Using Paradata to Assess the Quality of Questionnaire Design in the Adult Education Survey

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Abstract

Statistics Norway (SSB) conducted a Eurostat financed Grants project related to the Adult Education Survey (AES) from 2021 to 2023. One of the project's two objectives was to improve the user experience to increase the data quality. To do this, we used several qualitative methods, such as user testing the survey questionnaire, as well as conducting focus groups and explorative interviews to map the respondent user journeys. These qualitative methods helped us to gain insight into potential challenges with the questionnaire flow and the questions themselves. Specifically, we identified problems with naming non-formal education and training activities that could affect the data quality and risk of breakoff for specific questions. Hence, we adjusted parts of the questionnaire flow and the questions before the data collection for the Norwegian AES 2022 started. Despite having two rounds of user testing, several focus groups and explorative interviews, challenges in the questionnaire persisted. Specifically, results from the AES 2022 indicated there were still problems with naming activities, and the nonresponse rate for these questions increased from 2016 to 2022.

As Statistics Norway has recently set up a system to make paradata easily accessible, this article will focus on how paradata, in addition to the qualitative methods mentioned, can contribute to further insight into presumed pain points in the questionnaire. Paradata is a helpful quantitative tool for analysing and identifying areas to improve the questionnaire, which in turn can contribute to better data quality. We use paradata from web responses in the Norwegian AES 2022 to analyse how the identified problems from the qualitative analyses manifested. The paradata indicators we use are error messages, answer changes, previous page actions, breakoff rates and the use of "Don't know" and "Rather not answer". We then combine our quantitative and qualitative findings to provide a holistic picture. Finally, we suggest better ways to structure the questionnaire to reduce nonresponse and the respondent burden, to improve the overall data quality in the statistics.

In sum, we want to illustrate how paradata can be used to assess if problems in a survey still persist or not, and how one can improve the survey. Thus, the main objective of the paper is to offer ideas on how paradata can help us to assess and improve the quality of questionnaire designs and its resulting statistics.

Keywords: social surveys, quality improvement, paradata

1. Introduction

Identifying problems and difficulties respondents may have in a questionnaire, and then adapting the questionnaire to reduce these problems, are core tasks for survey methodologists and project managers. Within the Total Survey Error (TSE) framework, reducing measurement error in the data collection stage is important to produce reliable data (Biemer et al., 2017, p. 188). In other words, well formulated questions and a user-friendly questionnaire design that minimises respondent burden are essential. Cognitive testing is a state-of-the-art method to uncover pain points in questionnaires and to understand how to improve them. However, paradata is also a useful tool for analysing respondent question-and-answer behaviour (Mcclain et al., 2018, p. 197). Paradata contains data about the process by which data is collected and has the advantage that it uncovers respondent's true behaviour and opens for analysing several respondents simultaneously, unlike cognitive testing which is limited to a few people.

In this paper, we show how paradata is helpful to use in combination with cognitive testing to identify problems in questionnaires, using the Norwegian Adult Education Survey (AES) as an example. Prior to the data collection for the AES, Statistics Norway conducted an EU-Grant project where the findings from user tests identified the section on non-formal education and training activities as a particularly challenging part of the questionnaire. This article will illustrate how the qualitative insights from user tests can be combined with quantitative insights from paradata analysis from the actual survey. These two data types can work in harmony to uncover pain points that contributes to measurement error and reduced data quality.

We first describe the AES questionnaire flow before we present the theoretical framework for how different paradata indicators can be used to shed light on measurement error. Secondly, we give a brief overview of how we use paradata to analyse respondent behaviour in relation to anticipated difficult parts of the survey. Then we present the results. We find support for several of the assumed pain points in the paradata as well. Finally, we suggest improvements and present limitations of the paper.

