

Effects of Work-Oriented Adult Basic Education Trainings: Addressing Employee's Competencies across Sectors

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Abstract

The paper focuses effects of work-oriented adult basic education trainings across different sectors. As such manufacturing sector, care sector, transportation sector, personnel services as well as logistics sector are under scrutiny. It is based on a broader research project (ABAG²) funded by the German Federal Ministry of Education and Research and examines the acquisition of competencies through workplace-related trainings. All in all, 50 trainings and 304 participants are considered within the study. The survey draws on a longitudinal self-assessment of the participants at the end of the respective trainings and differentiates professional competence, methodological competence, social competence and self-competence. These competencies are not only considered crucial by the European Union (2018) for the personal fulfilment, participation in the labour market and social participation, but are also based upon a continuing scientific discourse (Roth 1971; Maurer 2006; Trautwein 2011) with references to Klippert's (1994) extended learning concept. What is more, individual preferences, satisfaction with the work situation and satisfaction with the trainings are also referred to within the survey. Next to common descriptive and bivariate analysis, the research on the effects of competencies is based on methods which are assigned to the area of robust statistics (Huber 1981). The methods of robust statistics consider the non-normally distributed response behavior which is to be anticipated in surveys on heterogeneous target groups. As a consequence, the data can be compared across sectors and highlight differences between participants. What is more, the findings of the study allow for conclusions regarding the anticipated effects of training for employees in different sectors and thus are of high relevance for employers.

Keywords: work-oriented basic adult education, competencies, evaluation, robust statistics

1 Introduction

For a long time, literacy and adult basic education were considered a topic for developing countries only. It took until the 1970s that literacy and adult basic education were discussed as a problem of industrialized countries.

Tröster and Schrader (2016) trace this back to the economic, technological and social change which took place in industrialized countries at that time and which led to higher unemployment rates among the low-qualified workers. Particularly workers with adult basic education deficits were both concerned of unemployment and due to their deficits had a harder time finding a new job in an economy which asked for higher and higher skill profiles. Since then, literacy and adult basic education are on the political agendas of developing and industrialized countries, but also of international organizations like UNESCO, OECD or the Worldbank.

Regarding the empirical side of the phenomenon, international organizations play an important role since they launched several studies and surveys which analyze the literacy and adult basic education levels in different countries. For example, in the mid 1990s OCED carried out the "International Adult Literacy Survey (IALS)". This survey focused on three domains: prose literacy, document literacy and quantitative literacy.

In total, more than 20 countries participated in all three surveys of IALS during the sample period from 1994 to 1998 (Maehler 2018, p. 4). IALS defined literacy "... as an advancing set of skills, knowledge, and strategies that individuals build on throughout their lives in various contexts and through interaction with their peers and with the larger communities in which they participate" (Kirsch 2001, S. 4) The results of the IALS "... demonstrated a strong plausible link between literacy and a country's economic potential" (Statistics Canada 2008)

As a following survey OECD presented the "Programme for the International Assessment of Adult Competencies (PIAAC)" in 2013. All in all, 25 countries participated in the first round of PIAAC in 2012 (Maehler 2018, p. 4). PIAAC analyzed the following domains: reading literacy, expertise in everyday mathematics, technology-based problem solving with 16 to 65-year-olds (Rammstedt, et al. 2013, p. 7). The findings underlined the importance of competencies for the participation in the job-market and in social life. What is more, a correlation between high basic skills and income was found.

Also, Worldbank engaged in empirically analyzing literacy and adult basic education. So far a measurement has been implemented in 13 countries (STEPSkills, 2014, p. 5). The domains or types of skills measured are cognitive skills, i.e. reading proficiency, reading, writing, numeracy; socio-emotional skills, i.e. personality traits, behavior, risk and time preferences; and job-relevant skills, i.e. qualifications required for job, assessment of skills used at work (STEPSkills, 2014, p. 4). The findings of the study show that solid foundational cognitive and socio-emotional skills are the basis for the development of job-relevant skills and also lead to higher wages.

