

Project Proposal (GEDI)**PROGRAMMA PER IL FINANZIAMENTO DELLA RICERCA DI ATENE0
Bando 2024****PROJECT TITLE****GEDI: GEnder stereotypes, Disciplinary Identity and academic performance****Abstract**

One of the priorities of the EU strategy, for an intelligent, sustainable and inclusive growth, is to overcome educational and employment gender inequalities, by developing inclusive approaches in research and innovation and bringing young minds closer to science. On a national scale, the call for actions to encourage female students towards STEM (Science, Technology, Engineering and Mathematics) disciplines is one among the ten final recommendations of the MIUR's document entitled "Indications for Positive Actions on Gender Issues in University and Research". Nevertheless, the gender gap in STEM persists and is fuelled by a complex set of gender stereotypes that affect women's interest, self-efficacy and, in turn, their educational and professional choices.

The GEDI project aims to analyze the role of gender stereotypes in conditioning the construction of Disciplinary Identity (i.e. the ability to identify oneself with the discipline and to have science career aspirations in the same area) of STEM students. Through a multidisciplinary approach, which involves research on psychological well-being methods and tools, combined with methodologies of educational research in science and physics, the project proposes a general structural model to explore the role of gender stereotypes as precursors of disciplinary identity and further psychological and metacognitive variables, that can in turn affect the disciplinary identity itself. The project will investigate the evolution of Disciplinary Identity among students during the first three years of university and how such identity affects the persistence and performance in studies. The GEDI project aims to provide ideas for positive actions and specific programs for promoting gender equality in science, as a fundamental prerequisite for individual, social and organizational development and well-being. For this reason it has been included in the Gender Equality Plan of UNINA.

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Project Proposal (GEDI)**Section 1 - Background and state of the art***Gender segregation in education and workplaces*

The role that society attributes to people, on the basis of their gender characteristics, affects their personal life, educational choices and work experience. This mechanism often limits personal and professional fulfilment, especially for women, and it can be due to a multiplicity of social, cultural, economic, educational and institutional factors. The consequences are significant, not only at individual, but also at social and economic level, as they result in a lack of exploitation of competent and qualified human resources, with an overall detriment to the society as a whole.

Although the scientific literature has long shown that men and women possess quite similar skills, methods and general approach to problem solving (Benbow et al., 2000; D'Zurilla et al., 1998), some areas of study and work are absolutely male dominated, with a greater presence of women in areas with lower employment, career and income prospects (WEF, 2019).

The European Commission's She Figures report (EC, 2021) shows that since 2010, the proportion of women among Doctoral graduates has increased, moving the total pool of Doctoral graduates closer to gender parity, nevertheless gender differences tend to be persistent across fields of study. A similar gap persists when looking at work distribution between male and female. As reported in the 2022 report on gender equality in the EU (EC, 2022), jobs in the EU are not becoming more gender mixed, considering that women account for most of the employment in specific working sectors: education, human health and social work (over 70%), and also in occupational groups of services, sales and clerical support workers (over 60%) (Eurofound and EIGE, 2021). As emphasized by the European Commission in the Gender Equality Strategy 2020-2025 (EC, 2020), horizontal gender segregation in studying subject choices can contribute to women's under-representation in higher-paid sectors and over-representation in lower-paid sectors. Furthermore, a slight presence of women in certain areas leads to a potential devaluation of an important and highly qualified human capital. The lack of use of this human capital also reduces the potential benefits of research and innovation-related activities, as well as general economic development, as both research and innovation require a constant supply of new ideas, the brightest usually coming from heterogeneous environments (AAAS, 2010; Gibbs, 2014; Hanson & Tao, 2015).

Furthermore, this phenomenon of horizontal segregation is accompanied by a mechanism of vertical segregation, in the form of cultural and structural obstacles that make it particularly difficult for women to adequately enhance their skills and abilities. This mechanism causes the under-representation of women among high level positions (Woetzel et al., 2015). For instance, according to the Fortune's "Global 500" ranking, only 14 out of 500 CEOs of the ranked companies in 2019 and 2020 were women, and only 23 in 2021. But even when women succeed in reaching the same career level, they earn on average less than men. According to UN (UN women, 2018), globally women earn on average the 84% of their male counterparts, and conditions are worst for women of colour, immigrant women, and women with children. Furthermore, this situation of horizontal and vertical segregation was exacerbated by the Covid-19 pandemic which affected particularly women (EC, 2022).

