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Review Paper: Agents Involved in Gendered Norms and Choices in Education



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1. Executive Summary

The present document constitutes **Deliverable 3.1 / Review paper: Agents involved in gendered norms and choices in education**. It is the first deliverable of Work Package 3 on De-biasing Education, which is part of the larger REWIRING (**R**ealising girls' and **w**omen's **i**nclusion, **r**epresentation, and **e**mpowerment) project that aims to identify the structural root causes of gendered power hierarchies and create sustainable change to prevent and reverse existing gender inequalities.

Work Package 3 focuses on gendered norms and choices within the context of education. The term *gendered choices in education* covers education-related choices that are in line with gender stereotypes and gender-based expectations of how girls and boys *should* feel, think, and act (Brownhill et al., 2015; Eagly & Wood, 2012; Ellemers, 2018; Eccles & Wigfield, 2020). A choice within the educational context might, for instance, be the choice between taking an advanced course in Literature versus Physics. A gendered choice in this context would be if boys disproportionately choose Physics and girls disproportionately choose Literature. In most (if not all) countries, social agents such as teachers and parents are likely to expect children to make gendered choices; common stereotypes will have taught them that girls and boys will have more natural talent and higher chances of success in gender-conform fields. In turn, agents such as media portrayals and textbook images tend to signal men as typical Physicians and women as typical Librarians. On an aggregated level, gendered educational choices result in an overrepresentation of girls/women and underrepresentation of boys/men in some fields such as HEED (healthcare, early education, domestic; Croft et al., 2015; Meeussen et al., 2020) as well as an overrepresentation of boys/men and an underrepresentation of girls/women in some fields such as STEM (science, technology, engineering, mathematics; Belanger et al., 2020). The aim of this review is not to find a way to make all girls choose Physics and all boys choose Literature. Instead, this report reviews existing studies that will help create an ideal situation in which every child can choose free from gender-based expectations, norms, and self-efficacy beliefs.

This work package aims to identify key leverages to change gendered norms and decisions in education and to map and develop tools that can help reduce gendered educational choices. This review of agents involved in gendered norms and choices is a first step towards these goals. The term “agent” serves as a collective term for everything that can

make gendered norms and decisions in education more likely, such as – but not limited to – objects, rules, symbols, beliefs, or media. Based on the reviews on agents (WP3.D1) and existing tools and interventions (WP3.D2), the next steps will include designing educational tools and testing interventions in several countries. The goal of these tools and interventions will be to reduce gendered educational choices. Thereby, the project will contribute to the development of concrete policies for de-biasing education, focusing specifically on advanced educational contexts (students between 12-20 years of age).

The **overall objective** of this review paper is:

- To identify and map the key agents by using multiple perspectives.

The target audience of this review paper consists of:

- Policy makers and other societal stakeholders (e.g. NGOs, educational institutions) around the world with an interest in de-biasing education.
- People working or studying in educational institutions with an interest in de-biasing education.
- Researchers in universities and other institutions with an interest in de-biasing education, including – but explicitly not limited to – people involved in the Re-wiring project.

The structure of this review paper is as follows:

- Section 2 provides a **broader introduction** to the entire **REWIRING project** and framework;
- Section 3 explains the content of this review and **clarifies the terminology** used;
- Section 4 contains the **review paper**;
- Section 5 concludes with **take-away messages, recommendations, and potential future directions**.

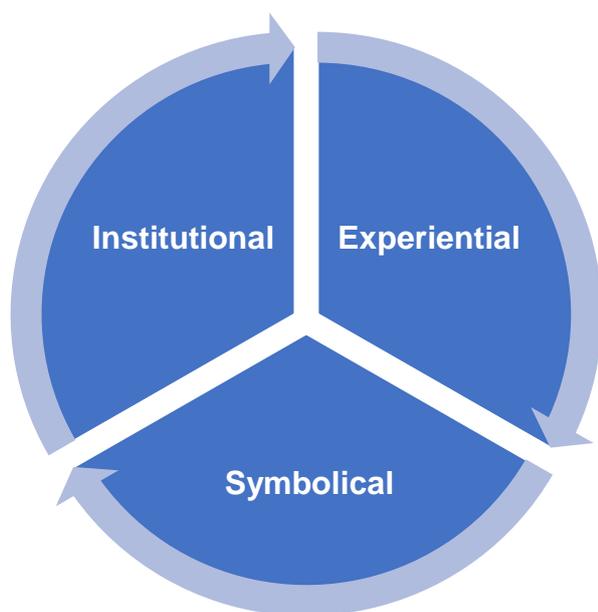
2. Introduction to the Project and Framework

The first section of this review provides a general introduction to the REWIRING project. The name “REWIRING” stems from the goal to “re-wire” institutions in order to achieve gender equality. Given the urgency for a shift from being gendered (or gender-blind/gender-neutral) institutions to gender-sensitive and transformative ones, this project focuses on the fundamental rethinking and '**re-wiring**' of existing institutional approaches and systems. In

our definition, “Institutions” include not only governments and other public bodies, but also companies, banks, social partners, health institutions, schools and academia, and other private social constellations, including, for instance, women’s organizations and religious groups. The RE-WIRING project goes beyond existing doctrinal and policy transformative equality approaches (e.g. EIGE, 2015; Fredman et al., 2016; OECD, 2021) by taking a holistic, multidisciplinary approach. This approach is based on the groundwork laid within the [Utrecht University interdisciplinary research platform for Gender, Diversity & Global Justice](#).

REWIRING, therefore, presents a novel three-dimensional framework that builds upon the premise that effective transformation and women’s empowerment can only come about when simultaneous action is taken on institutional, experiential, and symbolical levels:

Figure 1. Illustration of the Three Analytical Levels.



Institutional:

What are responses to inequality and exclusion on the institutional level, including in laws and policies?

Experiential:

How do women and girls and (non-)dominant group members experience the many forms of inequality in the context of social institutions such as the workplace, educational settings, the family, etc.? And how do they experience institutional measures aimed at correcting these inequalities?

Symbolical:

How are women and girls and (non-)dominant groups and their societal roles represented in the linguistic, narrative, and visual structures that shape society?

This three-dimensional approach takes three highly relevant factors into account: intersectionality, culture, and crises.



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RE-WIRING’s ambition is to:

- **Advance scientific theorization and knowledge** of the gendered power relations across the political, social, economic, and cultural spheres, and the key underlying intersectional dynamics and causal mechanisms that shape them;
- **Develop innovative tools and practical solutions** by empirically elaborating sets of actions that not only target women and girls but engage relevant actors and stakeholders, to improve political, social, economic, and cultural empowerment and increase sustainability and social resilience.

The main research question and objectives of RE-WIRING are summarized in Table 1.

