Education Scotland
Foghlam Alba

IMPROVING GENDER BALANCE & EQUALITIES

Improving Gender Balance

Literature Review

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For Scotland's learners, with Scotland's educators

Overview

The Improving Gender Balance and Equalities programme is a research-informed programme. The aim of this literature review is to provide an overview of relevant theory and research in this area, with points for professional discussion and ideas for practice. To ensure the original authors' voices are reflected as accurately as possible, paraphrasing has been kept to a minimum. This review focuses on three areas: 1) evidence of sex differences in education; 2) the influence of gender stereotypes and unconscious bias; 3) implications for practice.

Summary of key points from the literature

1. There is no inherent difference between genders which should limit a young person's interests, capabilities or ambitions.
2. Gender stereotypes and unconscious bias have an impact in early learning and childcare centres (ELCs), primary and secondary classrooms through multiple mechanisms. Schools are one of the social contexts in which gender appropriate behaviour is defined and constructed.
3. Practitioners may have differing expectations of boys and girls. It can be either boys or girls who are disadvantaged by these expectations.
4. Understanding *implicit* gender stereotypes is important.
5. Identifying and addressing gender stereotypes in early years, primary and secondary school classrooms can help reduce a range of gender imbalances.
6. Changing gender stereotype beliefs, attitudes and behaviours will require continued comprehensive messages of gender balance through multiple varied approaches.
7. Focusing only on a single approach (e.g. one-off role models) will not result in a sustained change to children's or young people's beliefs, attitudes or behaviours.

Note that while the terms sex and gender are often used interchangeably, they mean different things. That is, sex refers to biological differences between males and females (and is the context in which sex or gender differences are commonly reported), while gender refers to the characteristics commonly associated with being male or female.

1. Evidence of sex differences in education

There is no inherent difference between genders which should limit a young person's interests, capabilities or ambitions.

While the concept of gender differences dominates public discourse, there is compelling research evidence in favour of the gender similarities hypothesis (Hyde, 2005); that is, that males and females are more similar than different in cognitive, psychological and educational domains (Zell et al, 2015). In a review of 46 meta-analyses (method of aggregating research findings from a number of studies examining the same research question), it was found that gender differences vary considerably depending on context and age. Where gender differences were found, many were not educationally significant: 30% were trivial and 48% were small (Hyde, 2005). That is, 78% of the effects for psychological gender differences were small or near zero. An essential implication of these findings is that the overlap of distributions for males and females is substantial for most outcomes. That is, there is more variation among males and more variation among females than there are differences between them. Hyde concludes that overinflated claims of gender differences carry substantial costs.

Indeed, researchers argue that evidence citing gender differences has limited relevance for understanding the interests, capabilities or ambitions of individual children and adolescents; many females excel in male dominated areas while many males excel in female dominated areas (Miller and Halpern, 2013). Well-designed curricula will allow children and adolescents to reach their individual potential. On the other hand, focusing on sex differences and socialising children according to their sex will restrict children and young people from realising their full potential (Hyde & Linn, 2006).

Where sex differences have been found in cognition and achievement, explanations have centred around cultural influences, gender stereotypes, hormonal influences, brain development and biopsychosocial interactions – that is, the interaction between biology and environment (Miller & Halpern, 2013). For example, of the research exploring cultural differences, it has been suggested that traditional boys' toy play (e.g. construction) may lead to the advantage often observed in boys' mental rotation. Of the research focusing on gender stereotypes, it has been suggested that stereotype threat[1] may lower girls' performance in maths.

2. Influence of gender stereotypes and unconscious bias

Gender stereotypes and unconscious bias can have an impact in early learning and childcare centres (ELCs), primary and secondary classrooms through multiple mechanisms. For example, students' implicit[2] and explicit gender bias can impact on self-perceptions of ability (Cvencek et al, 2011; Passolunghi et al, 2014) and cause dropout in, for example, maths intensive fields (Steffens et al, 2010). Furthermore, gender stereotypes can lead to stereotype threat, that is, gender stereotype salience[3] can have a detrimental effect on performance (Huguet et al, 2009; Miller & Halpern, 2013).

