal Panel 2016](#)'. KfW Group (ed.), Frankfurt am Main, p. 16.
- ²¹ Other studies also confirmed the wide differences in investment and education expenditure between the federal states. See for example Klemm, K. (2016): 'Finanzierung und Ausstattung der deutschen Grundschulen' ('*Financing and resources of German elementary schools*' – our title translation, in German only), Grundschulverband (ed.), Essen, or Lenk, T., Hesse, M. et al. (2016): 'Zukunftswirksame Ausgaben der öffentlichen Hand - Eine infrastrukturbezogene Erweiterung des öffentlichen Investitionsbegriffs*' ('*Public spending on the future – expanding the concept of public investment to include infrastructure*' – our title translation, in German only), Bertelsmann Foundation (ed.), Gütersloh. The Federal Statistical Office also reports great differences in expenditure on schools between the federal states, cf. Malecki, A., Schneider, C. et al. (2016): *loc cit.*, p. 36.
- ²² Because construction investments in particular can vary from one year to another, a multi-year average should be chosen in order to make an informative comparison. It can be assumed that the variations in investment requirements will level out across the municipalities of all large federal states and over several years. The shift to double-entry bookkeeping led to considerable reporting problems in the years 2009 and 2010, in particular, making a longer time series analysis almost impossible. Before this paper went to print, student numbers were not yet available for 2015 so that the scope of analysis is limited at the current margin as well.
- ²³ Even if this study is unable to determine what absolute amount of euros is necessary and appropriate for the educational system, the vast differences do at least show the need for providing more funding for schools in individual states and regions.
- ²⁴ The development of student numbers, which is relevant for the construction of schools, depends heavily on the demographic development of a location and perhaps even within parts of it. On balance, however, student numbers have fallen in most federal states in the past years. This applies primarily to the school types 'Hauptschule' and 'Realschule', while 'Gymnasiums' recorded increases.
- ²⁵ The changeover from accounting in accordance with cameralistic principles to double-entry accounting in many communities may lead to mixed forms of capturing capital expenditure and defining ongoing maintenance which is additionally reflected in diverging data when they are recoded into the nationwide cameralistic financial statistics. See for example Hesse, M. and T. Starke (2015): 'Kommunale Investitionen – Einfluss des Erfassungskonzepts' ('*Municipal investments – influence of the collection concept*' – our title translation, in German only). In: Junkerheinrich, M., Koriath, S. et al. (eds.) *Jahrbuch für öffentliche Finanzen 2015*. Berlin, p. 393ff.
- ²⁶ For example, Hamburg outsourced the maintenance and construction of school buildings into the 'Schulbau Hamburg' city-state-owned corporation in 2010. Financing is provided from the special fund for school construction and operation entitled 'Schule – Bau und Betrieb'. Hamburg therefore shows only minor expenditure for this area in the financial statistics. The large federal states also outsource the management of municipal buildings time and again, particularly in large cities.
- ²⁷ These costs (especially rents and leases) should actually be captured as a replacement measure for own investments but the design of the contracts often does not permit a clear attribution so that the statistically captured values may be distorted. The fact is, however, that only an estimated 140 PPPs have been carried out at municipal level since 2002, around half of them in the education sector. For more on PPPs see, for example, Kunzmann, M., Kulle, B. et al. (2015): 'Erfolgsfaktoren kommunaler ÖPP-Projekte – Finanzierung kommunaler ÖPP-Projekte' ('*Success factors for municipal PPP projects – financing municipal PPP projects*' – our title translation, in German only), KfW Group (ed.), Frankfurt am Main.

²⁸ The PISA-E study is a comparison between Germany's federal states conducted by the Institut zur Qualitätsentwicklung im Bildungswesen (IQB - *Institute for Quality Development in Education*) on behalf of the Standing Conference of the Ministers of Education and Cultural Affairs of the federal states of the Federal Republic of Germany. Cf. Pant, H., Stanat, P. et al. (2013): 'IQB-Ländervergleich 2012 – Mathematische und naturwissenschaftliche Kompetenzen am Ende der Sekundarstufe I' (*'IQB country comparison 2012 – mathematical and scientific competences at the end of secondary level I'* – our title translation, in German only). Münster.

²⁹ Thus, several federal states are planning to specifically promote investment in the school sector, for example North Rhine Westphalia, which is running a EUR 2 billion investment programme for schools until 2020. For details go to <https://www.land.nrw/de/guteschule2020>.