2. AES Questionnaire Flow

To begin with, we give an overview of the AES data collection and the questionnaire flow. The AES is developed through a European collaboration orchestrated by Eurostat and covers adult participation in education and training. Statistics Norway conducted the Norwegian AES in 2022 as a mixed-mode survey, using both computer-assisted telephone interviewing (CATI) and computer-assisted web interviewing (CAWI). Prior to this, Statistics Norway conducted a Grant project aimed at improving data quality in the survey through usability testing to gain insight into pain points in the survey (Keute et al., 2023). Findings from these qualitative

analyses revealed that the section non-formal education and training in the questionnaire was particularly difficult to answer for several respondents.

In this section, respondents are asked about participation in non-formal education and training activities during the last 12 months, and they must then provide further information about each activity. As illustrated in figure A.1 in the appendix, respondents are asked about four different types of learning activities and must state how many they have participated in, and then name the learning activities.

Cognitive tests conducted in the Grants project revealed that naming learning activities from the past 12 months was a difficult task for respondents. Respondents had trouble remembering the names, and often the activity did not have a specified name (Keute et al., 2023, p. 12). Simultaneously, naming was necessary for the questionnaire flow as the name of the activity would be used in follow-up questions for a maximum of five randomly chosen activities. We therefore had to keep the naming of the activities as part of the questionnaire. Moreover, respondents also found it difficult to differentiate between the four types of learning activities, suggesting issues with double reporting of activities.

To improve the questionnaire flow and help respondents in their assessment and calculation task, we included a question asking respondents to confirm that the total number of learning activities was correct. In addition, we made the answer options “Don’t know” and “Rather not answer” visible for questions about naming activities and programmed error messages to nudge respondents to give unique activity names.

3. Theoretical Framework

A benefit of using user testing in the Grants project is that helped us to gain insights into the respondent’s cognitive process of answering the questions (Tourangeau et al., 2000, p. 7f). Although user testing helps us to identify questions to modify and how, a limitation is that it is resource extensive and we are only able to test the questions on a small number of people who may not be representative of the population. Paradata on the other hand, with it being quantitative data, has the benefit of containing data from several respondents, and can help us understand how a representative sample of the population respond to the questionnaire. Paradata can be used to “detect problematic survey questions or other survey design features, or to relate response behaviour to data quality” (Heerwegh, 2003, p. 360). Paradata opens the possibility for investigating navigation through the questionnaire and elements related to potential measurement error, such as prevalence of error messages, breakoff rates, and changes of answers (Yan & Olson, 2013, p. 73, Callegaro, 2013, p. 268). We use the same paradata indicators as used by Alstad & Kilicdogan (2023) to analyse the anticipated pain points in the questionnaire design identified in user tests. The indicators are error messages,

answer changes, previous page clicks, breakoff rates and the use of “Don’t know” and “Rather not answer”.

Error messages can be programmed into a questionnaire to notify respondents when they for instance miss a question or enter an erroneous response. A high prevalence of error messages can therefore indicate problems with certain questions, for instance, if respondents try to move forward in the questionnaire without entering an answer it may be because they do not know what to answer. Moreover, error messages have been found to increase respondent frustration and breakoff (Christian et al., 2007, p. 114). In the AES, the questions where respondents must name the learning activities they participated in had programmed error messages that appeared if they did not enter an answer or if they wrote the same name for several activities. We therefore want to explore the share of error messages for these questions.

Moreover, we also want to explore the share of answer changes for naming activities. Answer changes can tell us something about the cognitive effort of answering (Höhne et al., 2017, p. 365). In addition, respondents may change their answer when they understand the logic of the questionnaire to reduce their response burden. Particularly, when there are several similar questions where a certain answer will lead to a series of follow-up questions, the respondent may be likely to change their answer to avoid or reduce the follow-up questions. This behaviour is unlikely to happen in cognitive interviews due to interviewer effects. We therefore want to explore whether respondents reduce the number of learning activities in AES, suggesting they have understood the logic of the questionnaire design and want to reduce their response burden.