As regards the German context, literacy and adult basic education attracted a lot of attention and have been on the political agenda for quite a while. Empirically, the so-called “leo. – Level-One Study” (Grotlüschen et al. 2012) found quite a remarkable resonance and has been a central point of reference within the discussion since then. As opposed to PIAAC or IALS, leo. – Level-One Study focuses on the lowest competence level, the so-called level one. The study analyzed the dimension of low reading and writing competencies amongst German-speaking adults between 18 and 64 in Germany. It showed that the reading and writing skills of 14,5 % of the adult population or 7,5 Million were on the Alpha levels 1–3. Alpha level 3 is defined as being able to read and write single sentences but failing to read even short paragraphs (Grotlüschen et al. 2019, p. 4). A follow up study published in 2019 showed that the number went down to 6,2 Million or 12,1 % (Grotlüschen et al. 2019, p. 5). The study also makes clear that 62,3 % of adults with low literacy are in occupation (Grotlüschen et al. 2019, p. 12). Consequently, work-oriented trainings are one of the areas to look at in order to increase literacy levels and adult basic education.

As of 2006 the Federal Ministry for Education and Research established several funding schemes for literacy and adult basic education projects, in 2016 it launched the “AlphaDekade”. This article is based on a project called “ABAG²” which is embedded in the currently running funding scheme. The project focuses on effects of work-oriented adult basic education trainings across sectors. Work-oriented adult basic education takes the working environment in general as a reference point and uses concrete challenges of the workplace to enhance the skills of the working staff. The developed skills, however, can be used beyond the actual workplace. Work-oriented adult basic education does not comprise a set curriculum but follows an open curriculum which is oriented towards the learners’ needs. Key qualifications also play an important role in defining the content of the trainings. As such literacy, numeracy, foreign language skills, digital literacy or financial literacy can be named as examples.

The research question of this paper is formulated as follows: What kind of effects of work-oriented basic adult education trainings can be found and do they vary across sectors?

As regards the structure of the article, the following part of the article will focus on the theoretical and contextual background. After that the methodological approach and the empirical design will be outlined. In a next step the findings of the study will be presented and discussed. A final part will highlight the contribution of this article to the scientific debate and show further research perspectives.

2 Theoretical and Contextual Background

The project ABAG² is a cooperative project between the “Lernende Region – Netzwerk Köln e. V.”, a network organization for adult learning, and the University of Cologne. It was funded from 2016 to 2019 by the Federal Ministry of Education and Research and was extended till 2020. The aim is to analyze the individual, structural

and professional modes of action of work-oriented basic adult education trainings. Thus, the research design comprises three pillars. Pillar one focuses on central actors within companies, pillar two on trainers of work-oriented basic adult education trainings and pillar three on participants of these trainings.

The first pillar focuses on the institutionalization of work-oriented basic adult education trainings in companies and on central actors in companies who are able to make pertinent decisions. As such human resource managers, executives or staff councilors come to the fore and are interviewed with respect to their motives and interests regarding work-oriented adult basic education. Subsequently, the second pillar concentrates on the trainers. They are also central actors within the mode of action of work-oriented adult basic education. The underlying research question refers to the competencies needed as a trainer as well as indicators of excellent trainings. Accordingly, the third pillar takes the participants to the centre stage and focuses on the effects of work-oriented adult basic education trainings as well as on the development of competence structures on side of the participants. This third part of the project is emphasized in the following. However, there are particular challenges when it comes to work-oriented basic adult education trainings and these challenges turned out to be threefold: the heterogeneity of companies, the heterogeneity of the trainings as regards their content and goals as well as the heterogeneity of the participants.

We met these challenges by building on an instrument which we developed in a different project and which refers to the notion of key competencies (Klinkhammer & Schemmann 2018). The discussion on key competencies is currently quite dynamic. The European Commission (2018) considers specific knowledge, skills and attitudes as key competencies for personal fulfilment, participation on the labour market and social participation. What is more, the European Commission is quite concrete in describing some of these key competencies in detail, e.g. communication in one's mother language and foreign languages as well, whereas the scientific community takes a more general approach.

