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PIAAC and its Methodological Challenges

Beatrice Rammstedt[1] *& Débora B. Maehler*[1,2]

[1] *GESIS – Leibniz Institute for the Social Sciences*
[2] *College for Interdisciplinary Education Research (CIDER)*

Abstract

This article gives an overview of the *Programme for the International Assessment of Adult Competencies* (PIAAC) and introduces the methodological challenges in implementing the survey – especially those encountered in Germany. Adherence to high methodological standards is a prerequisite to participation in PIAAC and to inclusion of the national data of the respective participating countries in the international dataset (OECD, 2010). Depending on the standard in question, and on national circumstances, compliance is a challenging undertaking. This Special Issue discusses methodological challenges at different levels, and steps taken to implement PIAAC standards in Germany. The aspects addressed include sample design, survey instruments, field work preparation, data collection, and estimation standards. In this introductory article, we outline the central elements of the PIAAC design and the methodological challenges of the survey, and we present the other six articles in this Special Issue.

Keywords: PIAAC, methodological standards, competencies, basic skills, Germany

The Programme for the International Assessment of Adult Competencies (PIAAC)

The Programme for the International Assessment of Adult Competencies (PIAAC) aims to assess basic skills of the adult population in an internationally comparable way. The skills assessed – literacy, numeracy, and problem solving in technology-rich environments – are considered to be essential for successful participation in modern society and to be a foundation for developing numerous other, more specific, skills and competencies (OECD, 2013a). PIAAC provides information about the extent to which the adult population in the respective participating countries differs in terms of the basic skills assessed. Moreover, it examines factors associated with the acquisition, retention, and maintenance of these skills, and sheds light on their effects on social and, in particular, economic participation.

The PIAAC Design

PIAAC was initiated by the Organisation for Economic Co-operation and Development (OECD) and is steered by the PIAAC Board of Participating Countries. Twenty-four countries, including Germany, participated in the first round of PIAAC, which started in 2008. Results were published in 2013. In Germany, PIAAC was implemented by GESIS – Leibniz Institute for the Social Sciences and funded by the Federal Ministry of Education and Research (BMBF) with support from the Federal Ministry of Labor and Social Affairs (BMAS). GESIS was also part of the international consortium commissioned by the OECD to design PIAAC and supervise its implementation in the participating countries. As a PIAAC Consortium partner, GESIS supported the development of the PIAAC background questionnaire. The institute was also responsible for validating the background questionnaire and developing guidelines for its translation.

PIAAC is designed to be repeated at regular intervals. The currently published round, PIAAC 2012, marked the starting point of this multi-cycle program. Further cycles are planned at ten-year intervals, which will enable future changes in adult skills to be monitored and analyzed. As mentioned above, twenty-four countries participated in Round I of the first cycle of PIAAC. A second round, which started in 2012, includes nine additional countries. First results for these Round II countries are expected to be published in 2016. Just this year (2014), the OECD initiated a third round of the first cycle of PIAAC with presumably another five additional

Direct correspondence to
Beatrice Rammstedt, GESIS – Leibniz Institute for the Social Sciences,
PO Box 12 21 55, 68072 Mannheim, Germany
E-mail: beatrice.rammstedt@gesis.org

Figure 1 Participating countries in the three rounds of the first cycle of PIAAC

countries. Figure 1 shows the geographic distribution of the participating countries in the three rounds.

In PIAAC Round I, at least 5,000 randomly selected respondents between the ages of 16 and 65 were interviewed and assessed in each participating country. In Germany, approximately 5,400 interviews were conducted using a two-stage register-based sampling technique. The survey was carried out as a personal interview (background questionnaire) with a subsequent skills assessment. Together, the background questionnaire and the assessment of skills took between 1 1/2 to 2 hours to administer. After answering the background questions, respondents independently completed a computer- or paper-based version of the assessment in the presence of the interviewer (see Zabal et al., 2014).