Gender stereotypes and STEM

Prior literature suggests that explicit and implicit gender stereotypes may contribute to the low percentage of women who graduate in STEM subjects and work in the corresponding professional sectors (Smeding 2012, Cundiff et al. 2013, Schuster & Martiny 2016; Spencer et al., 1999; Moé et al., 2020). Gender stereotypes consist, on the one hand, in mechanisms of categorization, interpretation, processing and decoding of sexual reality, and, on the other hand, in socially shared representations of the differences between the masculine and the feminine, already active in the processes of primary and secondary socialization (Steele et al., 2002). Gender stereotypes therefore form a coherent system of beliefs and conceptions inherent in male and female identities in relation to the characteristics of personality,

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behavioral traits, attitudes and abilities that are considered socially adequate for males and females. In other words, "they are in the air" that we breathe and, therefore, once internalized, they also play a role in education and career choices (Steele, 1997).

There are two main reasons why pathways of scientific training and technology seem to be conditioned by stereotyped gender representations: (i) the perception of the existence of identity characteristics of the STEM student population, which assume, on the basis of gender stereotypes, the participation in STEM pathways of some types of students, excluding others (Blickenstaff, 2005); (ii) a widespread, socially shared, representation of gender characteristics in STEM (identity, role, expression) often confused with biological sex (Gudnerson et al., 2011).

This helps to create some sort of STEM stereotype, active both inside and outside school contexts, which has the effect of steering towards certain choices of study, rather than others, and of excluding a variety of students from the study of STEM subjects. In fact, young female students may not be interested in STEM careers because of their perception of these subjects as predominantly masculine (Eccles 1987; Eccles et al. 1990; Gunderson et al. 2012; Jacobs 1992; Steele 1997; Croizet et al., 2001; Tenenbaum and Leaper 2003; Tiedemann 2000; Wigfield et al. 1997; Cheryan et al. 2009; Correll 2004; Davies et al. 2002; Ertl et al. 2017; McCullough, 2002). Moreover, girls can be implicitly guided towards courses and careers where the percentage of girls is higher (Schuster & Martiny, 2017). To this regard, Cundiff and colleagues (2013) found that stronger gender stereotypes in women were associated with lower STEM career aspirations and, conversely, strong gender stereotypes among men were associated with higher STEM career aspirations. Consistently with previous work, a French study found that female engineering students had fewer gender stereotypes than their female colleagues in the humanities (Smeding, 2012).

Finally, in STEM, gender stereotypes can also affect job opportunities for men and women, influencing the attitude of those who are called upon to select candidates and staff in comparative assessments. A study found that the gender of applicants for a research position conditioned the commission's assessment in favour of men (Moss-Racusin et al. 2012). Similarly, another study shows that, compared to a woman, a man is twice as likely to be hired, both by a man and by a woman, for a position that requires mathematical skills (Rueben et al. 2014).

Disciplinary identity

Recent studies show that one way to deconstruct gender stereotypes in STEM is to foster the development of a disciplinary identity related to the specific field of interest (Kessels et al. 2006). In fact, there is a growing interest in literature on gender differences towards the construct of disciplinary identity. In general, the identity construct indicates a person's understanding of her/himself and of the others in a context in which she or he is placed. The construct can be extended to the understanding of how a person relates to a discipline and the professionals working in that discipline (Chemers et al., 2011).

Studies in the STEM show that persistence and educational success at university level are linked to a strong identification with the discipline (Dovidio et al., 2001), rather than ethnicity or the social group of belonging (Osborne & Walker, 2006; Eccles and Barber, 1999). Further studies in the United States also suggest that disciplinary identity is related to interest, confidence in preparation, self-efficacy, perceived utility value of the discipline and sense of belonging to the community (Hazari et al., 2020). Moreover, since each of these constructs is in turn linked to persistence and performance in a given discipline (Patrick et al., 2018), to study the disciplinary identity of freshmen and how it evolves over the years can be a way to identify possible causes for which girls do not choose STEM careers and to prevent the problem of girls' drop-out in STEM disciplines. For example, recent studies in physics education have shown a close link between identity and differences in self-efficacy and performance in introductory physics courses (Kalender et al., 2019; 2020). Similarly, in a study with undergraduate engineering and chemistry students, male students had a higher STEM identity than their female colleagues (Young et al., 2013). These results also show the importance of understanding more deeply which constructs affects STEM disciplinary identity and how it

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evolves over time when attending university courses. In this study, we will include in our conceptualization of the STEM disciplinary identity the following constructs: interest towards STEM, sense of belonging in a STEM context, perceived utility of the STEM discipline, and self-image as a STEM student/professional (Hazari et al., 2020; Kalender et al. 2019).

Self-Efficacy and Perceived Academic Control

Self-efficacy can be defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives (Bandura, 1991). Self-efficacy beliefs strongly influence people's feelings, thoughts, motivations and behaviour. An individual with a strong self-efficacy usually has high confidence in his or her own capabilities to successfully overcome difficulties and tends to approach difficult tasks as challenges to be mastered. In the case of failure, an individual with a strong self-efficacy will probably tend to attribute the failure to deficient knowledge or low skills which are acquirable. In other words, also the failure represents a sort of new motivating challenge to be approached. On the contrary people with low self-efficacy usually avoid facing difficult tasks approaching them as threats to be avoided (Bandura, 1991, 2000).