Table 1

How can gendered, intersectional inequalities in the areas of socialization, education, work, laws and policies, politics, business and media (including in their decision-making), be systemically changed in the institutional, experiential and symbolical realms of society in Europe and (South) Africa, to bring about the sustainable inclusion, representation and empowerment of girls and women?			
Aim	Objectives		WP
Advance scientific theorization and knowledge of gendered power hierarchies	RO1	Assess key concepts and develop a novel, interdisciplinary theoretical framework for an intersectional and cross-cultural Transformative Equality Approach	WP1
	RO2	Develop a systematic and in-depth understanding of the root causes of gendered power hierarchies , including relevant contextual, cultural and crisis factors and impacts	WP2, WP3, WP4, WP5, WP6
	RO3	Analyze the role of education and the media in perpetuating or challenging harmful gender stereotypes	WP3, WP5
Develop innovative tools and practical solutions to improve the political, social, economic and cultural empowerment of women and girls	IO1	Co-create and validate interventions with diverse stakeholders at several geographical and political levels and establish a stakeholder network	WP2, WP3, WP4, WP8
	IO2	Identify and test practical tools and innovative solutions for mainstreaming gender-transformative equality in society and institutional settings	WP2, WP3, WP4, WP5
	IO3	Synthesize findings into tangible policy recommendations for targeted and pragmatic programs that contribute to SDG 5 for the empowerment of women and girls	WP2, WP3, WP4, WP5, WP7

3. Setting the Stage

3.1 The Nature of this Review

This review is based on both academic sources (such as peer-reviewed articles published in academic journals) and more practically oriented knowledge sources (such as policy briefs and white papers) related to gendered norms and choices in education. The aim was to create a knowledge base as broad as possible, including sources based on both WEIRD (Western, Educated, Industrialized, Rich, and Democratic) and non-WEIRD countries (Henrich et al., 2010); and countries from the Global North and the Global South (Casellato, 2023; Reidpath & Allotey, 2019). Potentially relevant sources were identified via keyword searches on ProQuest (academic sources) and Google (non-academic sources), and additional relevant sources were found using a snowballing approach. The literature review stopped once already registered agents kept coming up and novel ones could no longer be identified. This review is neither an exhaustive nor systematic review of all literature available – instead, the goal was to provide an overview of relevant agents that exist on the institutional, experiential, or symbolical level.

3.2 The Geographical Scope

The geographical scope of the review is wide. This review contains sources that mention potential agents for students in 196 different countries (see Table 2 for an overview of countries included in the utilized sources).

Table 2
 Overview of Countries Included in Utilized Sources

Author(s) and year of publication	Countries/Regions under Study
Agius et al., 2023	Australia
Aragonés-González et al., 2020	Albania, Argentina, Australia, Austria, Azerbaijan, Belgium, Brazil, Bulgaria, Canada, Chile, China (Hong Kong), China (Macao), Chinese Taipei, Colombia, Croatia, Czechia, Denmark, Dubai, Egypt, Estonia, Finland, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Korea, Kyrgyz Republic, Latvia, Lithuania, Luxembourg, Mexico, The Netherlands, New Zealand, Norway, Panama, Peru,

	Poland, Portugal, Qatar, Romania, Russia, Scotland, Shanghai (China), Singapore, Slovakia, South Sudan, Spain, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, Turkey, UK, Uganda, US
Askola, 2019	Finland
Aydemir et al., 2022	Turkey
Baten et al., 2021	Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mali, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe
Bedyńska et al., 2019	Poland
Bedyńska et al., 2020	Poland
Bell & Juvonen, 2020	US
Benard, 2016	US
Berggren, 2023	England, US, Wales
Bian et al., 2017	US
Bian et al., 2018	US
Blee, 2020	Not specified, global perspective / review
Block et al., 2018	Canada
Block et al., 2023	Not specified, 70 countries
Blumberg, 2008	Syria, India, China, Romania, Sweden
Braun et al., 2005	Germany
Breda et al., 2020	Albania, Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Liechtenstein, Lithuania, Luxembourg, Macao, Malaysia, Mexico, Montenegro, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Qatar, Romania, Russia, Serbia, Shanghai-China, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States, Uruguay, Viet Nam
CARE International, 2022	Zimbabwe
Chaffee et al., 2020	Canada
Cheryan et al., 2015	US
Chestnut & Markman, 2018	US

Commonwealth of Learning, 2017	Antigua and Barbuda, Australia, Bahamas, Bangladesh, Barbados, Belize, Botswana, Brunei Darussalam, Cameroon, Canada, Cyprus, Dominica, Eswatini, Fiji, Gambia, Ghana, Grenada, Guyana, India, Jamaica, Kenya, Kiribati, Lesotho, Malawi, Maldives, Malta, Mauritius, Mozambique, Namibia, Nauru, New Zealand, Nigeria, Pakistan, Pan Commonwealth, Papua New Guinea, Rwanda, Saint Lucia, Samoa, Seychelles, Sierra Leone, Singapore, Solomon Islands, South Africa, Sri Lanka, St Kitts and Nevis, St Vincent and The Grenadines, Tanzania, Tonga, Trinidad and Tobago, Tuvalu, Uganda, UK, Vanuatu, Zambia
Davies et al., 2002	Canada
Davis & Pearce, 2007	US
Eccles, 2011	Not specified, global perspective / review
European Commission, Directorate-General for Education, Youth, Sport and Culture, 2021	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden
Falk & Hermle, 2018	Afghanistan, United Arab Emirates, Argentina, Australia, Austria, Bangladesh, Bosnia and Herzegovina, Bolivia, Brazil, Botswana, Canada, Switzerland, Chile, China, Cameroon, Colombia, Costa Rica, Czech Republic, Germany, Algeria, Egypt, Spain, Estonia, Finland, France, United Kingdom, Georgia, Ghana, Greece, Guatemala, Croatia, Haiti, Hungary, Indonesia, India, Iran, Iraq, Israel, Italy, Jordan, Japan, Kazakhstan, Kenya, Cambodia, South Korea, Sri Lanka, Lithuania, Morocco, Moldova, Mexico, Malawi, Nigeria, Nicaragua, Netherlands, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Saudi Arabia, Serbia, Suriname, Sweden, Thailand, Turkey, Tanzania, Uganda, Ukraine, US, Venezuela, Vietnam, South Africa, Zimbabwe
Feijóo & Rodríguez-Fernández, 2021	Spain
Formanowicz & Hansen, 2022	Not specified, global perspective / review
Galdi et al., 2014	Italy
Göğüş Tan, 2018	Turkey
Goswami, 2015	India

Gunderson et al., 2012	Not specified, global perspective / review
Hansen et al., 2014	Ethiopia
Hartmann, 1976	UK, US
Huber & Baena, 2023	German- and English-speaking profiles
Huggins & Randell, 2007	Rwanda
Jackson et al., 2021	Australia
Kane, 2006	US
Kerkhoven et al., 2016	Review of educational materials available on platforms Scientix and OERcommons (in English); no information on origin countries
King et al., 2010	US
Klingorová & Havlíček, 2015	Afghanistan, Algeria, Andhra Pradesh, Armenia, Belgium, Bhutan, Cambodia, Chhattisgarh, Comoros, Czechia, Denmark, East Timor, Estonia, Finland, France, Germany, Greece, Gujarat, Honduras, Haryana, Himachal Pradesh, Iraq, Iran, Japan, Laos, Madagascar, Malta, Mauritania, Moldova, Mongolia, Morocco, Myanmar, Norway, Odisha, Papua New Guinea, Rajasthan, Romania, Samoa, Saudi Arabia, Singapore, South Korea, Sri Lanka, Sweden, Tamil Nadu, Thailand, Tchaj-wan, Tripura, Tunisia, Turkey, Venezuela
Kurt-Yilmaz & Surgevil-Dalkilic, 2020	Turkey
Leach & Humphreys, 2007	Not specified, global perspective / review
Leslie et al., 2015	US
Lörz et al., 2011	Germany
Maltese & Tai, 2011	US
Manzi, 2019	Not specified, global perspective / review
Mariscal et al., 2018	Not specified, global perspective / review
Martino, 2008	Not specified, global perspective / review
Marsh et al., 2021	Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, Chinese Taipei, Colombia, Connecticut (USA), Costa Rica, Croatia, Czech Republic, Denmark, Estonia, Finland, Florida (USA), France, Germany, Greece, Hong Kong-China, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Latvia, Liechtenstein, Lithuania, Luxembourg, Macao-China, Malaysia, Massachusetts (USA), Mexico, Montenegro, Netherlands, New Zealand, Norway, Peru, Poland,