Related to answer changes are the prevalence of previous page button clicks, which also can also be used as an indicator of the quality of certain questions and the questionnaire flow (Alstad & Kilicdogan, 2023, p. 4-5). Respondents may return to the previous page to change their answer if they learn they will receive several follow-up questions they perceive as tiresome to answer. On the other hand, a high share of previous page actions, could suggest that respondents understand that they answered a previous question incorrectly when presented with the following question. From the qualitative findings, we learned that some respondents found it difficult to distinguish between the four different types of learning activities. A large share of previous page clicks could therefore suggest this difficulty persists as respondents want to change their previous answer.

The burden of answering a question, the format of questions, and the number of questions, are causes linked to higher rates of breakoff (Peytchev, 2009, p. 74-75). A high breakoff rate may imply a difficult cognitive task which increases the probability of poor response quality (Höhne et al., 2017, p. 370). In the AES, questions where respondents must name each learning activity was in user tests perceived as cognitive demanding and as a tiresome task

given the repetitive nature of the design. We will therefore examine the breakoff rate for these questions.

Item nonresponse refers to when a question is left unanswered by a respondent which may occur when the respondent is unable to retrieve the information needed to answer the question (Peytchev, 2009, p. 75; Bosnjak & Tuten, 2001). A high prevalence of "Don't know" and "Rather not answer" types of answers in a questionnaire, is indicative of uncertainty, which in turn is related to potential measurement error in survey responses (Yan & Olson, 2013, p. 74). If respondents are faced with a difficult assessment or memory retrieval task or asked about sensitive topics prone to social desirability bias, item nonresponse may occur (de Leeuw et al., 2003, p. 158-160). In the AES, we opted for a design where "Don't know" and "Rather not answer" was visible for respondents to reduce the risk of breakoff, based on findings from user testing which indicated giving names was difficult. We will analyse whether questions about naming learning activities have a high share of item nonresponse.

In sum, findings from user tests revealed a high respondent burden related to challenges with naming activities and differentiating between the four types of learning activities. Although we made improvements to the questionnaire, it is not evident that all pain points were mitigated. Results from user tests will guide our paradata analysis as we will explore whether the identified pain points identified in user tests remained in the actual survey.

4. Methodology

We use an explorative approach to analyse paradata from the AES and confine our analysis to the section of non-formal education and training because findings from user tests indicated this part of the questionnaire was particularly challenging. We only examine web responses, despite the survey being mixed mode, because respondent behaviour in a web questionnaire may be different from behaviour when an interviewer is present (Biemer & Lyberg, 2003, p. 144; Kreuter et al., 2008). That we omit CATI responses will likely affect our results as certain demographic groups were offered the CATI mode before CAWI. 7 000 people were randomly selected to participate in the AES, and 3 513 of them responded. 2 793 people responded to the survey self-administered online, resulting in an 80 percent web share. 183 web questionnaires were partially answered. Both completed and partially completed questionnaires are included in our analysis.

We analyse the occurrence of error messages, previous page actions and answer changes, breakoff rates, and how frequently "Don't know" and "Rather not answer" is chosen for certain questions in the aforementioned section of the questionnaire.

We analyse the occurrence of error messages for naming activities. The error messages would arise if respondents attempted to move forward without entering an answer, or if they enter the same name for several activities. A text "You have stated the same name for different

learning activities" would then appear. See figure A.3 in the appendix. Error messages is calculated as the share of error messages per question answered.

A previous page action is registered when respondents click on the "Previous page" button, which can be found on the bottom of all pages in the survey. We calculate the share of previous page actions per page visited.

We define answer changes as changes where the respondent writes a value or clicks on an answer option but then changes it. Our analysis also includes the answer options "Don't know" and "Rather not answer". The changes are calculated based on changes made from the first to the last answer given by the respondent for a specific answer field.

