Dear Gender Equality Committee

Thank you for inviting me to submit my response to the recommendations on Norms & Stereotypes in Education by the citizens assembly. I have chosen to focus on female equality issues only and participation in STEM– as these are the ones which are having the most impact in terms of participation in modern society.

Kind regards

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Opening Statement

Recommendation 26 talks about resourcing schools to ensure equality. There are some easy changes in schooling that can be made to ensure gender equality – ALL Science subjects should be on Offer in ALL schools. Women are underrepresented in the emerging workforce because we are socialized and educated out of these jobsr. By age 11 many girls have already decided science and math is not for them. We must make whole education changes to ensure young women see their potential in all areas. Science and technology subjects should be mandatory for all students- in the same way that Math, English and Languages are mandatory science should be also. This would reduce gender disparities in participation. Recent research shows that while 92% of all boys' schools have physics, chemistry, and biology on the Leaving Cert timetable, only 77pc for girls' schools do. In co-ed schools, it is even lower again, at 62pc. I recently interviewed girls from a DEIS city school who were moving to co-ed school, they noted that for the first time ever they were having woodwork and engineering added to the curriculum- they were angry about this and knew this was only for the boys! Science for all isn't about jobs for all- it's about ensuring everyone can engage in modern society critically. When we fail to offer all sciences to all students, we fail to prepare students for modern work and life. The consequences of which can be seen in fer of modern developments like vaccines and AI (Artificial Intelligence) technologies

I would urge you to consider the intersection between gender and class. Not all girls are the same, not all schools have the same resources- DEIS schools need added support to ensure young working-class girls can access ALL courses, capabilities, and careers. I would ask the question why are there no all-girls DEIS schools piloting the new Computer Science course? What are the governing structures in place to ensure equity of resources across schools? When we consider resourcing of education we must consider the impact of gender, race, class, and ability on participation and ensure ALL girls are served by education. Recommendation 26 and 27 in my view are related- career guidance and curriculum reform should consider what we communicate to young women about women. My research shows that young women cannot name a female scientist from history (apart from Marie Curie) or a female leader in finance or science. With young girls' aspirations being guided by what they see in society and learn in school, we need to be sense checking the curriculum content to ensure it celebrates excellent women. If our media only talk about women in terms of their husbands or their looks then how can we be different. Sense checking the media would help. Career guidance is not just about the teachers in school, it is what we show young women, if girls do not relate to women in all roles, then they will not try for them.

For recommendation 30 a systems and strategic approach is needed to strengthen existing programmes. We have best practice examples of gender equality activities across education, employment, and society- from mentoring to the Athena swan programme to coding and CS courses, we have excellent programmes making changes- the problem is these programmes often work in silos and compete for funding. We need to join up the system; we need to spend time identifying and evaluating programmes which support gender equality, and then scale them. I have been funded by the SFI Discover programme to deliver the STEM (Science Technology Engineering Mathematics) Passport for inclusion programme. This plugs some of the gaps in the system, it offers senior cycle girls across Ireland with 3 key STEM resources. A STEM university qualification while still in secondary school which they can use to enter courses or careers, a STEM mentor and STEM career guidance. Instead of working alone we partnered with Munster Technological University, Microsoft, teen-turn, Accenture, RDI hub, dog patch labs and others to build a systems approach to empowering young women to see STEM as a future for them. What I am doing is not unique, there are 1000s of programmes worldwide doing some of this work, what we are doing which is different is inviting attempting to change the system, we are inviting every university across Ireland and every school to work together to build a STEM Pathway for girls to get them into STEM careers and courses. And what we are doing is working. MTU (Munster Technological University) are awarding the STEM Passport girls 50 leaving cert bonus points which they can use towards science courses in MTU. 125 women across these companies have acted as mentors, receiving a mentoring for equality qualification for taking part. With 4000 applicants for only 1000 places, 78% of the girls who have participated in one year are now interested in studying or working in STEM careers because of this programme. The STEM passport programme has been included as recommendation 14 for national pilot in the recent Gender Balance in STEM Education programme by Norma Foley. We need to support and sustain good programmes, funding should support programmes to align with each other and fix the STEM gender equality issue.