Previous studies (Lent and Brown, 2006) have shown that self-efficacy may vary depending on the context in which an individual is located and therefore may affect the same identity of the person with respect to that context or discipline (Stout et al., 2011). Furthermore, the different extent to which one perceives her/his own abilities can be translated into a different performance and persistence in the chosen field of studies (for example, for physics, see the literature review in Taasobshirazi et al., 2015). Similarly, previous studies have shown that girls' self-efficacy in STEM disciplines can be influenced by gender stereotypes (Ertl, et al., 2017). At the same time, self-efficacy directly affects girls' attitude toward STEM disciplines (Zeldin & Pajares, 2000; Dasgupta & Stout, 2014).

For these reasons, we include self-efficacy as one of the variables of our model representing an important psychological variable that we hypothesized to affect STEM identity as in model in fig. 1. Researchers usually refer to "perceived control" as the subjective perception of individual influence; in other words, being in control. Many previous studies in sociology and psychology have demonstrated that this construct affects physical and mental well-being and is related to a variety of positive outcomes, including health, achievement, optimism, persistence, motivation, coping, self-esteem, personal adjustment, and success and failure in a wide range of life domains (Skinner, 1996).

For this study we are interested in studying how perceived control is related to students' academic performance, so we will refer only to a domain specific variant of this construct, the perceived academic control. This can be defined as a person's belief in his or her influence over the success or failure of achievement outcomes. (Perry et al., 2001, 2005a). Previous research studies suggest that perceived academic control is an important predictor of undergraduate university student academic success as it results to be strongly related to both (a) dropout intention and (b) academic achievement (Respondek, 2017).

Section 2 – Objectives

The GEDI project aims at contributing to the current understanding of the concept of disciplinary identity in STEM through an interdisciplinary approach, involving research into psychological well-being and science education.

The underlying idea of the project is that, in order to inform actions that can really result effective in addressing the issues of horizontal and vertical segregation at the educational level, it is necessary to found those actions on a research based model describing variables which can play an important role in choosing a career in STEM.

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Most of the research so far has investigated the role of gender stereotypes and disciplinary identity on persistence and academic success in STEM separately, although the evidence collected so far suggests a close relationship between these two constructs.

Based on previous scientific literature, the GEDI project aims at validating a structural model of disciplinary identity, including gender stereotypes as precursors and psychological and metacognitive variables – confidence perceived academic control and self-efficacy – as relevant mediators (Benbow et al., 2000; Eccles, 2009; Hulleman, et al., 2008; Lubinski, Benbow, Webb, & Bleske-Rechek, 2006;). The specific objectives will be:

- To explore the relationships between gender stereotypes, perceived academic control, self-efficacy and STEM disciplinary identity in students enrolled in the first three year of university according to a structural model hypothesized on the basis of literature (Wang and Degol, 2013; Eddy and Brownell, 2016). The model is shown in Figure 1.
- To analyse the longitudinal evolution of these relationships over three academic years
- To explore the relationship between the STEM disciplinary identity and academic performance

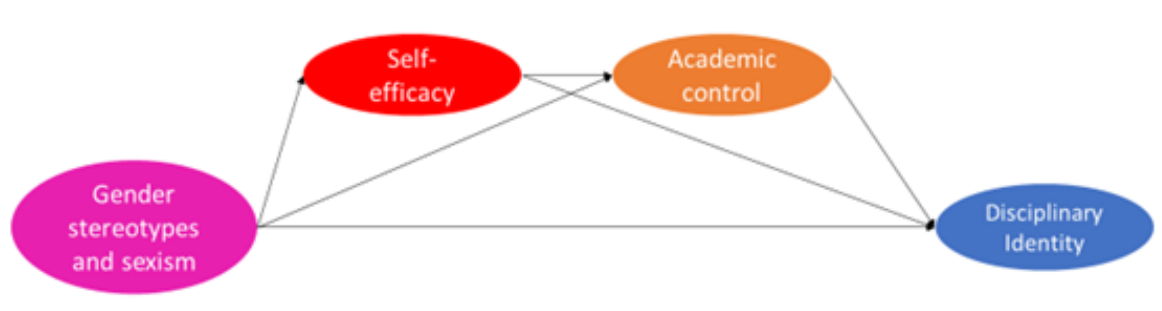


FIGURE 1. Structural model of the GEDI project

Section 3 - Methodology and work plan

Sample

To answer our research questions, about 1000 students attending different undergraduate STEM courses will be involved. To study the evolution of disciplinary identity, students from three university cohorts will be involved: first, second and third year. The reason for this choice is related to the fact that disciplinary identity develops and consolidates mainly in early university years (Hazari et al., 2010). In addition, non-STEM students will also be involved to investigate differences due to gender stereotypes. As far as possible, we will also try to extend the sample to students attending university in other regions of Italy.