	Portugal, Qatar, Romania, Russian Federation, Serbia, Shanghai-China, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States of America, Uruguay, Viet Nam
McGuire et al., 2020	UK, US
Meeussen et al., 2020	Not specified, global perspective / review
Mollaeva, 2018	Azerbaijan
Nadeem et al., 2020	Not specified, global perspective / review
Nash, 1990	Bolivia, Chile, Mexico, Peru, Uruguay
OECD, 2015	Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK, US
Öztimur, 2007	Not specified, global perspective / review
Pahlke et al., 2014	Australia, Barbados, Belgium, Bermuda, Brunei, Canada, Colombia, Hong Kong, Iran, Ireland, Israel, Jamaica, Japan, Germany, Kenya, Korea, New Zealand, Nigeria, Thailand, Trinidad and Tobago, UK, US
Pilotti, 2021	Saudi Arabia
Pomerantz & Field, 2022	UK, US
Promundo and CARE International in Rwanda, 2012	Rwanda
Rankin & Aytaç, 2006	Turkey
Rapoport & Thibout, 2018	France
Rammohan & Vu, 2018	India
Rhodes et al., 2019	US
Richardson et al., 2020	Not specified, 75 countries
Scharrer & Warren, 2022	US
Schøne et al., 2020	Norway
Shcholokova et al., 2021	Ukraine

Siapera, 2019	Not specified, global perspective / review
Singletary et al., 2009	Not specified, global perspective / review
Seguino, 2011	97 countries participating in the World Value Survey
Soylu Yalcinkaya & Adams, 2020	Not specified, global perspective / review
Steele & Aronson, 1995	US
Stepanenko et al., 2021	Germany, France, Poland, Ukraine
Stoet & Geary, 2018	Albania, Algeria, Australia, Austria, B-S-J-G (China), Belgium, Brazil, Bulgaria, CABA (Argentina), Canada, Chile, Chinese Taipei, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Estonia, Finland, France, FYROM, Georgia, Germany, Greece, Hong Kong (China), Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Korea, Kosovo, Latvia, Lebanon, Lithuania, Luxembourg, Macao (China), Malta, Mexico, Moldova, Montenegro, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Qatar, Romania, Russia, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam
Tellhed et al., 2018	Sweden
Toffanin, 2011	Italy
Towns et al., 2014	Sweden
United Nations Educational, Scientific and Cultural Organization, 2018	194 UNESCO member states
Uunk, 2023	Albania, Algeria, Australia, Austria, Belgium, Brazil, B-S-J-G (China), Bulgaria, Canada, Chile, Chinese Taipei, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hong Kong, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Korea, Latvia (LSS), Lebanon, Lithuania, Luxembourg, Macao, Macedonia, Malta, Mexico, Moldova, Montenegro, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Qatar, Romania, Russian Federation, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia,

	Turkey, United Arab Emirates, United Kingdom, United States, Uruguay, Vietnam
van der Vleuten et al., 2016	Germany, Netherland, Sweden, UK
Van de Werfhorst, 2019	Austria, Belgium, Czechia, Denmark, UK, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Sweden
Van Praag et al., 2021	Belgium
Vlasceanu & Amodio, 2022	Albania, Algeria, Argentina, Armenia, Australia, Azerbaijan, Austria, Bahamas, Barbados, Belgium, Belize, Brazil, Bulgaria, Canada, Chile, Croatia, Czech Republic, Estonia, Egypt, Finland, France, Germany, Hungary, Iceland, India, Indonesia, Ireland, Italy, Japan, Kazakhstan, Luxembourg, Malaysia, Malta, Mexico, Moldova, Netherlands, New Zealand, North Macedonia, Norway, Panama, Poland, Portugal, Russia, Saudi Arabia, Slovenia, South Africa, Serbia, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Arab Emirates, UK, US, Vietnam
Vzw Zijn – Beweging tegen Geweld, 2019	Belgium, Croatia, Germany, Portugal, Spain
Wang & Degol, 2013	Not specified, global perspective / review
Ward & Harrison, 2005	Not specified, global perspective / review
Women Deliver, 2016	Not specified, global perspective / review
Women Deliver, 2019	Not specified, global perspective / review
Young & James, 2001	US
Yu & Shay, 2022	South Africa
Zeng et al., 2014	China

3.3 The Studied Students

This review focuses on agents that influence gendered norms and the educational choices of students. Hereby, students between 12 and 20 years of age are the target, the described agents are thus present in more advanced educational settings. The educational stages students find themselves in range from the start of high school to their first years in higher education, for instance, at a university. While participants might likely identify as girls/boys at 12 years and as women/men at 20 years, the terms “girls” and “boys” are used throughout

this review. This means that the term “girls” as used here also includes young women and that the term “boys” also includes young men.

3.4 What We Mean by “Agents”

This review provides an overview of “agents” within the context of education that might have an impact on gendered norms and choices. The term “agent” serves as a collective term for any potentially influencing factor on gendered norms and decisions in the educational context. Agents are conceptualized very broadly, including everything from a subtle cue that students pick up to rules to laws that actively hinder their freedom to make autonomous educational choices. The term “agent” thus encompasses potential influencing factors such as objects, rules, symbols, beliefs, or media.

3.5 Vertical vs. Horizontal Gender Segregation

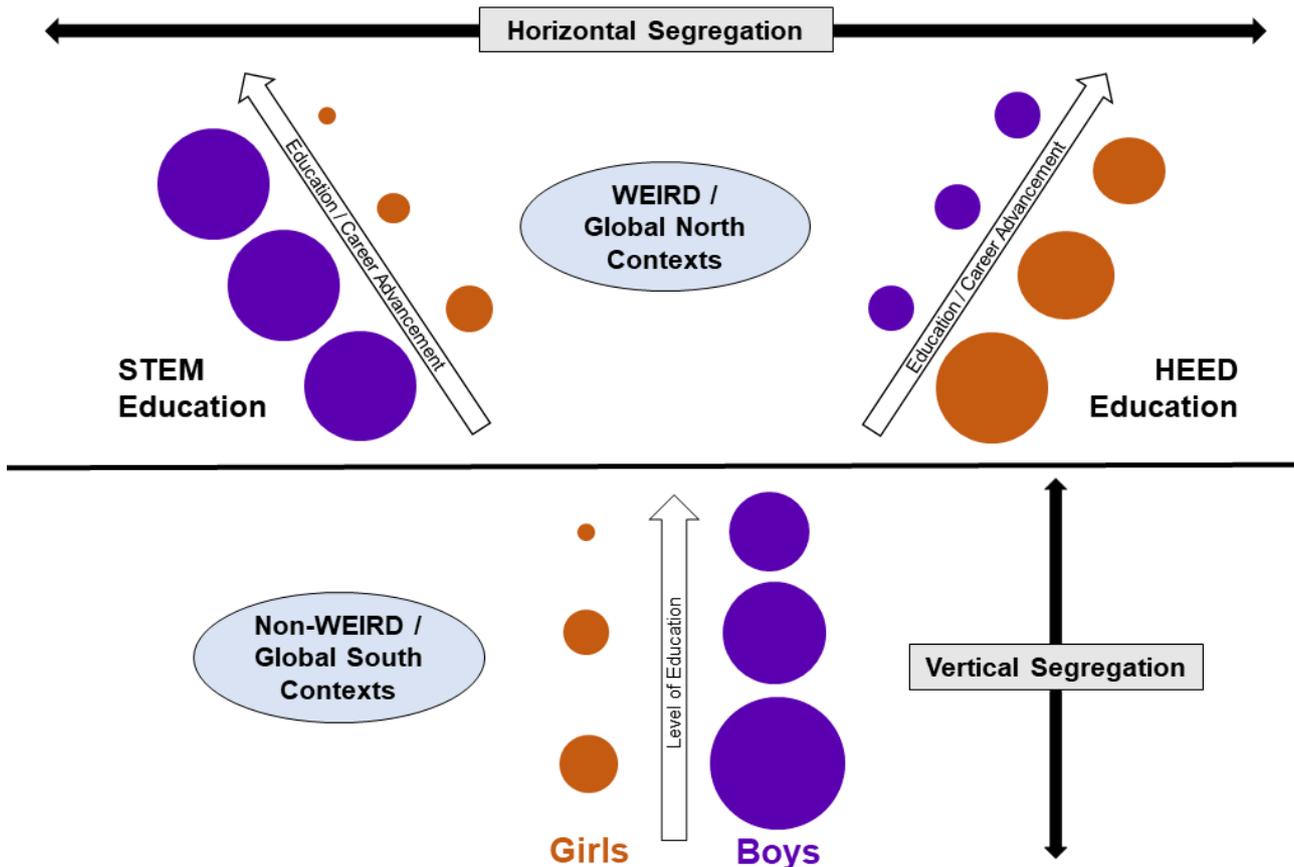
While this review discusses “choices” within the educational context, it is of course often not the case that students get to make educational choices for themselves. More specifically, educational gender segregation happens on two separate axes, best captured by the terms *vertical gender segregation* and *horizontal gender segregation* (Bettio & Verashchagina, 2009; Charles & Bradley, 2002; Charles & Bradley, 2009). Please see Figure 2 for an illustration.