Like all other good programme we face challenges in trying to implement this nationally. When we talk about girls in STEM courses our universities are often scared to develop gender only programmes, the conservative nature of our education system stops reform happening at the pace of societal change. It is my view that while our leadership is primarily made up of males then we will never really be able to change the dial and ensure all women are educated, employed, and empowered equally. Finally, now is the time to make these changes, women have never been more at risk of being left out of the emerging world. COVID19 has shown that women, especially those in service roles, are at risk of entrenched poverty if we do not ensure they are prepared to participate in the technological revolution- being STEM prepared is no longer a work force issue, we need to be STEM ready so we can stay connected, get educated and be part of the changing solutions for the world.

1. Recommendation: All science subjects should be on offer in all schools.
2. Recommendation: Make science a compulsory subject for girls across school and include quotas for girls participating in science subjects in school as part of the review process
3. Recommendation: Commission research to understand why girls are not participating
4. Recommendation: Consider the intersection between gender, class, race, ability, ethnicity when creating programmes- not all girls have the same advantages or challenges
5. Recommendation: We need joined up thinking! We need a system wide STEM Pathway for young women. Like the HEAR scheme and the DARE scheme we need a STEM Pathway for girls that supports gender equality.
6. Recommendation: Gender specific support for mothers/women to see pathways to careers and courses

Research Undertaken and Published by Maynooth University to support Recommendations:

Stereotypes: The stereotypes associated with STEM are a prominent and potentially off-putting factor which can contribute to gender inequality. From the age of two children understand that sex differences exist, and they can state the stereotypes that are attached to them (Blakemore, 2003). From early childhood girls assign themselves into the roles that are reflected by their family, friends, and their culture, these roles usually include scientists' mathematicians and engineers being male and nurses and the like being female (Chambers, 1983). A study in 2000 found that gender stereotypes encourage girls to be more focused on the social dynamics of their situation and to place greater importance on interpersonal relationships. In contradiction, boys stereotypes encourage them to focus on mastering their environment, by allowing opportunities for problem solving and exploration (Konrad, Ritchie, Lieb, & Corrigall, 2000). As such, male stereotypes match the cultural understanding of STEM, which have little to do with social and interpersonal relations (Buck, Leslie-Pelecky, & Kirby, 2002). Some have even argued that scientific ability may be associated as a gender trait, in that men are born with/possess the skills needed for the study of STEM and that those traits are simply lacking in females (Mascret & Cury, 2015). This research tries to say that STEM skills are gender innate; that is, that men are simply "born" to succeed in the STEM world. Studies such as this, when left unchallenged, are detrimental to the career motivation for many women (Garriott, Hultgren, & Frazier, 2017). An example of this, is the case of mathematics, by ten years old girls report to dislike math's more than reading, despite differences in performance not being evident until a later age (Herbert & Stipek, 2005). This indicates that a girl's internalization of stereotypes surrounding STEM exist before changes in a child's academic ability. Research has found that negative stereotypes associated with girls' intellectual abilities are observed as young as six years old. **When asked to identify the gender of someone who is "Really, really smart," girls are less likely to suggest their own gender than boys** (Bian, Cimpian & Leslie, 2017).

By early adolescence interest in STEM is established, suggesting that interventions are needed early in childhood to grow the interest and self-belief of children in their STEM skills (Maltese & Tai, 2010). **It can be argued that the first step in fostering this early interest is to create environments that pique situational interests of young girls. Using a variety of learning experiences both informal and formal allows for the seeds of personal interest to grow (Haden, 2010). The combined efforts of the immediate learning environment, such as discussions with parents, visits to exhibitions and extracurricular activities provide children with opportunities to explore science and technology in a way that holds a child's attention and interests (Pinkard, Erete, Martin, & McKinney de Royston, 2017). Without the effort made by the child's immediate educators, to expose them to STEM experiences girls will remain hesitant to independently explore, and the stereotypes ingrained by their cultural experiences will not be dismantled.**