Measurement tool

The instrument will consist of a battery of questionnaires already validated in Italian for high school students. In particular, it is planned to include:

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- I. Personal data survey (age, gender, geographical origin, political and religious orientation, type of diploma, socio-cultural capital).
- II. Questionnaires aimed at analysing gender stereotypes. Two questionnaires will be used.
 - a) Ambivalent Sexism Inventory (ASI; Glick & Fiske, 1996; adapted by Manganelli Rattazzi et al., 2008), aimed to assess the presence of sexist attitudes and feelings. ASI is a 22-item questionnaire with a 5-point Likert scale, which consists of the sub-scale of Hostile Sexism (HS), which evaluates negative stereotypes of women rejecting female roles and behaviours, and that of Benevolent Sexism (BS), which assesses the positive feelings and stereotypes of women who adhere to traditional female roles. The sum of the two sub-scores results in a total score that measures ambivalent sexism. The two sub-scales of HS and BS are influenced by three latent dimensions, namely paternalism, gender differentiation and heterosexuality;
 - b) Male Role Norm Scales (MRNS; Thompson & Pleck, 1986), which measures the identification in gender stereotypes based on a male, patriarchal and traditional ideology. It consists of 26 items with a 7-point likert scale, the latent dimensions of which are: social status; machismo; anti-feminism.
- III. Questionnaire on interest towards STEM, sense of belonging in a STEM context, perceived utility of the STEM discipline, and self-image as a STEM student/professional.
 - a) **Interest** towards STEM and **perceived utility** of the STEM discipline will be measured using four items each, developed from Deci and Ryan's theory of self-determination (2000), which states that there are different types of academic motivation that guide students in their choices. In particular, intrinsic motivation, the most autonomous form of motivation that occurs when the activity is linked to personal pleasure and intrinsic satisfaction, rather than external rewards, will be used as a proxy variable. Similarly, to measure the perceived utility of the STEM discipline chosen as undergraduate course, we will use as a proxy variable the identified motivation, a form of motivation in which the student attributes personal importance to a certain behavior.
 - b) The **sense of belonging** in a STEM context will be measured by three items based on previous studies in social psychology (Lewis & Lodge, 2015; Trujillo & Tanner, 2014), in which this construct is conceptualized as the subject's perception of belonging or feeling alienated from the community of reference, in this case peers who follow the same course of study. In our case, for example, not feeling part of a community can be related to having a different identity than the others present in the majority of the community itself (Murphy et al., 2007). Gender inequality, real or perceived, in a given community may also suggest a girl that she does not belong to that community (Walton & Cohen, 2007; Stout et al., 2013).
 - c) The **self-image** as a STEM student/professional will be measured with three items that ask the extent to which students perceive themselves or want to become professionals in the specific discipline (Hazari et al., 2020) .
- IV. Questionnaire on self-efficacy and the perceived academic control in the discipline. Self-Efficacy was measured through the General Self-Efficacy (GSE) scale, in particular we will use the Italian reduced 10-item scale version (Sibilia, Schwarzer, & Jerusalem, 1995) with a 5-point Likert scale, while Perceived Academic Control will be measured using the Italian 8-item scale version adapted from Perry et al. (2001) with a 5-point Likert scale.

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V. University performance will be assessed using the ECTS credits obtained within the targeted academic year (usually on November 1st). For example, for first-year students enrolled in the 2024-25 academic year, ECTS will be asked to administration offices in October 2025.

To support and integrate these measures, the implicit associations test will also be used to measure the interaction between gender stereotypes, attitude towards for science and disciplinary identity (<https://implicit.harvard.edu/implicit/selectatest.html>).

Procedure

After developing the privacy policy and gaining the approval from the UNINA Ethics Board, we plan online administrations (in three different phases, one for each year) using tools and channels usually adopted in remote teaching (for example, Microsoft Forms and Teams), through the active involvement of courses’ coordinators and institutional channels.

Data analysis

Each phase of data collection will be followed by a corresponding phase of data analysis. The measurement model will be tested using confirmative factor analysis (CFA), while a path analysis will be used to evaluate the adaptation of the data to the hypothesized model. To assess the differences between female students and male students and between different students’ groups (STEM and non-STEM), a multi- group structural analysis will be carried out. Longitudinal analysis will be performed through latent variable growth curve modelling (LGM).

Phases, tasks and milestones

The GEDI project will be articulated in the phases reported in the following Table.