The Basic Skills Assessed in PIAAC

PIAAC focuses on the assessment of three central basic skills, namely literacy, numeracy, and problem solving in technology-rich environments. Literacy is defined as the ability to understand, use, and interpret written texts. Hence, it is a prerequisite to developing one's knowledge and potential and successfully participating in modern society (Jones et al. 2009; OECD, 2013a; Zabal et al., 2013). The literacy domain in PIAAC includes tasks such as reading and understanding a medication package insert or a brief newspaper article. In addition, there are tasks that involve digital media, for example reading an online job posting. Numeracy

refers to the ability to access, use, and interpret everyday mathematical information in order to manage the mathematical demands of adult daily life (Gal et al., 2009; Zabal et al., 2013). This is measured, for example, with items involving the evaluation of a special offer or the interpretation of numerical information in figures and tables.

PIAAC marks the first time that problem solving in technology-rich environments has been assessed in an international survey (OECD, 2013a). Problem solving in technology-rich environments is defined as the ability to successfully use digital technologies, communication tools, and networks to search for, communicate, and interpret information (Rouet et al., 2009; Zabal et al., 2013). In the first cycle of PIAAC, this domain focuses on the ability to access and make use of information in a computer-based environment. Tasks include sorting and sending e-mails, filling out digital forms, and evaluating the informational content and the credibility of a number of different websites.

The construct definition and item development of each of the three competence domains was based on a theoretical framework developed by renowned experts in each field. The quality and appropriateness of the items was thoroughly tested before the PIAAC Main Survey. For all three domains, results are presented in the form of proficiency scales based on Item Response Theory models (OECD, 2013b). To facilitate the interpretation of the resulting scale scores, each scale was divided into skill proficiency levels with 50-point intervals (similar to other scales with 50-point intervals used in studies such as PISA). This results in five skill proficiency levels for both the literacy and numeracy domains and three skill proficiency levels for the problem solving in technology-rich environments domain. In addition, the area below the lowest level is classified as "Below Level I" (OECD, 2013b; Rammstedt, 2013).

The PIAAC Background Questionnaire

The background questionnaire used in PIAAC was developed by the PIAAC Consortium in cooperation with a Background Questionnaire Expert Group. Based on a framework specifying the analytical underpinnings (OECD, 2011), the development of the background questionnaire was guided by three additional criteria: first, it should possess analytical utility, especially in combination with the competence measures; second, it should provide internationally comparable data; and third, completion time should not exceed 45 minutes, on average. The Consortium developed a source version of the background questionnaire in English, which had to be adapted and translated by each country. An initial – longer – version of, the background questionnaire was tested in the PIAAC Field Test. Based on the empirical findings of the Field Test, the extent to which the aforementioned criteria were met

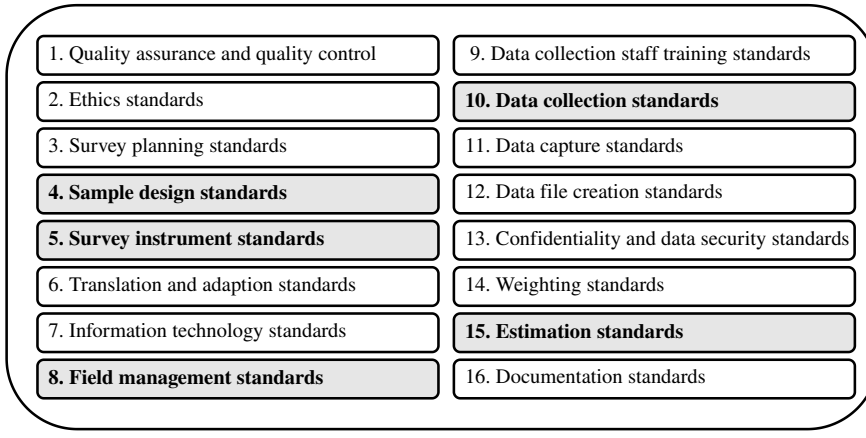
was investigated for each item. The resulting background questionnaire used in the Main Survey covers areas such as socio-demographic information, education and training, and questions relating to the respondent's work and background (Zabal et al., 2014).