Lack of Representation: One of the most basic human needs aside from physiological is the need to belong and feel accepted, so much so that it is considered necessary for our wellbeing (Baumeister & Leary, 1995). This is no different in educational settings, where students wish to feel that they fit in and belong to the group, a student who feels estranged from their peers is more likely to perform poorly in assessments, lack motivation and potentially leave their studies (Freeman, Anderman & Jensen, 2007). The previously mentioned gender stereotypes associated with STEM careers can lead girls to feeling as though they do not belong in the STEM field and increases the likelihood of a lack of interest (Stout, 2011). This becomes a self-fulfilling prophecy, as do so many stereotypes. Girls often feel underrepresented due to a lack of women in stem which is in part due to stereotypes, this in turn leads to less women engaging with STEM subjects and further decreasing the female role models available to girls (Shapiro & Williams, 2012). Being able to recognize oneself in a career is essential to influence a girl's engagement in study, having access to good role models can give young girls the belief that "If she could do it, why couldn't I?" However, girls often have little to no exposure to such role models before entering third level education, and even then, female faculty members of science and technology are less than 25% (Harford, J., 2018). Outside of an academic capacity, lack of female representation in STEM is often much more subtle and unconscious, but none the less has an impact on young women. For example, the use of a male figure when referring to a "Scientist/ Doctor/ Genius" subtly reinforces the belief in girls that they do not belong in the area. Videos of STEM research conferences attended mainly by men, and photos of university students which again are predominantly male (Smith et al. 2013). Women can be led to feel that they have no chance of succeeding in a field, or that they will have to battle their way through numerous obstacles to go as far as so few women do (De Welde, K., & Laursen, S., 2011).

To combat this lack of representation for young girls, children should be taught to broaden their concept of what fits in STEM. As opposed to depicting a message that only the best of the best, most clever men work in this line of work, using gender neutral images and terms allows a child to imagine themselves more easily in the role (Master, Cheryan, & Meltzoff, 2016). The aim of this is to adapt the culture and to accept the new generations of STEM thinkers. Introducing mentors and role models for the girls to look up to is also essential. This need not be necessarily a female, just someone that a young girl can look at and say, "They are like me," this may mean through gender, skin color, physicality, ethnicity and more (Meltzoff, 2013). Research shows that female presence in lecture halls has a significant impact on students; girls who are enrolled in college level STEM classes report higher confidence levels in their math skills when being taught by a woman rather than a man (Dasgupta, Hunsinger & Scircle, 2014). The same-sex mentors- in this case lecturer, was enough to allow a student to feel confident and comfortable in their study. This helps to emphasize the point that when girls feel a sense of belonging in a group, that it can transform their opinion of what is typically considered a man's job (Walton, Logel, Peach, Spencer, and Zanna 2015).

Lack of Academic Preparation: Another factor that influences the number of girls displaying an interest in STEM is the lack of opportunities to experience science and technology during the early educational period (Cheryan et al., 2017). Girls are more likely to engage in social/caring games (i.e., Playing with dolls) than boys who are more likely to engage in computer games, creative engagements (i.e., Legos/building blocks) and problem-solving games (Jirout & Newcombe, 2015). The lack of early experience in STEM activities creates the early gender stereotypes of STEM being for boys not girls. This issue was investigated and tested by increasing girl's interactions with computer coding (Master et al. 2017). By eliminating gender discrepancies and providing equal early opportunity, girls interest in further STEM studies increased. These result show that in early childhood, STEM ability and interest is not yet set but can be influenced by the immediate learning environment. The same malleability can be applied for STEM skills, where training children in spatial skills and mathematic ability can help improve overall abilities (Miller, Newcombe, Uttal, 2013). Simply providing a single STEM experience once to young girls is not enough- continued exposure along with a supportive environment is necessary to maintain the girl's self-belief and STEM-efficacy. Practically, for schools', parents and government bodies, children must experience workshops, presentations, science-based camps, and extracurricular STEM classes throughout childhood for gender difference in STEM learning to be reduced (Hidi & Renninger, 2006). Long term, consistent programmers may be the key activity that supports a child's engagement and creates a personal investment in a field. Particularly regarding coding and engineering activities, making such studies a compulsory part of the primary school science curriculum could aid in keeping girls engaged in studies which otherwise would have been just an extracurricular subject (Cvencek, Kapur & Meltzoff, 2015). As a child's critical thinking develops and they begin to think about the distant future, they start to seek out information about different careers and subjects from those around them (Howard & Walsh, 2010). In primary education settings, children are not being taught math and science by people who have specialized in that area. Instead, most teachers have little personal