Our approach refers to four acknowledged key competencies: Roth (1971), one of the central actors in the field of key competencies, stated that professional competence, social competence and self-competence are the basic competencies that would have to be learned for educational and work-related success. This approach refers mainly to White's (1959) psychological concept of competencies that seem to be necessary to interact effectively with the environment. Since then, all three key competencies have served as reference for further adaptations of the original concept. Nowadays experts differ in four dimensions of key competencies and their subdivision by professional, methodological, social and self-competence, as summarized, for example, by Maurer (2006):

- The professional competence addresses a broad range of knowledge, theories, attitudes and skills required in order to work in a specialized area or profession (Klippert 1994; Maurer 2006).
- Within the scientific discourse methods and methodological competence are referred to as tools for almost every educational and work-related success (Klippert 1994; Trautwein 2011). A correct and situation-specific application of these methods can be critical in most processes.
- The concept of social competence refers to the ability to act appropriately within social interactions and to get along with others (Roth 1971; Maurer 2006). Thus, social competence is related to interpersonal communication, the perception of others and the self-perception in respect to others.
- Self-competence can be described as someone's attitudes and abilities to reflect upon himself and his own strengths and weaknesses. It is sometimes referred to be the basis for developing other competencies (Maurer 2006).

One advantage of measuring key competencies is the clear intention of taking into account that each participant is unique and might have different evaluation outcomes. Furthermore, trainings can differ in respect of their content and consequently the effects on the key competencies of the participants within the trainings should differ. Therefore, the focussed trainings are rarely comparable figure by figure, but could be categorized according to their content and in respect to the key competencies achieved by participants. This, however, leads to the more detailed outline of the methodological approach and the empirical design.

3 Methodological approach, measuring points and participants

In the next section the methodological approach and the different methodical steps that were applied to analyze competencies of participants in work-oriented adult basic education trainings will be outlined.

Methodological approach

With regard to the heterogeneity of the target group, the evaluation tool bases upon the four previously mentioned competence dimensions of professional, methodological, social and self-competence (Roth 1971; Klippert 1994; Maurer 2006) that can be measured using a 5-point scale with a total of 16 easily understandable and target group-specific questions. Each competence dimension consists of up to six associated questions and has been confirmed via factor- as well as reliability-analysis (Klinkhammer & Schemmann 2018). Further insights into the questionnaire have been made available to the public by the authors (Schemmann & Klinkhammer 2017). This evaluation tool is mainly designed to provide insights into the underlying competence patterns of the participants – unlike common performance tests or scoring

instruments – and can be analyzed with respect to the industry sectors the work-oriented adult basic education trainings were offered to or with a specific focus on the trainings themselves. Evaluations on basis of a performance test or scoring instrument usually follow a classic pre-post-design and rely on significant differences in the arithmetic mean within the evaluation. Prerequisites for this are comparable participant numbers and structures, which are difficult to implement when it comes to work-oriented adult basic education trainings. Therefore, this evaluation tool determines target group-specific competence patterns – in respect to their often low number of participants – by applying robust statistical methods and using associated competence reference values for each industry sector and work-oriented adult basic education trainings. This approach is supposed to eliminate statistical outliers without interfering with the actual answering behavior (Yuen 1974).

Furthermore, this approach has proven to be beneficial, when the responses differ from a normal distribution (Keselmann et al. 2002; Kowalchuck 2006), whereby a longitudinal comparison of the arithmetic means can lead to a false-positive or false-negative significance. The responses of the participants in the project ABAG² are subject to these particularities. Keselmann and Kowalchuck therefore both argue for the use of trimmed values in order to compensate these particularities. In case of a skewed and above-average response behavior this automatically leads to a lower trimmed mean than the common arithmetic mean, which still acts as a reference value for the entire sector the work-oriented adult basic education trainings have been offered to. As a result, that is what pertinent simulations indicate, it is impossible for the trimmed means to exceed the reference values, without significant underlying effects on side of the work-oriented basic adult education trainings. By taking simulation- and randomization-based inferences into account, the findings presented below can be considered as robust.

Measuring points

Each work-oriented adult basic education training has been accompanied by a total of three measuring points. Measuring point T0 marks the beginning of a training, T1 its end and T2 the point in time three months after completion of the training. At measuring point T0, a total of 380 participants were enrolled in 54 different work-oriented adult basic education trainings. Subsequently, 304 participants from 50 different trainings gave feedback voluntarily and immediately after participation. In order to be able to measure the influence of work-oriented adult basic education trainings measuring point T1 is of specific relevance. Unfortunately, it was not possible to reach all participants at measuring point T2, since the employers seemed to have difficulties to establish a final measuring point outside the work-oriented adult basic education training. As a result, at T2 only 88 participants in 28 trainings gave feedback.