Breakoff is defined as the last question respondents answered and is measured as the breakoff rate per question answered. We also analyse the share of respondents who has the non-formal education and training section as their last section in the questionnaire before dropping out. Lastly, we analyse the share of "Don't know" and "Rather not answer" per question answered.

5. Results

In this chapter, we present the results from our paradata analysis of the questions in the non-formal education and training section that user tests revealed was challenging for respondents.

Table 5.1: Share of error messages, answer changes, breakoff and "Don't know" and "Rather not answer" for each type of learning activity, naming one, two and three.

Question	Share of error messages	Share of answer changes	Breakoff rate	Share of 'Don't know' and 'Rather not answer'	Number of responses
Course name 1	6,4	9,1	0,3	26,9	968
Course name 2	4,9	8,5	0,0	33,5	550
Course name 3	3,6	8,7	0,4	38,0	276
Seminar name 1	7,5	6,7	0,4	36,7	1116
Seminar name 2	7,3	10,0	0,3	43,6	768
Seminar name 3	5,7	12,5	0,2	50,3	457
Job training name 1	6,2	6,1	0,2	39,8	963
Job training name 2	8,4	13,1	0,2	48,8	535
Job training name 3	3,6	12,7	0,2	51,3	308
Private lesson name 1	5,3	5,3	0,0	18,7	171
Private lesson name 2	36,9	17,9	0,0	31,0	84
Private lesson name 3	7,8	21,9	0,0	49,0	51

Table 5.1 illustrates the share of error messages, answer changes, breakoff and "Don't know" and "Rather not answer" for the questions where respondents are asked to name the learning activities. We have only included naming one, two and three learning activities even

though it was possible with five, because few reported they participated in more than three activities.

The high share of error messages suggests respondents have difficulties with naming activities, supporting findings from cognitive interviews prior to data collection. The share of error messages decreases with each naming for courses and seminars, indicating the messages might help respondents to understand they can choose “Don’t know” or need to specify unique names. However, the same trend is not true for job training and private lessons.

It is interesting to see the share of error messages in relation to breakoff rate, as error messages have been found to increase breakoff (Christian et al., 2007, p. 114). The non-formal education section is the section with the highest breakoff rate among all sections in the questionnaire. See table A.1 in the appendix. 198 people, or 5,3 percent of respondents had their last answered question within this section. There is a 1,4 percent breakoff rate for the question where respondents are asked to confirm the total number of learning activities they participated in. This question has the highest breakoff rate in the questionnaire. In sum, the breakoff rate is not as high for questions regarding naming activities as we expected but is high when respondents are asked to confirm the total number of learning activities. Nonetheless, the fact that the section in question has the highest breakoff rate among all sections indicates challenges.

Table 5.2: Share of previous page clicks and answer changes for questions about the number of activities.

Question	Share of previous page clicks	Share of answer changes	Share of reduced number[1]	Share of increased number[2]	Number of responses
Number of courses	10,8	5,3	76,9	23,1	1 013
Number of seminars	9,7	6,3	78.6	21,4	1 183
Number of job trainings	10,8	4,6	81,8	18,2	1 036
Number of private lessons	17,9	9,6	85,7	14,3	188
Control question about total number of activities	12,6	-	-	-	1 830
Correction page	18,5	-	-	-	195
Total			**79,6**	**20,4**	

Error messages and answer changes should be seen in relation to each other because when respondents receive error messages, it should also lead to answer changes. For most of the naming questions, the share of answer changes is higher than the share of error messages, underlining this. Table 5.2 illustrates the share of answer changes for questions about the number of activities. 80 percent of those who change their answer reduce the number

[1] The column “Share of reduced number” is based on numerical answer changes only.
[2] The column “Share of increased number” is based on numerical answer changes only.

of activities they have participated in. However, we do not know whether this is because they understood the number was incorrect upon being presented with the next type of activity, or because they understood the logic of the questionnaire and wanted to reduce their response burden. Nonetheless, the high share of people who decrease the number of activities tell us the cognitive effort is high, as also found in user tests.