Two of the most crucial pieces of information provided by the background questionnaire are the highest level of educational attainment and the current educational engagement of the respondent. Not surprisingly, given their postulated learnability, the competencies assessed in PIAAC are highly dependent on education. In Germany, for example, respondents with the highest level of education possess literacy skills that are, on average, 1.5 proficiency levels higher than those without any formal educational qualification (Maehler et al., 2013).

One of the several innovative aspects of PIAAC is the assessment of the job requirements – that is, the level of skills people need to carry out their everyday work. Based on this information, a central intended outcome of PIAAC was an estimate of the match, or mismatch, between the personal skills assessed in PIAAC and the skills used in the workplace. However, the originally intended measure for skill mismatch, which was also used by the OECD in its initial report on the PIAAC data (OECD, 2013), proved to be problematic (see Klaukien et al., 2013). Therefore, in their article in this Special Issue, Perry, Wiederhold, and Ackermann-Piek seek an alternative, more valid, measure for skill mismatch based on the PIAAC data. They also systematically compare existing and newly developed skill-mismatch measures in a Mincer regression (Mincer, 1974) and investigate the importance of skill mismatch for individual earnings.

PIAAC's Methodological Standards

In order to provide high quality data that allow policymakers and scientists to draw reliable conclusions, PIAAC aims to meet the highest quality standards. This is especially true of the sample design and the survey operations implemented in the various countries. Therefore, detailed Technical Standards and Guidelines (TSG; OECD, 2010), which span almost 200 pages, were developed for the implementation of PIAAC. An overview of the main aspects addressed in these standards and guidelines is given in Figure 2. When developing the TSG, the PIAAC Consortium closely adhered to existing, scientifically recognized best practices and gold standards. One of the main sources was the set of standards developed for the European Social Survey (ESS; European Social Survey, 2012). For example, in accordance with these standards, the target response rate for PIAAC was set at 70%, and the minimum response rate at 50%. Diverging from the ESS procedure, however, the inclusion of countries in the international data set is directly dependent on compliance with these criteria. Countries reaching response rates below 50% in PIAAC



Notes. The highlighted fields indicate standards whose implementation in PIAAC in Germany posed methodological challenges that will be addressed in this Special Issue. Data source: OECD 2010.

Figure 2 Overview of the methodological standards of PIAAC 2012

are included in the data set only if their national data have a low nonresponse bias (OECD, 2013b).

As already described in the response-rate example, each participating country is required to follow all standards and guidelines formulated in the TSG and to document any deviation caused by factors such as national requirements or circumstances. For example, PIAAC could not be fielded in the region of Fukushima in Japan, as the area was highly contaminated with radiation at the time. This resulted in higher undercoverage in Japan than the allowed maximum of 5%. Strict adherence to the guideline whereby cases for interview validation should be randomly preselected, including cases finalized as nonresponse (Guideline 10.9.3A in OECD, 2010, p. 159), was extremely challenging for Germany because re-contacting adamant refusers is not allowed under German law.

Before data release and the publication of the international PIAAC results, the quality of the data of each participating country is investigated and assessed. When the first results from PIAAC were published in 2013, compliance with the quality standards had been certified and confirmed for 23 of the 24 countries that participated in PIAAC Round I. Only at a later point in time did the OECD confirm that the Russian Federation had met the quality standards, despite the fact that some data abnormalities had been identified (cf. OECD, 2013b). These abnormalities led, for example, to the exclusion of the Moscow municipal area from the Russian data.