Vertical gender segregation spans across agents that impact students’ general access to education, especially for girls. Vertical gender segregation determines whether students get to attend school at all, and until which level they attend school. Vertical gender segregation includes the rather insurmountable hurdles that students have to take. An example is the practice of child marriage in some regions that forces girls to drop out of school after marriage. Vertical gender segregation tends to be particularly present in non-WEIRD / Global South contexts and tends to be covered more in the practically oriented literature than in purely academic journal publications.

Horizontal gender segregation occurs once general access to education is achieved. It is in itself often a privilege to have the freedom to make one’s own educational choices. Horizontal gender segregation includes agents related to boys’ and girls’ segregated choices. Horizontal means that girls tend to steer towards typically feminine occupational fields (such as HEED), and boys tend to steer towards typically masculine occupational fields (such as STEM). The presented freedom of choice acts as a breeding ground for

existing gender bias and stereotypes. Horizontal gender segregation tends to be particularly present in WEIRD / Global North contexts and tends to be covered more in academic journal publications than in the practically oriented literature.

Figure 2. Vertical and Horizontal Gender Segregation in Educational Contexts.



3.6 The Fluid Borders Between Different Levels

In this review potential agents that boys and girls encounter and incorporate into their educational choices are classified into three different levels: the institutional level, the experiential level, and the symbolical level. The lines between these levels are not always clear-cut and an agent can matter on several levels. For example, a teacher might be a relevant agent whenever they enforce institutional rules (institutional level), succeed or fail to create a safe learning environment (experiential level) or decide to (not) use gendered

language in the classroom (symbolical level). This implies that while an agent might only be listed on one of these levels, this does not imply that it might not also matter on other levels.

3.7 The Binary Gender Distinction

The existing literature on school environments largely uses a binary conceptualization of gender, classifying children as either boys or girls (Smith & Payne, 2015). This conceptualization excludes non-normative gender identities from the research process and thereby leads to a lack of insight and representation of students with other gender identities, such as transgender or non-binary gender identities (Nowakowski et al., 2016). Hence, this binary understanding supports the maintenance of social structures that divide children into boys and girls and that teach them social rules and norms according to this binary gender conceptualization.

While most of the literature prioritizes this binary point of view, some literature emphasizes the importance of a non-gendered agenda in education research. For example, Smith and Payne (2015) note that non-normative gender identities are marginalized in schools, while the practices and structures of traditional gender roles are hardly examined. Woolley (2015) argues that school structures regenerate heteronormative binary gender norms in bathrooms, classrooms, teacher's instructions, and in-school practices. Rowan and colleagues (2002) define the depiction of boys and girls as homogenous groups and the practice of explaining possible differences by relying on “natural differences” between boys and girls as one of the problems of the gender-based agenda. Martino and Kehler (2007) highlight that interventions tend to re-establish traditional masculinity norms instead of questioning the binary gender distinction.

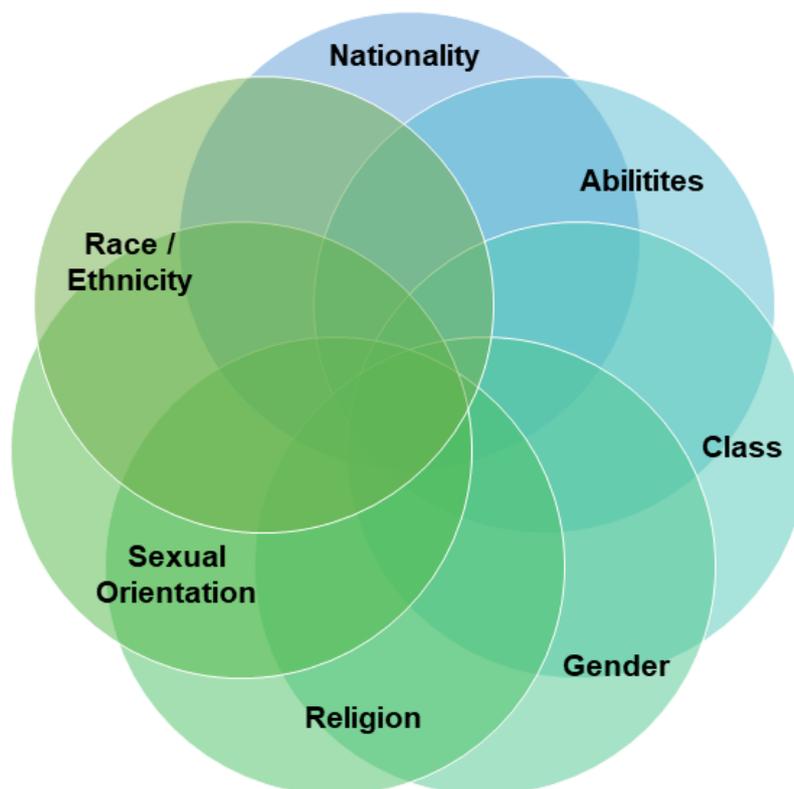
Despite its problematic shortcoming, the binary conceptualization of gender was adopted within the scope of this review given the lack of literature exploring the experiences and perspectives of students with other gender identities.

3.8 The Intersectional Dimension

Promoting gender equality in education is a vital goal, but it is important to note that inequality goes beyond gender categories alone. There are many documented historical and current disparities in educational opportunities and outcomes between non-dominant and dominant groups that affect their academic performance, well-being, and future career aspirations. For instance, educational discrepancies exist for boys versus girls and people

of other genders, but also for students from high versus low-income families, students born in the Global North versus the Global South (Ullah, 2019), students from urban versus rural areas (Urban Institute, 2018; Zeng et al., 2014), students who are considered able versus students who need special education, students who are heterosexual or cisgender versus students belonging to sexual and gender minorities (Francis, 2017), and students from majority ethnic, language, and religious groups versus minority ethnic, language, and religious groups (see, e.g., Cochran-Smith et al., 2016). While this review focuses on girls and boys and gender-related agents, it is important to recognize that for inequality in education, other group memberships also likely impact gendered norms and educational choices. Taking an intersectional approach can help to understand how different social identities (i.e., class, ethnicity, or gender) overlap and cause different and unique kinds of experiences of inequalities, which cannot be explained by using single-axis frameworks (Crenshaw, 1989). If intersectional identities are not considered at an institutional level, implemented social policies may have shortcomings and may not promote equality for everyone in education to an equal extent (Cho et al., 2013).

