A Data-driven Analysis of STEM-related Positions in UN International Organizations

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Abstract

International organizations (IOs) such as the United Nations play a crucial role in addressing global challenges in the 21st century. Talents majoring in Science, Technology, Engineering, and Mathematics (STEM) play a pivotal role in IOs. However, the evaluation of how to align the competencies needed for STEM-related positions with the United Nations Competencies for the Future (UNCF) is still overlooked. This paper utilized data consisting of 986 recruitment postings from various UN recruitment websites to investigate the current STEM-related job vacancies across different UN agencies and the essential competencies needed for application. This paper utilized Python to automatically trace, extract, and count names, locations, departments, and detailed requirements. The messages were coded according to the 17 competencies of UNCF. The results show that STEM positions emphasize the key competencies of subject skills. The findings indicate that educators should focus on integrating cross-cultural communication education with relevant subject skills.

Keywords

Global competency, natural language processing, data scraping, STEM education, UN careers

Introduction

Globalization works as a trend to foster the formation and strengthening of global social connections, intertwining localities in a way that events in one area are influenced by, and in turn influence, occurrences in distant places. The United Nations (UN) is an essential organization that keeps a balance in such a dynamic world and offers a diverse range of STEM (Science, Technology, Engineering, and Mathematics) positions that are crucial in addressing some of the most pressing global challenges. These roles are essential in supporting the UN's mission of promoting peace, sustainable development, and human rights worldwide. To fit with the demand for positions in international organizations, competency frameworks were explored by studies. However, research on playing students with STEM backgrounds often falls short, even if STEM professionals in these positions contribute significantly through a variety of ways, including scientific research and analysis, technological innovation, and engineering solutions. Therefore, the current paper will first scrap posts on the United Nations recruitment websites for positions, with their names, locations, departments, and detailed requirements. After this, the methodology of the research will be elaborated, and the results of UN agencies with the highest demand for STEM students will be displayed to reveal how significant is the demand for STEM-related positions. Then, based on the results and the UN framework for global competence, the recode of the corpus will reveal key competencies for STEM-related positions. The discussion will be focused on the demand and key competencies for STEM positions in the UN system.
1. STEM-related global competency

1.1 Towards global competency

1.1.1 Dynamic concept following the change in demand

Competency as a framework was first invented to describe a detailed and organized collection of skills, knowledge, behaviors, and qualities essential for effective performance in a specific role or area (McClelland, 1973). Global competency is a new-born concept and it was not until the 2010s that contributions to a scientific definition of global competency were published. Moreover, at that time, there was no widespread agreement on which global topics should be seen as dynamic environments that foster globally competent attitudes, mindsets, and behaviors (Sälzer & Roczen, 2018). The OECD describes this attribute as comprising certain skills and attitudes. These include the ability to think analytically and critically, possessing knowledge and understanding of intercultural and global issues, and demonstrating openness and respect towards cultural diversity (Colvin & Edwards, 2018).

However, the concept of global competence evolves with time and is subject to changes in different eras, it is challenging to label it definitively. The education of global engineers should be oriented to the needs of positions at the time. Thus, scraping job requirements for United Nations positions plays an indispensable role in understanding the global competence of students with STEM backgrounds. With the recoding method, it provides a more contemporary perspective on the labor market supply and demand dynamics.

1.2 STEM-related positions in the United Nations system

Given that the United Nations and its affiliated agencies are actively engaged in promoting and implementing Sustainable Development Goals (SDGs) on a global scale, it becomes essential to examine the specific roles these organizations expect their personnel to undertake in the pursuit of sustainable development. The United Nations works to maintain international peace and security, promoting social progress and better standards of life, strengthening international law and human rights, and fostering cooperation among nations to solve international economic, social, cultural, or humanitarian problems (United Nations, n.d.). Positions offered by the UN are aligned with its commitment.