	PHASES	Task/ Milestone
Preliminary Phase	Revision of the measurement tool	T.1
	Development of privacy policy	T.2
	Acquiring the approval from the University Ethics Board	T.3
1st Phase	Institutional communication with the University Course Directors (for the 1 st data collection)	T.4
	1 st online administration of the questionnaire to students of the 1st and 2nd year	T.5
	Data Analysis of collected questionnaire n.1	T.6
	Drafting Report n.1	M.1
	Dissemination activities within UNINA	T.7
2nd Phase	Institutional communication with the University Course Directors (for the 2 nd data collection)	T.8
	2 nd online administration of the questionnaire to students of the 1st, 2nd and 3rd year	T.9
	Data analysis of collected questionnaire n.2	T.10

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will be covered by the project funds. All proponents, aggregates and the research fellow will benefit of these costs.

- Finally, we plan to publish the results of the projects in at least 2 open access papers in high impact journals and to disseminate such results also in a national conference. These costs will be covered entirely by the project.

- Indirect general costs (max 5% of total)

Section 4 - Impact

The theoretical framework that will be validated in this project will not only contribute to the current knowledge of the construct of disciplinary identity in STEM, identifying significant precursors and mediators, but will also improve the current knowledge of the relationship between disciplinary identity, performance and academic persistence in STEM. Based on the results, it will be possible to develop interventions aimed at promoting STEM education and more gender-inclusive STEM careers in secondary schools and universities, in particular by addressing the role of gender stereotypes in order to build a more autonomous and conscious disciplinary identity. These interventions will be able to activate, at local level, cultural and inclusive processes aimed at the construction of fairer and more equal system of education, training, study, specialization and work, in agreement with the objectives of the programmes funded by the European Community to address the gender gap in STEM education. In addition, the project's results will support the debate and discussion on these issues within the Federico II academic community, in order to:

- (i) increase understanding and awareness of the role of the different factors involved in the processes of gender exclusion and segregation in STEM subjects;
- (ii) identify programmes and actions that reduce the outcome of these processes and promote individual, social and organisational development and well-being.

Although the path to gender equality in STEM pathways is not linear and impaired by several obstacles (cultural, social, organisational), the GEDI project can contribute to a more inclusive university and enhance individual differences.

In order to ensure the sustainability of the project, we intend to use the results obtained from the project for future participation in local, national and international competitive tenders, in order to continue and consolidate the actions of the GEDI action plan.

The planned research products are

- Three reports (two intermediate and one final report) (M1-M3)
- A GEDI action plan (M4), based on the outcome of the Report Analysis, aimed at identifying specific actions to promoting individual, gender sensitive social and organisational development.
- At least 2 research articles, possibly open access.

The dissemination program includes:

1. Communications to the CRUI gender commission, STEM organizations, research and teacher associations and to the organizations that deal with university policy, to promote further interdisciplinary research actions aimed at a cultural and organizational transformation of the university in the perspective of gender equality.

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2. Participation in international and local events and conferences (e.g., European researchers' Night, Remote Future, Science Festival, ESERA).
3. A national conference on the themes of the project, aimed at sharing the GEDI best practices and results.
4. Local presentations in the Departments of UNINA, with focus on the outcome related to students attending the involved degree courses.

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Project Proposal (GEDI)**Proponent Information Sheet (Antonella Liccardo)****PROGRAMMA PER IL FINANZIAMENTO DELLA RICERCA DI
ATENEIO
Bando 2024****PROPONENT/CORRESPONDING PROPONENT**

Name and Surname	ANTONELLA LICCARDO
Scientific-disciplinary sector	PHYS-02/A
Academic-recruitment sector	02/PHYS-02
Academic Position	RU
Department	Physics E. Pancini

Scientific Qualification of the Corresponding Proponent

Antonella Liccardo has been involved in research about gender-related issues in Science since 20 years.

Since 2019 she serves as Delegate of the Rector of the University of Naples for the Gender Budget (GB), and coordinator of the GB Working Group, in charge for elaborating the Gender Budget Report and the Gender Equality Plan (GEP). She authored both the university's Gender Budgets Reports of UNINA (2016; 2021), drafted the GEP of UNINA for the years 2022-2024 and coordinates the implementation activities of the GEP.

Since 2018 she also coordinates the Working Group on the Gender Budget for the Conference of Rectors of Italian Universities (CRUI). She authored the CRUI Guidelines for the GB of Italian Universities. In the CRUI context, she is currently involved in training and supporting Universities in the implementation of the GB, in periodic revisions of the Guidelines, overseeing relations with the MIUR Statistical Office and CINECA. With CINECA she developed, on behalf of CRUI, the project "Dashboard of context indicators and gender reclassification of accounting data".