Figure 3. Illustration of Intersectionality.



4. Review of Agents Involved in Gendered Norms and Choices in Education

Gender inequality is found to be one of the critical elements that determine performance, attainment, and motivation to pursue education, and representation in specific fields (Davies & Ercolani, 2021; Huggins & Randell, 2007; Rhodes et al., 2019). The goal of this review is to provide an overview of agents within the context of education (e.g., curricula, parents, teachers, school policies, peers) that cause and/or reproduce:

1. overrepresentation of boys/men and underrepresentation of girls/women in some fields such as **STEM** (science, technology, engineering, mathematics; Belanger et al., 2020); as well as
2. overrepresentation of girls/women and underrepresentation of boys/men in other fields such as **HEED** (healthcare, early education, domestic; Croft et al., 2015; Meeussen et al., 2020).

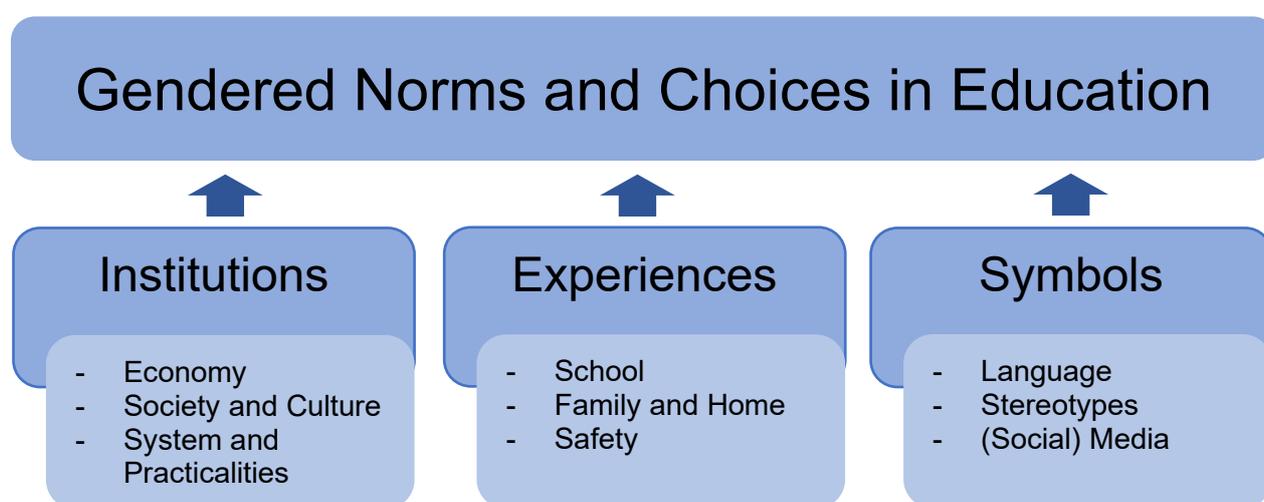
The agents that boys and girls and individuals with other gender identities potentially encounter and incorporate into their educational decisions are classified across the three main levels of the project: 1. the institutional level, 2. the experiential level, and 3. the symbolical level.

Agents that students might encounter on an **institutional level** are economic factors, broader norms, or traditions related to the society and culture people live in. Moreover, institutional barriers such as broader systemic or practical factors can play a relevant role. These might be the general accessibility of a school, the policies in place to support pregnant women, or the mere access to menstrual hygiene products as a barrier to school attendance.

At the **experiential level**, students may have experiences that lead to gendered norms and decisions throughout their school and career tenure. Such experiences happen at school itself, for instance, while interacting with teachers or peers. They can, however, also take place at home. For example, they might learn that relatives have certain expectations regarding their educational choices. Experiencing unsafe situations, be it on the way to school or at school itself can also influence the educational path that boys and girls and individuals with other gender identities follow.

At the **symbolical level**, girls, boys, and individuals with other gender identities might also encounter agents of symbolic character that will influence their educational journey. The language used by teachers and school books often reflects and reinforces gender stereotypes and thereby also enforces gendered educational decisions. Gender stereotypes are woven into students' daily environment, be it through teachers' and parents' expectations, present role models, or online and offline media.

Figure 4. Overview of Identified Agents Across Levels of Analysis.



4.1 The Institutional Level

4.1.1 Economic Agents

Several economic agents influence vertical gender segregation. **Economic development structure and growth** play a vital role in reducing gender disparities in education (Rammohan & Vu, 2018). This implies that **economic integration** is a powerful tool to bridge the gender education gap (Baten et al., 2021). The overarching (economic) system of a society matters as well. In a similar vein, research in Turkey and 21 sub-Saharan African countries¹ showed that areas that underwent **urbanization**, had **coastal access** or **railway**

¹ Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mali, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

proximity, or were **less politically conflicted** achieved greater gender equality in education (Rankin & Aytaç, 2006; Baten et al., 2021).

When it comes to **educational costs**, the economic impact on gender equality in education becomes even more clear. **School fees** and **poverty** constitute major barriers to girls' education (Women Deliver, 2019), especially with school fees and costs for educational materials often increasing with age (Zeng et al., 2014). If families need to limit such expenses, this often disproportionately affects girls, especially in families where traditional gender roles prevail and **the importance of education and return to education is considered higher for men** (Aragonés-González, 2020; Zeng et al., 2014). In line with this prioritization of boys' education over girls' education, **illiteracy** rates among girls are still high and stagnant in many countries, especially in North Africa, Western Asia, Southern Asia, and sub-Saharan Africa (UNESCO, 2018; Women Deliver, 2019). If the family income and **financial decisions in a family are dominated by men**, women's empowerment is especially likely to be suppressed, including their educational attainment and own decision-making (Promundo and CARE International in Rwanda, 2012).

Economic agents also determine horizontal gender segregation. Two straightforward economic agents related to the different educational choices that girls and boys make are their **prospects of employment and earnings**. Not only do girls tend to face fewer future employment opportunities than boys (Women Deliver, 2019; Rankin & Aytaç, 2006; Block et al., 2018) but also their expected earnings are lower than those of boys (Rapoport & Thibout, 2018). The differences in future employment and salary opportunities also tend to be linked to the **general structure and state of a country's economy**.

Economic development not only improves the educational situation for girls but also increases boys' performances in areas in which they tend to underperform, such as reading (OECD, 2015). Systems characterized by **capitalism** and **patriarchy** promote gender segregation in career decisions (Hartmann, 1976). These systems enforce and/or require **men's dominance over women**. In these systems, women are needed as **cheap labor** and often **objectified** and reduced to means to obtain sexual pleasure (Benard, 2016; Öztimur, 2007). Capitalist systems tend to **minimize welfare provisions**, which threatens women more than men (Nash, 1990; Toffanin, 2011). Even in modern digital spheres, **misogyny** and **digital violence against women** bar the way to women's partaking in creating technological spheres for the future (Siapera, 2019).

One economic agent that tends to boost gender equality in education is **women's labor force participation** (Rammohan & Vu, 2018). In countries with a large proportion of women participating in the labor force, economic prospects for girls tend to be better. However, labor

force participation also has demonstrable effects within the educational context: In countries with larger women's labor participation, girls tend to do better in math to the extent that the gender gap narrows considerably, while boys' performance stays unaffected (OECD, 2015).