Participants

Regarding the participants it can be stated that more men (70 %) than women (30 %) attended the work-oriented basic adult education trainings. The average age of all participants is 36 years, while men with an average age of 34 years are younger than women with an average age of 42 years. Up to 60 % of all participants learned German as their main language during childhood and youth and 73 % of all participants have a general education qualification in the form of middle maturity or higher forms. Thus, the general education qualification of most participants would have been suitable for accessing the vocational training system. In addition, participants were asked about their satisfaction with working conditions: While men state satisfaction levels beyond the average values of all participants and in all aspects, the women are particularly concerned with the aspects of safety at the workplace, to have a say at the workplace, their workload as well as the pressure to perform and their payment. When asked about individual preferences, participants respond primarily to health, secondarily to job security, and tertiary to opportunities for education and further training.

4 Industry-specific evaluation and competence acquisition

Participating industry sectors

Considering responses from participants at various measuring points a total of 95 different work-oriented adult basic education trainings, which are distributed among 12 different companies within five different industry sectors, can be taken into account. The trainings within the evaluated companies are distributed across the following industry sectors: Many of the trainings have been offered for participants from the manufacturing sector (26 %), followed by the care sector (20 %) as well as the transportation sector (10 %). The personnel service is represented at 8 %. To a lesser extent, work-oriented basic adult education trainings have been offered for participants from the logistics sector (2 %).

Competence acquisition across different industry sectors

As stated before, the industry-specific evaluation of the competence acquisition through work-oriented adult basic education training participants is based on the so-called robust statistical methods, in which the competence reference value as an average value within an industry sector must be exceeded by the trimmed mean values of the underlying competence dimensions in order to achieve a demonstrable competence effect on side of the participants. Therefore, the effect sizes presented in this paper indicate a moderate positive effect when the trimmed mean values exceed the average values by ≤ 0.10 and a strong positive effect when the trimmed mean values exceed the average values by ≥ 0.11 . In a sector-specific evaluation that focuses the different industry sectors, it must be taken into account that sometimes different work-oriented adult basic education trainings have been realized within one company and that several companies can be assigned to one industry sector, so that the

effects related to competence acquisition are likely to be less clear in direct comparison with a program-specific evaluation. Gradually, the effect sizes in the five designated industry sectors are presented.

Manufacturing sector

Work-oriented adult basic education trainings offered within the manufacturing sector (see table 1) seem to affect the competencies of the participants at measuring point T1 when it comes to the social (trimmed mean of 4.39) and self-competence (trimmed mean of 4.40), which were above the competence reference value within this industry sector (mean of 4.23 at measuring points T1 and T2). However, three months after completion of the trainings and at measuring point T2, these effects shift to professional (trimmed mean of 4.36) and methodological competence (trimmed mean of 4.33). This could be attributed to the fact that participants during work-oriented basic adult education trainings in particular experience the course atmosphere as positively and get in touch with other people, so that they rated accordingly. However, back in working context, the topics and contents of the trainings as well as their clear professional and methodological connection to the work context of the participants could provoke that shift when it comes to competence acquisition.

Table 1: Competence effects within manufacturing sector

Competence effects straight after trainings	Competence effects 3 months after trainings
<input type="checkbox"/> Professional	<input checked="" type="checkbox"/> Professional
<input type="checkbox"/> Methodological	<input checked="" type="checkbox"/> Methodological
<input checked="" type="checkbox"/> Social	<input type="checkbox"/> Social
<input checked="" type="checkbox"/> Self	<input type="checkbox"/> Self

Care sector

For the care sector (see table 2), a competence reference value of 4.09 is available for measuring point T1, which increases to 4.19 at measuring point T2. Immediately after the completion of the work-oriented basic adult education trainings these reference values are exceeded and positive effects in the methodological (trimmed mean of 4.10), the social (trimmed mean of 4.16) and self-competence (trimmed mean of 4.20) can be recorded. Back in the working context of the participants, the social (trimmed average of 4.28) and the self-competence (trimmed mean of 4.49) of the participants seem to manifest themselves on a long-lasting level.