Since 2024 she is the coordinator for the University of Naples Federico II of the *No women no panel protocol* with the RAI (public Italian radio and television), the Campania Region, the Municipality of Naples, the Metropolitan City, and the Campania universities.

Since 2024 she is a member of the Scientific Committee of the RIGEL Foundation (Respect, Inclusion, Gender, Ethic, Work) active in training and cultural, social and economic development courses related to gender equality, inclusion, diversity, ethics, equity, sustainability, social responsibility and organizational well-being.

Since 2017 she is a member of the Gender Observatory on University and Research of the Federico II University of Naples, as responsible for the area of Gender Statistics.

She is the author of the LALEO Lab board game on gender stereotypes produced by tUNINA and distributed at national level in public high schools, universities and associations dealing with gender-based violence, with the aim of bringing out gender stereotypes and role models.

She is curator and co-author of the MOOC produced by FedericaWeb Learning titled "Gender equality and the fight against discrimination in universities" She has also been professor in the *Integrated Gender Gap in Research* course - MASTER in Equal opportunities, gender equity and culture of differences.

Since 2017 she is a member of the Gender Observatory on University and Research of the Federico II University of Naples. She was a member of the team of the European project GENOVATE - Transforming Organizational Culture for Gender Equality in Research and Innovation funded under the FP7 Framework Programme, Science in Society, chairing its Institutional Address Committee. She is also a founding member of the Neapolitan Coordination of Women in Science.

CV of the Corresponding proponent

Antonella Liccardo is a Researcher of Theoretical Physics at the University of Naples Federico II since 2005. Her research activity was carried out in the fields of string theory and complex systems, with a specific focus on

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applications to population dynamics and epidemiological models. Since 2017 she is aggregate professor of Mechanics and Thermodynamics within the Physics Degree. Alongside the research interests in physics she is extremely active on gender issues at local and national level. In the last years she promoted, at national level, the elaboration of a shared model for the GB of all the Italian Universities, based on data analysis and the identification of specific variables, indicators and representations, in order to help each academic institution in measuring its own level of gender inequality and, at the same time, facilitating the comparison among all the Italian Universities and Research Institutions. This idea led to the establishment of a work group on the GB within the Conference of Rectors of Italian Universities that produced many pragmatic supporting tools, among which the Guidelines for the gender report (<https://www.crui.it/bilancio-di-genere.html>). She regularly carries out training activities at universities and public bodies on gender issues.

Since 2019, she carries out orientation and tutoring projects for high schools focused in particular on the theme of gender in science. She is currently involved in the projects:

- 2023- 2027 PROJECT IF- CHANGES project for the fight against poverty educational poverty – Impresa Sociale Con i Bambini• 2023-2024.
- maSTEM game - Promoting the understanding of STEM disciplines with a multilingual and engaging approach, projects by Public Engagemen of the University of Turin.
- PRIN 2022 Contrasting Violence against LGBTQI+ people: towards innovation of territorial policies. 2022PAXZ5J_003.

Some publications related to the topic of the proposal include

- Galano, S. Liccardo, A. Amodeo, A. L. Crispino, M. Tarallo, O. and Testa I. Endorsement of gender stereotypes affects high school students' science identity" Phys. Rev. Phys. Educ. Res. 19, 010120 (2023)
- Liccardo, A. Camerlingo, C. Amodeo, A.L. Caruso, C. Cotticelli, A. Galgano, F. Paladino, P. Petraglia, M. Renna, S. Il Bilancio di Genere dell'Ateneo federiciano: dal rapporto di genere all'istituzionalizzazione del processo. Collana Genere Scienza e Società FedOA - Federico II University Press
- Liccardo, A. Il Bilancio di Genere degli Atenei italiani alla luce delle Linee Guida CRUI in Diversity Management: nuove frontiere dell'inclusione e sfide per i C.U.G. universitari a cura di Francesca Galgano, Maria Sarah Papillo. Serie Cultura delle differenze : diritto, conoscenza, formazione ; 3, FedOA - Federico II University Press, Napoli ISBN: 978-88-6887-076-8, DOI: 10.6093/ 978-88-6887-076-8 (2020)
- Liccardo A, Borelli S, Canali C, D Onghia M, Damiani M, Di Letizia C, Gianecchini M, Oppi C, Pisanti N, Rosselli A, Siboni B, Tomio P Linee guida per il Bilancio di Genere negli Atenei italiani Fondazione CRUI, Roma ISBN 978-88-96524-30-5 (2019)
- Picardi, I; Agodi MC; Gargano, A; Lauria, A; Liccardo, A; Masullo, MR Pisanti O. La dimensione di genere nelle carriere accademiche. Riflessività e cambiamento nel progetto pilota di GENOVATE@UNINA Serie Genere Scienza e Società, FedOA - Federico II University Press, Napoli ISBN:978-88-6887-017-1DOI: 10.6093/978-88-6887-017-1 (2017)
- Liccardo, A. Agodi, A. Gargano, A. Masullo, M. Picardi, I. Pisanti, O. *Il Bilancio di Genere della Federico II* FedOAPress 2016
- Liccardo, A. Pisanti, O. Picardi, I. Transforming Organisational Culture for Gender Equality in Research INGENERE NEWSLETTER - ISSN:2039-1838 (2015)
- Liccardo, A. Gargano, M. Masullo, O. Pisanti *La presenza delle donne nelle facoltà scientifiche: un percorso attraverso analisi statistiche dall'Europa all'Italia, dal Nord al Sud*. Atti del VI Convegno Annuale dell'Associazione Donne e Scienza "La creatività delle donne come elemento d'innovazione in Ricerca e Impresa". Torino 1-3 Luglio 2010.