4.1.2 Social and Cultural Agents

When it comes to vertical gender segregation, the macrostructure of society also plays a relevant role in gender equality in education. **Colonial influences and historical Catholic missionaries**, for example, often add to the gender gap in education, as is the case in Sub-Saharan Africa (Baten et al., 2021). This is because colonization delayed educational expansion overall and because Catholic missions gave greater importance to boys' education (Baten et al., 2021). A country's present level of **religiosity** is also related to gender inequality, as religious beliefs tend to enhance more conservative and patriarchal attitudes towards women (Seguino, 2011). In line with this, states with mostly unreligious inhabitants tend to display the lowest levels of gender inequality, Christian and Buddhist societies tend to display average levels of gender inequality, and countries with citizens who adhere to Islam or Hinduism tend to display the highest levels of gender inequality (Klingorová & Havlíček, 2015).

Regarding horizontal gender segregation, features of the **educational system** itself also drive students' ambitions at school (OECD, 2015). More specifically, more open education systems that tend to give students greater **choices on what to read and learn** and help them look ahead can nurture their ambitions at school (OECD, 2015).

The overall **level of gender equality** in a country is an agent that generally tends to increase the gender gap in reading skills (with girls outperforming boys) but decreases the gender gap in math (OECD, 2015). Another relevant country-level agent is **gender ideology**. A society's predominant gender ideology influences the educational decisions that girls and boys make, a more egalitarian and less traditional gender ideology is associated with higher educational attainment (Davis & Pearce, 2007). The positive association between a country's level of gender equality and student's ungendered choices regarding their education and career is, however, only observable within certain limits. The so-called **Gender-Equality Paradox** is the phenomenon that countries with higher levels of gender equality (such as Finland) tend to have a larger gender gap in STEM (Stoet & Geary, 2018). Moreover, this phenomenon is not explainable on the level of household wealth but takes place on the country's macro-level (Uunk, 2023). There has been much discussion about this paradox, with more and more evidence supporting the correlation of economic development with socio-cultural changes that provide explanations for the paradox (e.g. compare Berggren, 2022; Block et al., 2023; Breda et al., 2020; Falk & Hermle, 2018; Marsh

et al., 2020; Richardson et al., 2020; Soylu Yalcinkaya & Adams, 2020). The evidence for the Gender-Equality Paradox thus suggests that improving students' educational options and establishing higher levels of gender equality – as is done in countries like Finland – will not suffice to eliminate gendered educational choices. The conclusion that economic growth alone does not suffice when aiming for de-biasing education and work recently gained additional attention when Claudia Goldin received the Nobel Prize for her work on gender differences in the labor market:

“Despite modernisation, economic growth and rising proportions of employed women in the twentieth century, for a long period of time the earnings gap between women and men hardly closed. According to Goldin, part of the explanation is that educational decisions, which impact a lifetime of career opportunities, are made at a relatively young age.”

(The Royal Swedish Academy of Sciences, 2023)

4.1.3 Systemic and Practical Agents

Several agents at the systemic and practical level contribute to vertical gender segregation. A social practice that harms girls' educational attainment very directly is **forced and/or child marriage**, often resulting in **teenage pregnancy** (CARE International, 2022; Women Deliver, 2019). **Denial of access** to public schools and the expulsion of pregnant girls as well as a **lack of re-entry policies or laws** protecting pregnant girls' and young mothers' right to education can additionally increase this harm (Women Deliver, 2019).

Another agent that disproportionately affects girls in the Global South and that can directly hinder them from regularly attending school is **(menstrual) hygiene management**. The general **lack of a sanitary school environment** including inadequate WASH (water, sanitation, hygiene) facilities for girls or mere lack of **separate toilets for girls** makes school attendance during menstruation extra hard (Aragón-González, 2020; Women Deliver, 2016; Women Deliver, 2019). The absence of menstrual hygiene management that could provide **access to menstrual hygiene products** can hamper girls' regular school attendance even more (Aragón-González, 2020; CARE International, 2022; Women Deliver, 2019). Another way in which teachers can harm girls' educational attainment is via their **negative attitudes towards girls who are menstruating** which exist in some countries such as Uganda (Aragón-González, 2020).

Systemic and practical agents also matter for horizontal gender segregation. **Gender-discriminatory norms and stereotypes** as well as pervasive **patriarchal norms** enhance gendered educational choices (Women Deliver, 2019). Those are particularly present in **far-**

right, alt-right, and (populist) nationalistic ideologies. The far-right and alt-right build on **misogyny**, a form of sexism characterized by a general dislike and mistrust of women (Blee, 2020). Those spaces tend to be **hierarchical and male-dominated** and cherish traditional values (Agius et al., 2023; Blee, 2020). In a similar vein, **populist national** spaces tend to uphold traditional gender roles and ideas of sexual differences and male superiority (Towns et al., 2014) and consider gender equality as unnecessary or harmful (Askola, 2019). Such ideologies thus mandate strong gender order and norms to advance political agendas. In turn, these strong norms for masculinity and femininity influence girls' and boys' choices regarding education and employment as well as their possibilities to participate in public spaces.

Within educational institutions, school-related activities can also strengthen girls' interest in math and science, and boys' interest and openness to care, social, and language domains. Research has shown, for example, that girls' interest in math and sciences tends to be sparked during school-related activities, while boys discover their interest in these subjects mainly during **self-initiated activities** (Maltese & Tai, 2011; Wang & Degol, 2013). Boys' interest in care, social and language domains as well as girls' interest in math and science might thus be increased by both stimulating school activities as well as more encouragement and inspiration to engage in activities outside of school.

Another school-related agent that generally tends to enhance inequality is **early** (versus late) **tracking**, meaning that differences in educational attainment tend to be greater if children are tracked into differentiated curricula at an early age (Van den Werfhorst, 2019).

4.2 The Experiential Level

4.2.1 School-related Agents

One powerful institution that shapes many experiences that guide students' educational choices is the **school** itself, and once girls, boys, and individuals with other gender identities have gained access, many agents relevant to horizontal gender segregation come to the fore. Generally, **gender inequality in education tends to increase as education progresses** towards secondary and tertiary levels (Huggins & Randell, 2007).

A general school-related agent is the **socio-economic position of the school** (OECD, 2015). Moreover, **gendered schooling norms, hidden curricula, and traditional gender perceptions** tend to make gendered educational decisions more likely (Aydemir, 2022; Blumberg, 2008; Goswami, 2015; Mollaeva, 2018). Gendered educational decisions are further strengthened by a **lack of gender equality discussion in the classroom**

(Shcholokova et al., 2021). The **presence of male teachers in early education** matters as well. They can serve as role models for boys and inspire them to see the context of school as well as a career in early education as less typically feminine (Martino, 2015). The **size and composition of classes** and the **quality of teacher education** can also influence how gendered students' educational decisions will be (Maltese & Tai, 2011; Wang & Degol, 2013). Girls, for example, tend to perform better in math if they attend a same-sex school (Pahlke et al., 2014). Some **structural differences** such as boys' higher likelihood to repeat grades and attend vocational schools also offer boys better opportunities to learn math (OECD, 2015).

One practice regarding the composition of classes and groups that is problematic is **tokenism**. It describes the placement of members of underrepresented and/or disadvantaged groups (e.g., men in women-dominated HEED fields or women in men-dominated STEM fields) in order to give the appearance of equality (Oxford Reference). This symbolical placement, however, often does not result in more diverse voices and perspectives (Yu & Shay, 2022) or higher perceptions of workplace equality (King et al., 2010) but is instead frequently accompanied by performance pressure and role entrapment for members of underrepresented groups (Kurt-Yilmaz & Surgevil-Dalkilic, 2020). The negative consequences of tokenism apply to men as much as they apply to women. In male flight attendants, for example, tokenism resulted in lower self-esteem and job satisfaction (Young & James, 2001). Students might thus tend to make gendered educational choices to avoid being tokenized in their future careers.

Teachers pose another crucial influence on gendered norms and educational choices.