Table 2: Competence effects within the care sector

Competence effects straight after trainings	Competence effects 3 months after trainings
<input type="checkbox"/> Professional	<input type="checkbox"/> Professional
<input checked="" type="checkbox"/> Methodological	<input type="checkbox"/> Methodological
<input checked="" type="checkbox"/> Social	<input checked="" type="checkbox"/> Social
<input checked="" type="checkbox"/> Self	<input checked="" type="checkbox"/> Self

Transportation sector

In the transportation sector (see table 3), employers in particular expressed the need for communication skills when it comes to work-oriented contents and topics. Accordingly, several work-oriented adult basic education trainings were realized, which had a competence reference value of 4.05 when it comes to measuring point T1 and 4.19 when it comes to measuring point T2. Since the trainings aimed specifically at communication, positive effects can be observed at both measuring points, especially in the case of social (trimmed mean values of 4.13 and 4.30 respectively) and self-competence (trimmed mean values of 4.16 and 4.39 respectively). Thus, these effects seem to manifest themselves on a long-lasting level like in the other industry sectors presented above.

Table 3: Competence effects within transportation sector

Competence effects straight after trainings	Competence effects 3 months after trainings
<input type="checkbox"/> Professional	<input type="checkbox"/> Professional
<input type="checkbox"/> Methodological	<input type="checkbox"/> Methodological
<input checked="" type="checkbox"/> Social	<input checked="" type="checkbox"/> Social
<input checked="" type="checkbox"/> Self	<input checked="" type="checkbox"/> Self

Personnel service

Participants who attended a work-oriented adult basic education training via a personnel service provider (see table 4) seem to have significantly shorter competence reference values three months after completion of the work-oriented basic adult education training compared to their time of ending, so that 3.71 was measured at measuring point T2 compared to 4.05 at measuring point T1. This could be attributed to the fact that not all participants have arrived in a work context at survey time T2 and that those participants who have already arrived in the work context seem to be set more negative about their job satisfaction compared to the participants in other sectors. Immediately after completion of the trainings, there seem to be competence acquisitions in the professional (trimmed mean of 4.06), social (trimmed mean of 4.11) and self-competence (trimmed mean of 4.20). Compared to other sectors, the lowest trimmed mean values on social competence can thus be found in the personnel services. At baseline T2, these effects shift towards methodological (trimmed mean of 3.75) and self-competence (trimmed mean of 3.81), both measured at an intersectional low rate.

Table 4: Competence effects within personnel services

Competence effects straight after trainings	Competence effects 3 months after trainings
<input checked="" type="checkbox"/> Professional	<input type="checkbox"/> Professional
<input type="checkbox"/> Methodological	<input checked="" type="checkbox"/> Methodological
<input checked="" type="checkbox"/> Social	<input type="checkbox"/> Social
<input checked="" type="checkbox"/> Self	<input checked="" type="checkbox"/> Self

Logistics sector

Since the answers of more than three participants can only be used for the logistics sector (see table 5) at measuring point T1, there are no results presented for measuring point T2 due to data protection reasons. After completion of the work-oriented basic adult education trainings, a competence reference value of 4.59 could be determined, which is exceeded only in the field of self-competence (trimmed average of 4.83). This effect is in line with expectations, as the logistics sector has expressed the need for self-competence and the work-oriented adult basic education trainings were specifically designed to meet these needs.

Table 5: Competence effects within logistics sector

Competence effects straight after trainings	Competence effects 3 month after trainings
[] Professional	[-/-] Professional
[] Methodological	[-/-] Methodological
[] Social	[-/-] Social
[x] Self	[-/-] Self

5 Further insights and implications for employers

As previously mentioned, satisfaction with the work situation and satisfaction with trainings were also referred to within the survey and they have proven to be worth mentioning: For instance, participants with an increase in methodological competence seem to be more satisfied with the working atmosphere after completing the work-oriented basic adult education trainings. A positive correlative connection as well as a t-test confirm that connection, both significant at $p=.000$. Furthermore, participants with an increase in professional, methodological as well as self-competence seem to be more satisfied when it comes to the experienced workload, all effects have proven to be significant at the $p=.000$ level as well. This corresponds with the effect, that an increase in methodological, social and self-competence seems to have a significant impact on the pressure to perform. Participants seem to perceive the pressure to perform in their company as more pleasant, if they experience positive effects by the work-oriented basic adult education trainings, despite the fact, that the experienced workload as well as the pressure to perform did not change during the evaluation period. Overall, there are positive effects when it comes to the satisfaction of participants with their work situation. These effects seem to be especially strong, when the topics and contents of the work-oriented adult basic education trainings have been in accordance with the work of the participants.