In terms of gender stereotype development, studies vary in their findings. For example, Passolunghi et al (2014) note that children's stereotypical beliefs from as early as 3 years of age may correspond to those held by adults (Martin & Ruble, 2010) but also that both boys and girls until 9 or 10 years of age often state that the members of their own gender group are the most talented in either maths or language (Heyman & Legare, 2004; Muzzatti & Agnoli, 2007). On the other hand, research by Bian et al, (2018) suggests that gender stereotypes are endorsed by, and influence the interests and activities of, children as young as 6.

Koneg et al (2018) report that stereotypes are both descriptive and prescriptive in nature. Gender stereotypes have descriptive components, which are beliefs about what men and women typically do. However, they also contain strong prescriptive components, or beliefs about what men and women should do.

To date, there is a considerable focus on the negative impact of gender stereotypes on girls, with less awareness of the research focused on boys. As Myhill & Jones (2006) note, teachers may have differing and inequitable expectations of boys and girls, though at different times and in different contexts, it can be either boys or girls who are disadvantaged by these expectations.

In this review, we have highlighted the negative impact of gender stereotypes and unconscious bias on boys and girls separately, as this distinction is frequently made in the literature. However, by splitting this review by sex, we do not wish to amplify differences between girls and boys. As mentioned above, in many ways, females and males are more similar than different.

[1] Stereotype threat: Belief that you will be evaluated based on a negative stereotype. For example, the awareness of being negatively stereotyped in maths could impair girls' maths performance.
[2] Implicit bias: automatic cognition (i.e., spontaneous, impulsive, uncontrolled mental contents) and explicit bias: conscious beliefs (i.e., deliberate, controlled, rule-based mental contents), definitions taken from (Passolunghi et al, 2014).
[3] Gender stereotype salience: Gender stereotype is particularly noticeable/prominent

Negative impact on boys

Penalties for counter-stereotypical behaviour

Koneg et al (2018) argue that the consequences for violating stereotypes appear to be especially harsh for boys, that boys tend to be bounded by stricter rules of gender conformity and are subject to stronger "gender policing" than girls. For example, even from a young age, parents give little latitude for boys' behaviours but encourage both feminine behavior as well as masculine occupations and interests for girls, even complaining that their daughters can be "too girly" (Kane, 2012). Boys who are "sissies" are often negatively perceived, whereas girls who are "tomboys" have both feminine and masculine interests and traits and therefore do not violate gender stereotypes as strongly (Martin, 1990, 1995; Martin & Dinella, 2012). This has been explained by stereotypical gender asymmetry (Chanturia et al, 2015), that is, gender stereotyping is less restrictive for female than male stereotypes.

Academic engagement

Kessel et al (2014) argue that the perception that displaying effort and engagement at school is feminine leads to a misfit between boys' gender identity and academic engagement in general. That is, boys' general lower academic engagement is related to their intention to demonstrate and verify their identity as masculine. Kessels argues that male students experience a fundamental conflict between putting effort into schoolwork or following rules at school and maintaining a cool and masculine image in front of their peers – so-called "laddish behaviour".

Reading & writing

McGeown & Warhurst (2019) report that sex differences in reading and writing attainment favouring girls are much larger and more consistent than any sex differences found in maths and science attainment (using data from national and international comparison studies). Therefore, while efforts to engage girls in STEM are important, attention needs to be paid to encouraging and developing boys' engagement and attainment in reading and writing, as much wider sex differences exist in these domains. Indeed, reading and writing are more "gendered" in girls' favour than maths and science are "gendered" towards boys. McGeown and colleagues argue that it is possible that the differences found between boys and girls in education potentially reflect differences in gender identity (i.e. the extent to which children identify with stereotypical masculine or feminine traits) rather than sex. In several studies (McGeown et al, 2012; 2013; 2019) they found that children's gender identity was a better predictor of motivation across different academic domains, than sex was. They concluded that focusing on children's gender identity removes the dichotomy associated with sex differences research and encourages researchers and practitioners to consider the similarities among, rather than solely the differences between, girls and boys.