“If parents and teachers subscribe to the belief that women are poor in mathematics, their behavior may in fact create that reality and maintain it. Thus the belief reflects the truth, but it is not a necessary truth, and therein lies the insidious nature of stereotypes.”

(Hamilton et al., 1990)

The **gendered expectations** that teachers hold influence students and are also one reason for boys' underachievement at school (Commonwealth of Learning, 2017). Teachers tend to give different **grades** to boys versus girls according to their own **stereotypical notions** (Gunderson et al., 2012). More specifically, when comparing students performing equally well, they tend to still grade girls higher in reading and boys higher in mathematics (OECD, 2015). **Teachers' instructional practices** also play a crucial role (Maltese & Tai, 2011; Wang & Degol, 2013), for instance, when **approving reading materials** for boys. Boys tend to underperform when it comes to reading skills, which is worsened when teachers discourage boys from reading materials in line with personal interests (e.g., comic books) in the belief that these materials are not ideal reading materials to develop reading skills

(OECD, 2015). In line with this, teachers' use of practices aimed at **stimulating reading enjoyment** is positively associated with reading achievement in both girls and boys (OECD, 2015). In addition to that, teachers' **use of cognitive-activation strategies** is associated with better performance in math, especially for girls (OECD, 2015). In many countries, the **lack of qualified women teachers** harms girls' school performance. Girls tend to perform better and are less likely to drop out when they have competent women teachers who encourage them to succeed and act as **positive role models** (Women Deliver, 2016).

Besides teachers, **peers** can also act as an agent that increases or reduces gendered norms and choices. For example, girls' performance in math can be influenced by the **performance of other girls** in their class (OECD, 2015). For students in Norway, having more **friends from the opposite gender** resulted in less gendered educational choices (Schøne et al., 2020), and having other-gender friends is itself more likely when gender norms and expectations are less strict.

4.2.2 Familial and Domestic Agents

Students' **family** contributes to both their access to education and the decisions they make within the course of that education.

Parents' decisions and preferences as well as a family's composition matter for vertical gender segregation. In some countries, for instance, in Turkey, parents tend to enhance gendered educational choices by **endorsing patriarchal family beliefs** and **prioritizing their sons' education** over their daughters' (Rankin & Aytaç, 2006; Women Deliver, 2019). Another family-related influence on students' educational attainment can be their **birth order**. In Turkey, for example, being born first is especially detrimental to girls' education because they are often expected to **take care of their younger siblings** (Rankin & Aytaç, 2006). In countries such as Azerbaijan, Turkey, or Zimbabwe, girls' educational attainment is also often disrupted by overwhelming unpaid **household chores** (CARE International, 2022; Mollaeva, 2018) given that their relatives implement **sex-segregated household work** and do not expect boys to perform similar chores (Rankin & Aytaç, 2006). The role of a parent's **immigration background** is less clear as gender gaps in equality can be more or less pronounced with immigrant parents (OECD, 2015).

Families also matter when it comes to horizontal gender segregation, especially **parents** tend to have a powerful impact on students' educational choices (Eccles, 2011; Göğüş Tan, 2018). **Parents' expectations** for their children shape their future, and often these expectations are gendered. Around the world, parents tend to have different expectations for their sons and daughters that are likely stimulated by the **gender stereotypes** they hold. They are often more likely to expect their sons to work in STEM fields, and this is especially

the case in socio-economically advantaged households in many countries around the world (OECD, 2015; Wang & Degol, 2013). Parents tend to **accept gender non-conform behaviors** from their daughters more than from their sons, and boys tend to report perceived **pressure from parents to comply with stereotypically masculine norms and behaviors** (Jackson et al., 2021; Kane, 2006). This pressure likely also influences the educational interests and choices that boys make. More generally, research shows that **parents' perceptions** tend to correlate with their children's self-beliefs about their skills in different subjects and also influence their actual performance in these subjects (Gunderson et al., 2012). **Parents' educational backgrounds and occupations** tend to further shape their children's educational choices (Rankin & Aytaç, 2006). Aside from their beliefs about their child's abilities, **parents' personal feelings toward subjects** such as math might shape the (unintended) messages they convey to their children (Gunderson et al., 2012). Lastly, daughters often **lack a role model** as few mothers work in STEM (OECD, 2015).

4.2.3 Safety-related Agents

On the vertical level of gender segregation, a lack of **safety** itself can hinder girls from equal access to school and education, for instance, in India (Goswami, 2015). Something as simple as their **distance to school** can make it more likely for girls to experience gender-based violence and therefore make it less likely that they take the daily risk of this journey (Women Deliver, 2019). Complications of **humanitarian and conflict settings** can further hinder girls' school participation (Women Deliver, 2019).

Relevant for both vertical and horizontal gender segregation, safety also matters in less tangible ways, for instance, for identities. **Bullying**, gender-based violence, and discrimination can occur based on gender or identities intersecting with gender. Research in Spain has shown, for example, that children tend to be bullied if they do not fit into traditional gender roles (Feijóo & Rodríguez-Fernández, 2021). While reports on **gender-based violence** often focus on violence against young heterosexual women, gender-based violence includes violence with **homophobic intent**, and violence against girls and boys who do not conform to common gender roles and identities, including less masculine boys (Leach & Humphreys, 2007; Women Deliver, 2019). **Gender-based discrimination** by peers or teachers also plays an important role in students' educational pathways. Students who experience gender discrimination by teachers perceive school to be unfair, which is – in turn – associated with depressive symptoms and a lack of sleep (Bell & Juvonen, 2020). Already the **expectation of discrimination** in certain fields causes girls to avoid those fields and certain careers associated with them (Van Praag et al., 2021). It is also likely that boys **experience discrimination when pursuing traditionally female careers** (e.g., in HEED

domains), mostly based on **negative competency expectations** (Manzi, 2019). Taken together, safety-related agents play an important role in the perceived **hostility of the school environment**, which in turn, contributes to both vertical and horizontal gender segregation (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2021).

4.3 The Symbolical Level

4.3.1 Language-related Agents

Language is not only omnipresent but also has the capacity to carry information between the lines, which impacts horizontal gender segregation in particular. It is a powerful agent to communicate subtle cues that result in gendered educational choices. One such way is the use of **masculine generics** (Braun et al., 2005; Formanowicz & Hansen, 2022). **Small linguistic choices** such as speaking of “being a scientist” or “doing science” as well as saying that “Girls are as good as boys at math” or “Girls and boys are equally good at math” can have a big influence on students beliefs by (re)producing the gender stereotypes they hold (Chestnut & Markman, 2018; Formanowicz & Hansen, 2022; Rhodes et al., 2019).

4.3.2 Stereotype-related Agents

Agents related to stereotypes are core drivers of horizontal gender segregation. Children start holding gender stereotypes from an early age and by age 6 they have already internalized the **stereotype that brilliance is a male quality** (Bian et al., 2017; McGuire et al., 2020). These stereotypes lead to biased ability beliefs and gender-typical career aspirations (Bian et al., 2018; Leslie et al., 2015; Tellhed et al., 2018; van der Vleuten et al., 2016; Van Praag et al., 2021). For girls, these **gender stereotypes** result in a lack of self-confidence, reduced self-efficacy beliefs, and higher anxiety regarding the fields of math and science (OECD; 2015), eventually resulting in lower self-determination to pursue STEM careers (Pilotti, 2021).

This tendency is also captured by the phenomenon of **stereotype threat**, students’ tendency to perform worse in a domain that is related to negative performance stereotypes associated with the group they belong to (for instance, the STEM domain for girls; Singletary et al., 2009; Steele & Aronson, 1995). This tendency is mostly researched in African Americans and women, but more recent studies indicate that stereotype threat also causes boys to underperform in typically female domains such as language arts (Bedyńska et al., 2020). Chronic stereotype threat tends to accumulate in individuals and tends to result in long-term

consequences, such as career choices (Bedyńska et al., 2019). As a result, the perceived benefits, life plans, perceived success probability, and choice of study field depend on gender (Lörz et al., 2011).