PIAAC's Methodological Challenges

As described in the last section, PIAAC aims to meet very high methodological standards. Adherence to these standards is crucial to each country's inclusion in the data set and the comparative analyses, thereby enabling it to justify its participation in PIAAC. Depending on the standard in question, and on the national circumstances, meeting these standards is a challenging undertaking. In Germany, too, traditional methods of field work preparation, organization, implementation, and monitoring had to be rethought against the background of the PIAAC TSG. Zabal's article in this Special Issue describes important fieldwork measures and procedures for the PIAAC Main Survey in Germany, and describes how some of these required adaptations with regard to the PIAAC standards. Based on the experience with the PIAAC fieldwork in Germany, the author reflects on the limitations and possibilities posed by international survey operation standards in national implementation.

One standard that proved surprisingly challenging for all countries was the technical requirements for the competence assessment (see Standard 7.1.1 in OECD, 2010). The competence assessment is computer-based by default. Only if the respondent is unable or unwilling to complete the assessment on the computer, is a paper-based assessment administered (OECD, 2013b). However, the items and the virtual machine that displays them were developed for a laptop screen format (4:3) that was already outdated by the time PIAAC was fielded. To meet the standards and to guarantee sufficient resolution and size of the displayed items, 17-inch laptops had to be purchased for all interviewers in Germany. As the laptops, together with all additional material (extra battery, testlets etc.), were comparatively heavy, interviewers in Germany were equipped with wheeled suitcases.

As described above, new and challenging procedures for controlling interviewer performance must be followed.[1] For example, PIAAC TSG (Standard 10.9.5 in OECD, 2010) requires participating countries to review tape recordings of each interviewer's work. If the review reveals performance problems, intervention- and interviewer-retraining measures must be implemented. In their article in this Special Issue, Ackermann-Piek and Massing report on the use of these audio-recorded interviews, and describe interviewers' actual behavior with regard to standardized interviewing techniques and correlations between this behavior and interviewer characteristics.

From a German point of view, the greatest challenge posed by the PIAAC TSG was to reach the minimum response rate of 50% (see Guideline 4.7.4B in OECD, 2010). This is due to the fact that, for years now, response rates in such register-based face-to-face surveys have been dramatically decreasing in Germany – they are usually around 40%, or even lower (cf. European Social Survey, 2012; Wasmer,

1 For an overview of the requirements with regard to interview validation see Massing, Ackermann, Martin, Zabal, Rammstedt, 2013.

Scholz, & Blohm, 2010; Zabal et al., 2014). In order to achieve this challenging goal, and to thereby ensure the inclusion of the German data in the international data set, numerous measures were taken, including, for example, the payment of an attractive incentive to the respondents. In their article in this Special Issue, Martin, Helmschrott, and Rammstedt describe the incentive experiment conducted within the framework of the German PIAAC Field Test to determine the optimum amount of the incentive to be used in the Main Study.

The various measures taken when fielding PIAAC in Germany proved to be successful. In the end, a response rate of 55% was achieved – a figure that had not been reached in such surveys in Germany for years, or even decades. However, the PIAAC TSG (Standard 4.7.6 in OECD, 2010) requires all participating countries with response rates below 70% to conduct extensive nonresponse-bias analyses to prove that this bias was of an acceptable size. In their article in this issue, Helmschrott and Martin report selected results of these nonresponse analyses from the PIAAC Main Study with a special focus on the identification of the main factors influencing survey participation in PIAAC Germany.

Besides the challenges posed by the PIAAC methodological standards, the implementation of PIAAC in Germany faced another major challenge as an error occurred during sampling. Due to this error, people no longer had the same probability of inclusion in the sample (for details, see Zabal et al., 2014). In order to estimate the selection probability of each element of the sampling frame post hoc, an innovative simulation approach was developed and implemented by Gabler, Häder, and Kolb. This approach is described in detail in their article in this Special Issue.

In addition to all these methodological issues, the biggest challenge that countries faced when conducting PIAAC was the very tight timeline. Even though the deadline was extended by a further six months, the time allocated to perform the various tasks was hardly enough. For example, when preparing the national report of the PIAAC data, which was published on the internally fixed date – October 8th 2013 – we received the data of one of the 23 countries only one week before sending the manuscript to the printers. The tight timeline (see Figure 3) was most probably due to the fact that PIAAC is a newly developed and methodologically innovative study. The international design was developed and implemented in parallel with the preparation of the national implementation of PIAAC. In the light of this situation and the constraints and challenges it caused, it is impressive that all countries were able to adhere to this timeline and to meet the methodological requirements.

