Questionnaire for the Characterization of STEM Identity in Secondary Education Students (QIDSTEM_12-18)

Authorship

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Introduction

The **QIDSTEM_12-18** questionnaire has been designed to characterize STEM identity among secondary school students (aged 12–18). Its objectives include identifying relationships and patterns between the different constructs included in the instrument, as well as detecting potential differences that can be analyzed from a **gender and intersectional perspective**.

To achieve this, the questionnaire defines several **constructs or dimensions** that shape STEM identity, such as **interest, competence, recognition, self-efficacy, and aspirations**, both in STEM and non-STEM fields. These dimensions contribute to defining what is referred to as **constructed STEM identity**. Additionally, students are asked to explicitly state their **self-positioning towards STEM** fields, allowing for a comparison with their constructed identity.

The questionnaire also includes a section to **capture students' perceptions of STEM fields and careers**, providing complementary information. Lastly, the instrument contains an initial and final section aimed at gathering **sociodemographic information**, including gender and the occupational status of adult family members as a proxy for the family's socioeconomic level.

Intended Uses of the QIDSTEM_12-18 Questionnaire

The **QIDSTEM_12-18** questionnaire is designed for use in various contexts:

- **Educational research**: To examine how STEM identity develops among different groups of students and to identify barriers and enablers in this process.
- **Diagnosis in schools**: Teachers and guidance teams can use it to better understand students' STEM identity and detect potential gender or socioeconomic disparities.
- **Evaluation of educational interventions**: To assess the impact of STEM-specific activities, guidance programs, workshops, extracurricular activities, and other initiatives aimed at fostering STEM identity development.

Citation:

Grimalt-Álvaro, C. & Couso, D. (2019). *Qüestionari per a la Caracterització de la Identitat en l'àmbit STEM a l'Educació Secundària (QIDSTEM_12-18).* https://ddd.uab.cat/record/308892

Description of the Instrument

Since complex constructs such as identity or learning **cannot be directly measured**, the questionnaire is designed using **multiple measures** to develop an **indicator of constructed STEM identity**. The variables included in the instrument were selected based on their relationship with the constructs described below.

Additionally, the questionnaire includes information on other relevant sections aimed at:

- Measuring students' **explicit self-positioning** regarding STEM.
- Characterizing their **perceptions of STEM and STEM professionals**.
- Collecting **demographic information** to contextualize the results.

Description of Questionnaire Sections

Measurement of Constructed STEM Identity

The **constructed STEM identity** is measured through the following constructs:

- **Interest**: 17 items
- **Competence**: 4 items
- **Recognition**: 2 items
- **Self-efficacy**: 17 items
- **Aspirations**: 12 items

Each construct is primarily measured using **Likert scales or structured responses**.

Interest: Measured using a **6-point Likert scale**, where students rate their interest in various **STEM-related activities and subjects**. Additionally, they are asked to **select the three most interesting areas** for them among all subjects in the **secondary education curriculum (STEM and non-STEM)**.

Competence: Students **report their average grades** in STEM subjects, such as **science, technology, computer science, and mathematics**, following the Spanish grading system.

Recognition: Measured through **two single-response questions**, where students indicate in which **areas they feel most recognized** by their **parents/guardians and teachers**.

Self-efficacy: Measured by assessing students' **confidence** in their ability to perform various STEM activities and achieve academic success in STEM subjects. It uses a **6-point Likert scale**. Students are also asked to **select the three areas in which they believe they are most capable** of successfully completing activities, chosen from all subjects in the secondary education curriculum (both STEM and non-STEM).

Aspirations: Students indicate their aspirations in **STEM and other knowledge areas**, as well as their **career aspirations** through an **open-ended question**. The responses are **coded** following the **International Standard Classification of Occupations (ISCO-08)** to determine whether they express **STEM-related aspirations**.

Measurement of STEM Self-identification

Students' self-identification as a STEM person is assessed using a single-item question, where they select the statement that best describes their relationship with STEM. This single-item measure serves as a target variable in later analyses.

Measurement of STEM Perceptions

This section includes 17 items, adapted from previously published surveys. Students express their degree of agreement with statements regarding stereotypes of STEM professionals and STEM-related practices.

Demographic Information

he demographic questions are divided into **two sections**:

- **Initial section**: Basic identification (e.g., initials, date of birth, etc.).
- **Final section**: Additional demographic aspects (e.g., gender, occupation of adult family members).

Responses regarding **adult family members' occupations** are **coded using ISCO-08**, allowing an **approximate classification of participants' socioeconomic background**. Responses include a combination of **single-choice questions** and **open-ended fields**.

Development Process, Reliability, and Validity

The **QIDSTEM_12-18** questionnaire was developed based on an extensive **review of existing literature** on STEM identity and scientific careers. To ensure its **methodological robustness**, a rigorous validation process was conducted, including the following phases:

- **Expert Review**: A panel of **STEM education researchers and teachers** evaluated the **relevance and clarity** of the items to ensure content validity.
- **Pilot Study**: The questionnaire was administered to an **initial sample of 1,058 secondary education students in 2018**, aiming to assess item comprehension and refine wording where necessary.
- **Reliability Analysis**: **Cronbach's Alpha** was calculated to assess the internal consistency of each construct, yielding the following values:
    - **Interest** → $\alpha = 0.86$
    - **Competence** → $\alpha = 0.83$
    - **Self-efficacy** → $\alpha = 0.86$
    - **Aspirations** → $\alpha = 0.75$

Additionally, an **exploratory factor analysis** was performed to examine the underlying structure of the items and verify that the constructs measured aligned with theoretical expectations. Finally, a **comparison with population data** was conducted to establish the **external validity** of the instrument.

Questionnaire Administration

Target Group
Secondary education students (aged 12–18).

Estimated Completion Time
Approximately 30 minutes.

Recommended Administration
Preferably administered digitally to facilitate data collection. Ideally supervised by a teacher or researcher to clarify doubts and ensure proper understanding.

Language Availability
The **validated** QIDSTEM_12-18 questionnaire is **available in Catalan**.

Versions in **English and Spanish** have been developed but **have not been validated**.

Usage Guidelines and Permissions
Cost: Free

Access: To obtain the full questionnaire, please contact Carme Grimalt (Carme.Grimalt@uab.cat).

Related bibliography

Theoretical background of the questionnaire
Grimalt-Álvaro, C., & Couso, D. (2022). ¿Qué sabemos del posicionamiento STEM del alumnado? Una revisión sistemática de la literatura. *Revista de Investigación Educativa*, *40*(2), 531-547. https://doi.org/10.6018/rie.467901

Use for research purposes
Grimalt-Álvaro, C., Couso, D., Boixadera-Planas, E., & Godec, S. (2022). "I see myself as a STEM person": Exploring high school students' self-identification with STEM. *Journal of Research in Science Teaching*, *59*(5), 720-745. https://doi.org/10.1002/tea.21742