experience of STEM subjects and often have personal biases and stereotypes about STEM (Breiner et al., 2012). This is a hugely critical point as teachers are a child's primary and, sometimes, the only source of information on such subjects before the age of eleven or twelve. In secondary education, teachers may have a greater specialization of sciences, but often due to teacher shortages they are left to cover the three main science subjects (Biology, Chemistry and Physics). This "stretch" of a teacher's abilities means that even with a specialization in a particular area (e.g., Chemistry), when pushed into teaching another area where they hold less knowledge (e.g., physics) they may feel unqualified and less confident (Hobbs, 2013). This hesitance and discomfort displayed by teachers can influence a child's thinking, and lead to the belief that a particular subject is too difficult (Darmawan & Salleh, 2013). Often a school is short staffed/ resourced that they do not have the opportunity to supply even the three basic sciences at secondary school level, further inhibiting the chance of any meaningful connection being made for students to the sciences. This shortage of staff along with lack of academic preparation is clearly seen in the number of children who take on STEM subjects in Second Level education. Excluding biology and mathematics, over 72% boys take a science subject to their final year compared to just over 39% of girls (Department of Education and Skills, 2019). One study found that of a study of Irish leaving cert students studying in same sex schools, 91% of boys had access to physics classes as compared with 84% and for applied math's (55% to 38%), showing that the gender divide in STEM is trickling down to preventing girls the chance to take the subjects (Delaney, & Devereux, 2019).

Socioeconomic Considerations: Getting a good education is believed to be a key component in creating opportunities for disadvantaged individuals/families- especially in the rapidly growing fields of STEM. However, children that come from disadvantaged areas are more likely to perform poorly on standardized tests and often do not take STEM classes in school, which immediately places them at a disadvantage to their peers when moving forward into third level education (Aries & Seider, 2005). Many systemic barriers exist which prevent lower income students from pursuing the subjects that interest them- such as where they live, available schools, and existing prejudices on class- this can leave students feeling as though they are trapped in cycle that is inescapable. This feeling of hopelessness may contribute to the high stress and anxiety levels reported by students from poorer socioeconomic areas during standardized exams in school (Jury M, et al., 2017). Students from lower socioeconomic backgrounds often show little interest in or knowledge of STEM subjects which may be because of lack of access to adequate education or a lack of strong female role models. Despite the sociological barriers that can influence a student's opinion on pursuing a career in STEM, studies have shown that while they are among the least likely to attend third level education, economically disadvantaged students gain more from college than other students (Brand & Xie, 2010). Students coming from economically advantaged households tend to base college decisions on familial and societal expectations, less advantaged students are more likely to weigh up the decision based on its economic costs and benefits. With this method of decision making, it can be found that lower income students often have higher confidence in their academic abilities and STEM skills than higher income students, as this decision to pursue a STEM career has presumably been carefully considered to the student's strengths (Lichtenberger & George Jackson, 2013).

By 2030 there will be 6.2 million new STEM jobs worldwide unfilled –only 2% of graduates will have the right qualifications for these roles. Furthermore, 80% of all future jobs will require basic digital skills even if they are not in the STEM arena. Hence being STEM prepared is essential for participation in society. This potential skills crisis is frightening from a social and demographic perspective; it not only adversely impacts the economy, but it threatens to widen the opportunity gap between those people who are affluent in society, and those who are not. With SED girls least likely to enter STEM courses and pursue STEM careers there is a very real risk that they will be left out of the 21st-century job market if current trends are not reversed. This will mean that women from SED communities will be more likely to end up in low paid, low-potential jobs and remaining entrenched in poverty due to a lack of STEM opportunities. COVID19 has highlighted these disparities and emphasized the risk women are at if they do not begin to engage in emerging STEM trends. Low-income women are overrepresented in healthcare, caregiving, cashiering, and retail jobs. In Europe, women make up 76% of healthcare and social care workers and 86% of personal care workers in health services. These sectors tend to be characterized by low salaries. With working-class women being more likely to be seen in these roles we risk a widening of the gender pay gap, and working-class women being left out of emerging opportunities. The COVID-19 pandemic led to disproportionate job losses among the lowest-paid women and has increased the gender wage gap for all people

from 26.5 to 27.4 percent. Without significant intervention at several levels of the employment and education infrastructure women who are working class, and low income- are at risk of long-term, entrenched poverty.

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