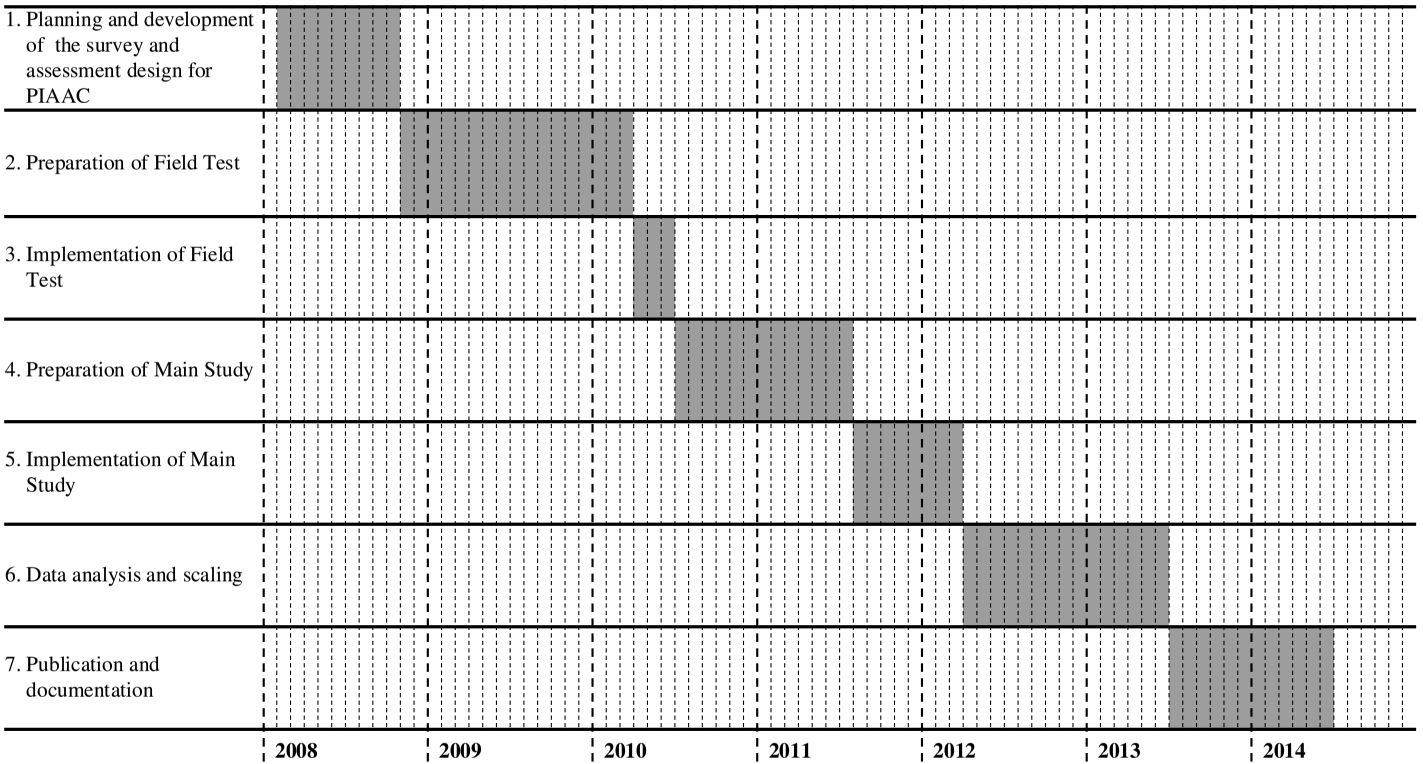


Figure 3 Rough timeline for the preparation and implementation of PIAAC 2012

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