Negative impact on girls

Notions of brilliance

Bian et al (2017) note that common stereotypes associate high-level intellectual ability (brilliance, genius, etc.) with men more than women. They argue that these stereotypes discourage women's pursuit of many prestigious careers; that is, women are underrepresented in fields whose members cherish brilliance (such as physics and philosophy). In this paper they illustrate that these stereotypes are endorsed by, and influence the interests of, children as young as 6. Specifically, 6-year-old girls are less likely than boys to believe that members of their gender are "really, really smart." Also at age 6, girls

begin to avoid activities said to be for children who are “really, really smart.” These findings suggest that gendered notions of brilliance are acquired early and have an immediate effect on children’s interests.

Science

Research suggests that children typically associate science with men (Miller et al, 2018). For example, Miller et al (2018) reported on a meta-analysis, spanning five decades of Draw-A-Scientist studies, examining U.S. children’s gender-science stereotypes linking science with men. While children’s depictions of scientists have become more gender diverse over time, children still associate science with men as they grow older. Interestingly however, boys drew male scientists more often than girls.

Maths

Passolunghi et al (2014) cite research suggesting that gender stereotypes that emphasise the idea that males are more competent in mathematics than females can greatly impact girls and women by impairing their maths performance (Spencer et al, 1999) and maths learning (Appel et al, 2011), and causing them to devalue their actual maths ability while also placing less value on maths success (Eccles, 2011). For example, in a study with adults (Spencer et al, 1999), gender differences in performance could be eliminated when stereotype threat was lowered (i.e., the test was described as not producing gender differences). When the test was described as producing gender differences, stereotype threat was high, and women performed substantially worse than equally qualified men did.

A more recent study carried out with young adolescents (Huguet et al, 2009), found stereotype threat had a negative impact on girls’ maths performance even when they denied the negative gender stereotype. This suggests that schoolgirls’ explicit beliefs cannot be taken as sufficient evidence for deciding whether the struggle against stereotype threat is needed or not. Indeed, Steffens et al (2010) found that implicit maths-gender stereotypes could already be detected among 9-year-old girls and that adolescent girls showed stronger implicit gender stereotypes than adolescent boys, who, on average, did not reveal implicit gender-stereotypic associations.

Examining implicit gender stereotypes is important as children and adolescents often disavow maths-gender stereotypes when asked directly (Ambady et al, 2001; Hyde et al, 1990; Muzzatti & Agnoli, 2007), and young children may reveal ingroup bias instead, stating that their own gender is more successful in maths (Heyman & Legare, 2004; Muzzatti & Agnoli, 2007). Therefore, understanding *implicit* gender stereotypes is important.

However, it is important to note that focusing on gender stereotypes alone may not be all that is needed to redress sex differences in education. For example, in their detailed review of the literature with adults, Stoet & Geary (2012) argue that although stereotype threat may affect some women, the existing state of knowledge does not support the current level of enthusiasm for this as a mechanism underlying the gender gap (in mathematics). They argue that too much weight on the stereotype explanation may hamper implementation of effective interventions aimed at redressing sex differences in maths attainment.

3. Implications for practice

Identifying and addressing gender stereotypes in early years, primary and secondary school classrooms can help reduce a range of gender imbalances.

Schools are one of the social contexts in which gender appropriate behaviour is defined and constructed. Researchers have argued that schools can either reproduce the dominant gender ideology of the wider society or be a potential site for developing non-traditional gender identities (Myhill and Jones, 2006). Shamai (1994) also argued that school is an important arena where values are contested; the absence of school interventions focusing on challenging gender stereotypes means that dominant values will preside. Gender stereotypes will always constitute restrictions on individual possibilities and potentials.

Teachers are important agents in combating gender-stereotyped ways of thinking and gender-stereotyped education choices (Gullberg et al, 2017). Therefore, teachers should feel empowered to educate and teach in a way that focuses on the individual and his/her competence development (Kollmayer et al, 2018). Miller and Halpern (2013) note research to suggest that stereotype threat effects may emerge as early as pre-school, therefore work needs to begin in early years settings.