The pressing global need to enhance STEM education may arise from the environmental and social repercussions of the twenty-first century, ultimately posing threats to global security and economic stability. The intricacies of these worldwide factors extend beyond the sole objective of assisting students in achieving top scores in mathematics and science evaluations (Kelley & Knowles, 2016). Nowadays, with emerging technologies like Artificial Intelligence, changes are driven throughout the educational landscape, leading to the redefinition and reshaping of STEM education (Chiu & Li, 2023). STEM education and entrepreneurship intersect with social topics like sustainable development, social innovation, and environmental education to address the complexities and uncertainties in contemporary society (Ribeiro et al., 2023). Thus, the significance of enhancing STEM education to fit with UN system needs becomes even more pronounced.

The United Nations Competencies for the Future (UNCF) framework is indeed a critical component of the United Nations’ recruitment process (United Nations, 2009). It serves as a structured and comprehensive guide for identifying the skills, knowledge, and abilities that are essential for individuals to effectively contribute to the work of the United Nations. The UNCF encompasses a wide range of competencies that are relevant to various roles within the UN system. It remains unclear what kind of key competencies for STEM positions within the UN under this framework.

1.3 Research Questions

The current study will address the following questions:

1. What are the general requirements for STEM-related positions?
2. What are the key competencies required for STEM-related positions within the UNCF framework?

2. Methods to analyze the STEM-related positions in the UN system

2.1 Source

This network data collection is adapted for all the 986 job postings of the United Nations and its subordinate organizations that are within their valid recruitment period during the time frame of January 8 to December 10, 2023. The
sources of the website data are (1) the unofficial UN jobs website (https://unjobs.org) and (2) the official UN career website (https://careers.un.org).

2.2 Data Collection and Analysis

In this project, Python version 3.11.4 is used for data scraping, with the Selenium library version 4.16.0 and the requests library version 2.31.0 being utilized.

The UNjobs website provides a comprehensive integration of data on many recent United Nations and non-United Nations job positions or internship requirements. It includes the names, locations, departments, and detailed requirements of these positions. The website is built by the UNjobs Association of Geneva, an unofficial organization, with web scraping to gather content from different international organizations' recruitment announcements and display them in text form in real-time on the website, providing links to apply on the official websites. The search function is initially used to locate all the United Nations official part-time job entries on the site. Regular expressions are used to preliminarily obtain the content, department information, and job numbers of the positions. Then, correct regular expressions are generated through manual identification for tokenization and segmentation, separating the specific job titles from the work locations to form a comprehensive job CSV table, sorted by title, department, upload time, and location. URLs are constructed using the scraped job numbers to access specific job requirement pages on the website. Since UNjobs is an unofficial, privately made website, some links are invalid. Therefore, after excluding invalid links, the valid links are used to scrape specific job requirement pages, capturing the content using XPath, and saving it in individual Txt files named after the job title and location (excluding special characters that cannot be used in Txt file names).

UNCareer is also a website dedicated to providing services for job seekers looking for positions within the United Nations and other international organizations. It focuses on offering career opportunities within the United Nations system and other multilateral organizations. The website provides job information from the United Nations and its affiliated agencies, international NGOs, non-profit organizations, and other international institutions. The site employs dynamic structure loading, and the program uses the Selenium library to simulate normal browsing for scraping. The website is locked to the search list of all jobs, and the Requests library is used to search for XPath paths, saving all the job information appearing on the entire page (including job title, job ID, department, job grade, job number, etc.). The Selenium library is then used for pagination, recording all searchable job positions. After that, using the corresponding job ID to generate the respective URL, detailed requirement pages of all recorded job positions are scraped in sequence. Detailed information on job position requirements is recorded. Then, the information is written into correspondingly named Txt files according to the sequence numbers in the job position CSV table (since UNCareer web pages do not experience missing pages, a one-to-one correspondence with the CSV table can be formed) for preservation.

Second coding is employed after collecting the data to find out how these positions are linked with the UNCF framework, which is composed of 17 competencies.