Project Proposal (GEDI)**Proponent Information Sheet (Ofelia Pisanti)****PROGRAMMA PER IL FINANZIAMENTO DELLA RICERCA DI
ATENEIO
Bando 2024****PROPONENT**

Name and Surname	OFELIA PISANTI
Scientific-disciplinary sector	PHYS-02/A
Academic-recruitment sector	02/PHYS-02
Academic Position	Associate professor
Department	Physics E. Pancini

Scientific Qualification of the Co-proponent

Ofelia Pisanti is one of the founders of the Women in Science Group in Naples, which works on the issue of the representation of women in research and scientific careers. She has been scientific coordinator for Italy of the European project GENOVATE - Transforming Organisational Culture for Gender Equality in Research and Innovation (2012-2016), funded in the FP7 - Science in Society SiS 2012. 2.1.1-1 programme. She is currently representative of the Rector of UNINA for the enhancement of female careers in university and research.

CV of the Co-proponent

Ofelia Pisanti is Associate Professor of Theoretical Physics (SSD FIS/02 - FISICA TEORICA MODELLI E METODI MATEMATICI, Settore concorsuale 02/A2) at the University of Naples Federico II since 2016. Her research activity was carried out in the field of particle phenomenology (grand unified theories and deep inelastic scattering phenomenology) and, in the last years, astroparticle physics. In this field she contributed to an important research line on Big Bang Nucleosynthesis (BBN) and the neutrino role in the primordial universe. In particular, she is author (as well as responsible of its distribution as web manager of the page <http://parthenope.na.infn.it/>) of a public BBN code, with a level of accuracy of the order of 1%, for the calculation of the primordial abundances of the light elements of the universe, widely used by the scientific community working on primordial nucleosynthesis. She was a member of the international collaboration Pierre Auger Observatory, with the aim of studying the chances for detection of cosmic high energy neutrinos; for this experiment she developed the modulus of the Monte Carlo CORSIKA (used in the cosmic ray community for the simulation of particle showers in the atmosphere) which treats neutrinos as primary particles. She joined the KM3NeT collaboration that is realizing two observational sites of cosmic neutrinos under the waters of the Mediterranean Sea. Finally, she joined the collaboration PTOLEMY aiming to detect for the first time the neutrino cosmic background produced in the Big Bang. She is author of more than 100 papers (h-index=46) and 2 books, was scientific coordinator of several funded astroparticle projects, referee of the MIUR SIR and FIRB programme, and is referee of several journals. Finally, she was awarded with the "Lydia Cottone 2016" award for the sector "Research and University" with the motivation: "For her relevant contributions to the phenomenology of elementary particle physics and in particular to neutrino physics."

Project Proposal (GEDI)**PROGRAMMA PER IL FINANZIAMENTO DELLA RICERCA DI ATENEO
Bando 2024****PROPONENT**

Name and Surname	Silvia Galano
Scientific-disciplinary sector	PHYS-06/B
Academic-recruitment sector	02/PHYS-06
Academic Position	RTDa
Department	Physics E. Pancini

Scientific Qualification of the Co-proponent

Silvia Galano is a Researcher in Physics Education. Her research activities include the investigation of metacognitive and affective variables (e.g., self-efficacy, confidence, anxiety, etc.) affecting students' academic performance. She is also interested in research studies focused on the disciplinary identity and on the role that gender and gender stereotypes play in education field in particular as a factor affecting students' choices in studying and working fields. In her research works she mainly uses quantitative statistical data analysis that are at the base of the present research project.

CV of the Co-proponent

Silvia Galano is a Researcher in Physics Education (**02/PHYS-06**).