In terms of interventions to challenge and undermine gender stereotypes, changing gender stereotype beliefs, attitudes and behaviours will require continued comprehensive messages of gender equality through multiple varied approaches. Focusing only on a single approach (e.g. one-off role models) will not result in a sustained change to children's or young people's beliefs, attitudes or behaviours. Ultimately the school learning environments needs to be as unbiased as possible (Smith & Hung, 2008).

To date, researchers have tested a variety of approaches, with varying levels of success. These approaches could be broadly categorised as:

1. Raising awareness of implicit and explicit stereotypes among teachers and students (Brinkman et al, 2011; Kollmayer et al, 2018; Shamai, 1994; Zhao et al, 2018)
2. Providing children with opportunities to develop skills and achieve success in gender stereotyped domains (Master et al, 2017; Sullivan et al, 2016)
3. Making the learning environment as unbiased as possible (e.g. removing posters, texts etc which encourage gender stereotypes, Smith & Huang, 2008) and ensuring school resources and materials espouse gender equality (Finsterwald & Ziegler, 2007)
4. Consistently using gender fair language in the classroom (Vervecken & Hannover, 2015)

Summarised below are details of some of the specific research under each area.

Raising awareness of implicit and explicit stereotypes among teachers and students

Critically reflect on one's own gendered assumptions and engage in professional learning/dialogue about gender differences

The basic assumptions we make about a child or young person, often unconsciously, will affect our interactions with them (Johansson, 2011). A positive view on heterogeneity should become a pivotal educational goal for teachers (Kollmayer et al, 2018), that is, developing inclusive teaching practice that genuinely supports and develops all students as individuals, regardless of their gender.

Arnot & Gubb (2001) conclude that schools tend to recognise and comply with gender difference rather than identifying ways in which it could be reduced or removed. In Warrington and Younger's (1996) study, few of the teachers acknowledged that they treated boys and girls differently, but their attitudes to gender and behaviour revealed that they view girls as working harder, having better motivation, being more cooperative in the classroom and being better organised about homework.

Kollmayer (2018) notes that gender-stereotyped expectations play a central role in the perpetuation of gender differences, as they determine the behaviour of important others (e.g. parents, peers, teachers) and thus lead to vicious cycles in the development of children's gender-stereotyped motivation and performance. There is robust evidence that in addition to teachers' attitudes, their instructional practices influence gender differences (Lüftenegger et al, 2012).

In research with education students training to be teachers, Schober & Finsterwald (2016) surveyed 244 education students who had not yet taught in schools, asking them about their attributions of girls' and boys' success and failure in mathematics. For girls, the education students attributed success in mathematics primarily to effort, and failure in mathematics mainly to a lack of talent. For boys, they showed the opposite attribution pattern. These attributions could lead girls and boys to receive different kinds of feedback in the classroom, which could have different motivational consequences.

Teachers' beliefs about a subject and about a child's inclinations to develop knowledge in that subject area have an impact on whether the child's learning will be stimulated, challenged or inhibited (Andersson 2012).

Use stories to challenge gender stereotypes

Storybooks are an excellent way for children to learn about the world, learn about gender stereotypes and potentially breakdown these stereotypes. For example, Abad and Pruden (2013) note that exposure to gender atypical characters and behaviours in story books can impact children's immediate and future play behaviour. Furthermore, it can challenge children's stereotypes about gender appropriate occupations, activities and aspirations. However, these messages need to be given clearly and consistently. For example, some children tend to misremember/distort gender atypical information to make it consistent with gender stereotypes (particularly those with strongly held stereotype beliefs). Furthermore, research suggests that girls are more responsive to these approaches (e.g. more likely to change behaviours/beliefs as a result of gender atypical storybook). To date, research in this area has typically only examined immediate impact; there is currently a lack of long-term studies.

Providing children with opportunities to develop skills and achieve success in gender stereotyped domains

Ensure children's early play experiences are broad

Researchers suggest that engagement with gender stereotypical toys can lead to long term higher levels of gender stereotypical behaviour, for both boys and girls (Cohen et al 2016). For example, in a review by Dinella & Weisgram (2018) gender typed trends apparent in children's toy interests were found to potentially narrow their early play experiences. The resulting gender-typed play patterns and repeated exposure to gender stereotypes raise concerns that gender-typed toy play during children's formative years results in gender differentiation in children's skills and abilities.