The accordance of the topics and contents with the actual work situation of the participants led to better satisfaction levels when it comes to the trainings and trainers. In particular, a seamless integration into the work routine, as well as the proximity of the discussed contents to the workplace resulted in a good evaluation of the

work-oriented adult basic education trainings. Therefore, only satisfaction with the discussed contents seems to favor professional competence, methodological competence, social competence and self-competence alike. Contents considered to be off-topic by the participants led to lesser or no effects at all. Satisfaction with the trainers is also beneficial when it comes to methodological, social and self-competence. All correlative connections are .300 or above and have proven to be significant at the $p=.000$ level. The duration of the work-oriented adult basic education trainings did not have any significant effects at all, since different topics and contents seem to require different duration periods. They have been arranged by the trainers in agreement with the employers. These results seem to indicate, that a close consultation between these two stakeholders seems to improve the effects of work-oriented adult basic education trainings. Only then employers and employees both seem to benefit from the offered trainings.

6 Conclusion

This study as well as the presented research method provided first insights into the competence patterns of participants of work-oriented adult basic education trainings by focusing longitudinal effects. It contributes to the scientific debate, by being one of the few, if not the only longitudinal study, which allows for analysis of inter-personal differentiable competence patterns and their development over time. In order to do so, the underlying questionnaire and research method are capable of differentiating between the level of participants, the level of work-oriented adult basic education trainings as well as the level of sectors. Results on the level of sectors were presented within this paper. It is due to the correlative connection of the four key competencies, that the acquisition of competencies can be traced in detail.

As a first result, it can be very clearly stated that social as well as self-competence seem to profit from work-oriented adult basic education trainings in almost every case. This effect seems to expand to the professional as well as methodological competence, when the participants are back in their working routine. Subsequently, and as a second result, it has to be mentioned that some of these effects seem to depend strongly on whether the participants can apply the key competencies in their working context or not. This suggests a certain degree of specificity as prerequisite, when it comes to work-oriented adult basic education trainings. Furthermore, and this is a third result, it can be stated for the sector-specific evaluation that the work-oriented adult basic education trainings favor the competence acquisition of the participants across all sectors. Finally, this is a fourth result, the general increase of the reference values of the key competencies seems to come along with stronger correlations between almost all underlying items of the four key competencies over time. Participants who stated to feel more secure in communicating with others because of a communication related work-oriented adult basic education training also stated that they feel more secure in dealing with superiors. However, this correlation was

less established right after the work-oriented basic adult education training than three months afterwards, so the same for most of the other underlying items.

All in all, these results are covered by an increase of the competence reference values between measuring points T1 and T2 in almost every industry sector – despite the manufacturing sector and within personnel services. This can be attributed to the sensitivity of the questionnaire and research method, which both indicate a general increase in key competencies through work-oriented basic adult education trainings. This stands in line with the perspective, that each participant is unique and might have different evaluation outcomes in respect to the context the work-oriented adult basic education trainings were offered.

Since the questionnaire has proven to be functioning within different training contexts and its results are supported by the interviews with the trainers as well as the relevant actors within enterprises, it seems to be adaptable to more contexts as well. especially when it comes to work-oriented basic adult trainings with all the heterogeneity involved. Therefore, a Scientific Use File, the questionnaire and methodological framework of reference values as well as the application of robust statistics within the programming language R can be provided on request.

As regards further research perspectives, two aspects are to be highlighted. On the one hand further research is to be carried out in order to scrutinize the patterns that were presented in this paper as regards the different sectors. On the other hand, international-comparative research needs to be carried out in order to validate the findings presented in this article.

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