Gender differences in attitudes towards school and learning are generally driven by **society's notion of masculinity and femininity**. While showing interest in school fits with femininity, it goes against a **masculine identity** (OECD, 2015). The dominance of masculine and feminine concepts restricts students' freedom for self-development (Vzw Zijn - Beweging tegen Geweld, 2019), and holding a **hegemonic masculine identity** is in fact found to be one of the reasons for boys' underperformance at school, especially if it is reinforced by teachers and peers (Commonwealth of Learning, 2017). This tendency also continues to exist in male university students among which students with a traditional masculinity ideology tend to report less interest in female-dominated university subjects after their **masculinity was threatened** (Chaffee et al., 2019). Reducing the **presence of gender stereotypes** can thus not only increase boys' interest in school but also increase girls' self-confidence (OECD, 2015).

4.3.1 Media-related Agents

Media-related agents can also strengthen traditional gender roles and thus enhance gendered educational decisions, while others tend to foster less traditional gender roles and enable less gendered educational decisions. Depending on the medium or its content, horizontal gender segregation can either be strengthened or weakened.

The content of many **media** (such as TV shows or video games) tends to alter students' educational choices by strengthening gender stereotypes and norms and eliciting stereotype threat (Davies, 2002). Media use tends to enhance girls' traditional beliefs about gender roles, including typical occupations (Ward & Harrison, 2005). In a similar vein, media use (**watching TV or YouTube, playing video games**) is associated with the endorsement of masculinity norms (Scharrer & Warren, 2022). Exposure to **television content that objectifies women** (vs. portraying them in professional roles or not including women at all) also increases boys' conformity to masculinity norms (Galdi et al., 2014). **Artificial intelligence** (AI) is another media-related entity that tends to be gender-biased (Nadeem et al., 2020; Vlasceanu & Amodio, 2022). Using AI-based applications can thus enhance traditional gender roles in students and thereby make gendered educational decisions more likely.

Media in the form of **educational materials** are often associated with masculinity (Cheryan et al., 2015). Women tend to be underrepresented in **textbook illustrations** and textbooks generally contain **gender stereotypes** (Blumberg, 2008). Moreover, **gender bias** is also present in the visual content of **online science education materials** (Kerkhoven et al., 2016).

However, the media also have the power to reduce gender stereotypes. The **social media platform TikTok**, for example, also enables the spread of feminist knowledge (Pomerantz & Field, 2022) and for women scientists to gain visibility and challenge gender stereotypes (Huber & Baena, 2023). It is important that women have equal **access to digital devices** in order to become / remain a key component of a digital society and have access to modern values and gender roles (Hansen et al., 2014; Mariscal et al., 2019). **Automation and technological advancements** in education can also reduce gender inequality (Stepanenko et al., 2021).

5. Conclusion and Outlook

The goal of this review was to provide an overview of the institutional, experiential, and symbolic agents that enhance gendered norms and decisions in education. Identified agents on the institutional level related to economy, society and culture, system and practicalities, agents on the experiential level related to school, family and home, and safety, and agents on the symbolical level related to language, stereotypes, and (social) media.

To conclude, more tangible agents on the institutional level that constitute boundary conditions for general access to education seem to play a greater role in non-WEIRD / Global South contexts. Those are mainly relevant for vertical gender segregation regarding education, meaning that they determine whether girls get to have access to education and the freedom to make educational choices at all. However, once students have access to education and their freedom of choice is secured (as is the case in many WEIRD / Global North contexts), more intangible agents start to play a pivotal role. Those primarily matter for horizontal gender segregation into gendered educational pathways and careers. Ultimately, this tends to prohibit both boys and girls from reaching their true potential and results in women's more precarious financial prospects compared to men's.

One important note is that much of the focus in existing work is on the vertical segregation of girls relative to boys, and the stronger representation of boys in high-status domains. Much less attention in policy and research is devoted to the horizontal segregation of boys into gender-specific domains – and away from HEED domains (Health, Elementary

Education and Domestic domains, Croft et al., 2015). Boys are not facilitated or encouraged into these educational and career paths and face stigma and backlash when they do venture in (Meeussen et al., 2020). Moreover, an emphasis on moving girls into traditionally male educational paths and careers such as STEM implicitly and explicitly communicates that it is these domains and activities that are societally valued while caring for others and educating them is less valued. Not only does this act as yet another process maintaining gender inequality, but it also contributes to the increasing difficulty filling these HEED occupational positions.

Throughout the three analytical levels, several points of leverage were identified that might allow for a future with less gendered norms and choices within the educational context.

On the *institutional level*, the lives of boys, girls, and individuals with other gender identities are impacted by tremendous variations in institutional structures. Nonetheless, a general trend can be derived.

A more flexible education system that allows students to choose what to read and learn enables them to nurture their ambitions and various interests (OECD, 2015). **Providing students with greater choice**, for instance, by also allowing boys to read comic books, could help reduce their underperformance in reading. Another way to limit inequality in educational attainment is to **delay tracking**.

Given that girls tend to do better in subjects that are stereotypically masculine when women's general labor participation is high (Rammohan & Vu, 2018), it also seems promising to **make women's labor force participation as visible as possible**. Moreover, students avoid certain career fields because they expect to experience discrimination in these fields (Van Praag et al., 2021). First of all, it is of course necessary to do everything possible to prevent instances of discrimination and to address instances of discrimination effectively if they occur. This applies to potential discrimination of men in HEED careers as well as women in STEM careers. Second of all, **open days and mentor programs might also help girls and boys reduce their fear of potential discrimination** and pursue a career in a field in which their gender group is still underrepresented.

This review also identified promising points of leverage on the *experiential level*. One powerful agent that increases the likelihood of gendered decisions is the gendered expectations of teachers and parents. **Reducing those gendered expectations** through, for instance, informative **seminars or interventions with teachers and parents** would hopefully unburden students of gendered norms and biased grading. There are many ways in which teachers can be supported to ungender their students' educational decisions. Workshop or publications could inform them on how to best **adapt their instructional**

practices (Maltese & Tai, 2011; OECD, 2015; Wang & Degol, 2013), present **positive role models** (Women Deliver, 2016), and **discuss gender equality in the classroom** (Shcholokova et al., 2021). Apart from workshops and trainings, **mentoring, strong policies**, and a clear assignment of **responsibility** to, for instance, schools or teachers, are also promising avenues to reduce gendered educational norms and decisions (Kalev et al., 2006).

The **symbolical level** also offers several insights into how gendered norms and decisions in education can be reduced. One such possibility is via **language used by teachers and in educational materials** (Braun et al., 2005; Formanowicz & Hansen, 2022). Moreover, generally **freeing textbooks and other educational materials from gender stereotypes and gender-biased illustrations** would likely also reduce the gender stereotypes students hold and follow when making career decisions (Blumberg, 2008; Kerkhoven et al., 2016). Lastly, identity also seems to play an important role. A masculine identity, for instance, tends to go against showing interest at school (OECD, 2015). **Discussing identity concepts and components** with students and helping them to **create their own identities** independent of society's notion of masculinity and femininity as well as **teaching them about the multiple identities** they may hold might help them to follow their true interests and to reach their true potential independent of their gender.

Taken together, this review provided an overview of agents that influence gendered norms and educational decisions. Moving forward, this overview will help to identify and map relevant interventions and tools that can help to reduce gendered educational decisions and norms. The gained insights into relevant agents will, ultimately, support the development of effective interventions that will tackle gendered educational choices in both boys and girls.

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