Ensure children have opportunities to engage in diverse activities

In an example focusing on girls and robotics, Master et al, (2017) report on an intervention that targeted girls' interest and self-efficacy (confidence) in computer science and engineering. They tested whether providing 6-year-old girls and boys with a brief experience in programming robots can affect girls' immediate interest and self-efficacy in computer science and engineering. They found that first-grade children held stereotypes that boys were better than girls at robotics. They experimentally tested whether positive experience with programming robots would lead to greater interest and self-efficacy among girls

despite these stereotypes. Children were randomly assigned either to a treatment group that was given experience in programming a robot using a smartphone or to control groups (no activity or other activity). Girls given programming experience reported higher technology interest and self-efficacy compared with girls without this experience and did not exhibit a significant gender gap relative to boys' interest and self-efficacy.

Making the learning environment as unbiased as possible and ensuring school resources and materials espouse gender equality

Look critically at textbooks and encourage children to critically reflect on them as well

School textbooks often implicitly communicate gender stereotypes in their pictures or text. In an analysis of 28 textbooks for primary school children, Finsterwald & Ziegler (2007) focused on the pictures within textbooks, examining approximately 300 pictures depicting more than 800 people. They found that adult female characters are represented less frequently than adult male characters. Moreover, men were represented at their job more often than women, whereas women were represented in a family/household context and during leisure time more often than men. In terms of child characters, girls were depicted as more submissive than boys. The authors argued that teaching materials not only support students' learning, but they can also convey socially shared cultural knowledge, such as stereotypes, especially when teachers use them without reflecting on the stereotypes. Textbooks challenging gender stereotypes, or teachers encouraging students to critically reflect on gender stereotypes present within textbooks is important.

Audit environment for projection of gender stereotypes

Master et al (2016) describe two studies where a computer science classroom that did not project current computer science stereotypes caused girls to express more interest in taking computer science than a classroom that made these stereotypes salient. Therefore, providing children with an educational environment that does not fit current stereotypes could increase their interest in non-traditional courses.

Consistently using gender fair language in the classroom

Use gender fair language and teach children and young people to challenge peers' sexist remarks

In a study by Lamb et al (2009), children aged 5–10 years were taught to challenge peers' sexist remarks. In this study they either practiced using retorts to peers' sexist remarks (practice condition) or heard stories about others' retorts (narrative condition). Before the intervention, children rarely challenged peers' sexist remarks. However, after the intervention, children were significantly more likely to challenge sexist remarks in the practice than narrative condition. At a later follow up, these intervention effects had become more widespread, but primarily among girls.

More recently, Vervecken & Hannover (2015) have argued that gender cues in language (e.g. fireman rather than firefighter; air hostess rather than flight attendant) influence children's and adults' perceptions. They propose that linguistic interventions (i.e. use of gender fair language), can impact on children's self-efficacy toward stereotypical occupations.

Conclusion

As summarised by Coyne et al (2016), there is nothing inherently wrong with behaving in a gendered manner, but stereotypical male or female behaviour may potentially be problematic if children and young people believe that their opportunities in life are limited because of preconceived notions regarding gender.

The previous section aimed to give general points for consideration, and implications for professionals working within early years, primary and secondary school settings. However, while the literature reports numerous approaches to challenging gender stereotypes, these research studies have typically been small scale, often focusing on individual interventions and rarely examining long term changes to gender stereotype beliefs, attitudes or behaviours. A rigorous research informed approach is necessary to better understand the messages, resources, activities and contexts which are conducive to challenging gender stereotypes and creating long term change.

Education Scotland's Improving Gender Balance and Equalities (IGBE) team are working with early learning, primary and secondary settings to explore and establish ELC/school interventions to address unconscious bias and tackle stereotypes with the aim of making education inclusive and accessible for all, regardless of gender.

This programme is building on the successful three-year pilot project that was supported by Education Scotland in partnership with Skills Development Scotland and the Institute of Physics. The pilot project found that sustained whole school/setting approaches are effective ways of addressing a wide range of gender imbalances.

A range of practical resources developed to support practitioners can be found at: www.bit.ly/NIHIGB.

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