During the data scraping process, the program was designed following general web crawler behavioral guidelines. It strictly limited the access frequency and appropriately identified the crawler's identity. This approach ensured that the normal operation and security of the websites were not compromised.

3. Results

3.1 Results of the agencies with the highest demand for STEM students

The bar chart in Figure 1 delineates the distribution of new job postings across various United Nations agencies, where the horizontal axis represents the different agencies and the vertical axis indicates the number of new postings, distinguishing between total new positions and those in STEM fields. The results have revealed that the United Nations International Children's Emergency Fund (UNICEF) and the United Nations Development Program (UNDP) are at the forefront with 1127 and 1030 total new posts, respectively, yet when it comes to STEM-related posts, UNICEF has 485 and UNDP has 412. Following them are the World Health Organization (WHO) with 788 total posts and 250 in STEM, and the United Nations Environment Programme (UNEP) with 636 total posts and 192 in STEM. The Food and Agriculture Organization of the United Nations (FAO) and the International Telecommunication Union (ITU) show a smaller number of total posts, 323 and 23 respectively, with an even smaller footprint in STEM posts, at 160 and 10 respectively. This breakdown indicates a varied focus on job roles within these
organizations, with a notable emphasis on STEM-related positions, especially within agencies such as UNICEF and UNDP.

Figure 1. The agencies with the highest demand for STEM students.

3.2 Results of competencies in engineering construction as well as statistics and monitoring

The results of competencies in engineering construction are presented in Figure 1 with the axes representing different key skill areas. The result has revealed that the areas of Judgment/Decision-making, Integrity, Professionalism, Respect for Diversity, Communication, Teamwork, Accountability, and Client Orientation are particularly strong, but there is a noticeable scope for improvement in Creativity and Vision. The results of statistics and monitoring display the same as Engineering Construction. This phenomenon indicates stringent professional standards and a strong emphasis on cooperative capabilities within STEM roles.

Figure 2. Competencies mapping on engineering construction.
Such results indicate very similar competencies among STEM positions. Therefore, they should be used for fostering STEM talent for international organizations.

4. Discussion

In recent years, STEM staff have been in considerable shortage in the UN agencies (Xue & Larson, 2015). As shown in Fig. 1, these key entities include UNICEF, UNDP, WHO, UNEP, FAO, and ITU. The percentage of STEM positions reflects the urgent need for STEM education for the UN workforce (Nikitina & Ishchenko, 2023). The key competencies for STEM-related positions guide fostering global engineers and scientists to be equipped with international horizons and critical thinking skills to solve global and practical problems (Chen et al., 2021).

The implications of the current study can be summed up as follows. Firstly, the study illuminates what is the current proportion of STEM-related positions for UN agencies with the largest demand for applicants. Attention should be especially paid to achieving STEM education for international organization positions according to their appreciable vacancy. Such results indicate that STEM-related jobs in the UN system are attainable in diverse branches.

Secondly, STEM-related key competencies are requested similarly. Judgment/Decision-making, Integrity, Professionalism, Respect for Diversity, Communication, Teamwork, Accountability, and Client Orientation were the most frequently asked elements, which were perceived to be fit for a cross-border working environment. Such results reveal that an integration of education should be combined with STEM and cross-cultural communication.

Thirdly, multilingual and multicultural education is essential for strengthening STEM education within UNCF (United Nations, 2009). One of the challenges is the multiple languages used in UN workplaces (Mogea, 2023). Being multilingual contributes to the adaptation of the multilingual and multicultural UN working environments (Xue et al., 2022). Thus, it is highly necessary to motivate educators’ and learners’ skills in strategically utilizing multilingual resources (Chen et al., 2022).

5. Conclusion

The current study has employed corpus analysis through a data scraping approach to tracking the STEM-related positions in the UN system and corresponding job requirements. The recoding of the collected data distinguishes the specific component of competencies. Through such exploration, the key competencies for STEM positions were revealed. The study provides some implications for educators conducting interdisciplinary education. Educators need
to develop a better integration of STEM subject-related skills and international communication.

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