From 2013 to 2015 she was a fellowship owner for the European project FP7 "Chain Reaction", Project ID: 321278 Funded under: FP7-SIS. She was responsible for Italy of two WP and was involved in teachers' training focused on Inquiry Based Science Education (IBSE). In this period, she studied students' and teachers' ideas on Nature of Science and how IBSE approach can promote knowledge about NOS.

In 2018 she obtained her PhD in physics education with a thesis focused on the development of a learning progression on basic astronomical phenomena. After her PhD, she continued to work on "Learning Progression" (LP) and on the development and validation of teaching learning sequences based on the developed LPs and mainly focused on astronomy and on modern physics.

After her PhD, she specialized in the analysis of students' drawings as a method to investigate students' mental models.

She is also involved in the study of the disciplinary identity and on the role that gender and gender stereotypes play in education; in particular, she contributed to develop and characterize the constructs of physics and astronomy identity.

In all her research study she mainly adopts quantitative statistical methods for data analysis which are necessary also in the proposed study. She contributes to the development and validation of many measurement instruments both focused on disciplinary topics and on psychological constructs.

Some publications related to the topic addressed in the projects:

1. Cioffi, A., Galano, S., Passeggia, R. and Testa, I. (2024) Validation of two test anxiety scales for physics

Project Proposal (GEDI)

- undergraduate courses through confirmatory factor analysis and Rasch analysis. *Phys. Rev. Phys. Educ. Res.* 20, 010126 <https://doi.org/10.1103/PhysRevPhysEducRes.20.010126>
- Galano, S., Palazzo, L. & Testa, I. (2023) A latent profile analysis of students' attitudes towards astronomy across grades 9–13. *International Journal of Science Education*. <https://doi.org/10.1080/09500693.2023.2289485>
 - Galano, S., Liccardo, A., Amodeo, A. L., Crispino, M., Tarallo, O. and Testa, I. (2023) Endorsement of gender stereotypes affects high school students' science identity. *Phys. Rev. Phys. Educ. Res.* 19, 010120 <https://doi.org/10.1103/PhysRevPhysEducRes.19.010120>
 - Testa, I., Galano, S., Tarallo, O. (2023) The relationships between freshmen's accuracy of self-evaluation and the likelihood of succeeding in chemistry and physics exams in two STEM undergraduate courses. *International Journal of Science Education*, 45(5), pp. 358–382 <https://doi.org/10.1080/09500693.2022.2162833>
 - Italo Testa, Giovanni Costanzo, Marianna Crispino, Silvia Galano, Alessio Parlati, Oreste Tarallo, Francesca Tricò & Umberto Scotti di Uccio (2022) Development and validation of an instrument to measure students' engagement and participation in science activities through factor analysis and Rasch analysis, *International Journal of Science Education*, 44:1, 18-47, <https://doi.org/10.1080/09500693.2021.2010286>
 - Testa I., Colantonio A., Galano S., Marzoli I., Trani F., Scotti di Uccio U. Effects of instruction on students' overconfidence in introductory quantum mechanics. *Phys. Rev. Phys. Educ. Res.* 16, 010143 (2020). <https://doi.org/10.1103/PhysRevPhysEducRes.16.010143>

Project Proposal (GEDI)

Project Budget

PROGRAMMA PER IL FINANZIAMENTO DELLA RICERCA DI ATENEO
Bando 2024

Costs	Year 1	Year 2	Year 3**	Total
A) Research associate (assegni) (*)	0,00	24.000,00	0,00	24.000,00 €
B) Equipment	5.000,00	2.000,00	0,00	7.000,00 €
C) Travels, conferences and dissemination	2.000,00	4.000,00	14.000,00	20.000,00 €
D) Other costs	2.000,00	2.000,00	2.000,00	6.000,00 €
E) Indirect general costs (max 5% of total)	1.000,00	1.000,00	1.000,00	3.000,00 €
Total per year	10.000,00	33.000,00	17.000,00	60.000,00 €
Totals for Department of the Proponent (= Co-proponent n. 1)	10.000,00	33.000,00	17.000,00	60.000,00 €
Totals for Department of Co-proponent n. 2				0,00 €
Totals for Department of Co-proponent n. 3				0,00 €
Overall total***	10.000,00	33.000,00	17.000,00	60.000,00 €

* regarding the amounts to be reported under this heading, you should consult your departmental research office, remembering that the minimum cost for “assegni di ricerca” contracts is estimated at 23.890 € per year; it is currently not yet known what cost the contractual positions that will replace the “assegni di ricerca” will have

** the third year is optional; the project can have a duration of either two or three years. Column D for year 3 must be left empty for a 2-years project

*** the overall maximum financing for type A/B projects is of € 40.000 for a 2-years project and € 60.000 for a 3-years one. For type C projects, the maximum is of € 20.000 for a 2-years project and € 30.000 for a 3-years one.

Place and date
Napoli, 19/09/24

Signature