Table 5.1 shows that the share of “Don’t know” and “Rather not answer” answers increases with a higher number of activities to be named. It should be mentioned that most people only participate in one activity within each of the four types. The increase might indicate that respondents name the activities they remember the best first, and that they become fatigued having to remember the name of several similar activities. That they are more likely to choose “Don’t know” and “Rather not answer”, suggests that data quality decreases with the amount of learning activities to be named. The share of “Don’t know” and “Rather not answer” answers also increases when respondents are faced with the next type of learning activity, as figures A.3 and A.4 in the appendix illustrates, except for private lessons.

If respondents chose “Don’t know” or “Rather not answer” instead of naming the activity, they would not receive follow-up questions about the activity, thus reducing the data quality about these activities. That the alternatives “Don’t know” and “Rather not answer” were visible for the questions about naming learning activities could explain the relatively high share of item nonresponse for these questions. Moreover, the section on non-formal education is the section in the questionnaire with the highest share of overall “Don’t know” and “Rather not answer” answers, with a 11,6 percent item nonresponse rate. See table A.1 in the appendix. The high rate of item nonresponse makes comparability of the AES between years more difficult and challenges the data quality (de Leeuw et al., 2003, p. 154).

The high share of previous page button clicks may mean that respondents recognise they answered a previous question incorrectly and want to return to the previous page to correct the answer. This underlines findings from user tests, namely that differentiating between different types of learning activities is difficult. Table 5.2 also shows that 12,6 percent of respondents returned to the previous page when asked to confirm that the total number of activities was correct. If respondents answered that the total number was incorrect, they could correct the numbers in the next question. See figures A.5 and A.6 in the appendix for question formulations. In other words, returning to previous pages was unnecessary as the respondents could have corrected their answer in the correction page. However, as table 5.2 shows, many respondents nevertheless returned to previous pages instead of correcting the number of activities in the table. This indicates that the question did not have the desired effect of simplifying the answering process. A possible explanation might be that respondents did not know they could correct the number in the following question, that tables are cumbersome or

that respondents just wanted to revisit the previous question formulation for clarification purposes.

6. Conclusions

In sum, the purpose of this paper has been to show how paradata can be used to assess the quality of a questionnaire design, using the AES as an example. Although the Grants project improved the questionnaire prior to data collection, our paradata analysis indicates that challenges remained. Some of the improvements we implemented were making “Don’t know” and “Rather not answer” visible for the questions on naming learning activities, programming error messages and asking respondents to confirm the total number of learning activities.

To summarise our findings, the paradata analysis shows there is a noticeably high share of error messages, indicating that there are still challenges with naming learning activities. The section on non-formal education and training is the section in the questionnaire with the highest breakoff rate, also indicating challenges. Similarly, there is high share of answer changes for naming activities, which in part may be correlated to the error messages respondents receive. Most people who change the number of activities reduce the number, indicating respondents correct double-reporting or want to reduce their response burden when understanding the logic of the questionnaire. The high share of previous page clicks for correcting the total number of activities suggests the control question did not have the desired effect of simplifying the answering process. Finally, the share of “Don’t know” and “Rather not answer” answers increase with a higher number of activities to be named, suggesting fatigue among respondents having to remember names. In sum, our paradata analysis implies a high response burden for the questions we have explored.

Even though item nonresponse was high, which hindered comparability for certain questions to previous AES rounds, from a survey methodologist viewpoint, we recommend keeping “Don’t know” and “Rather not answer” answer options visible to mitigate breakoff. Moreover, we recommend reducing the reference period from 12 to six months to lessen the response burden, as the high share of “Don’t know” and “Rather not answer” indicates the reference period is too long for respondents to remember the names of all activities. To avoid previous page clicks, answer changes and risk of double reporting number of activities, we also recommend user testing a questionnaire design where respondents receive questions about participation in all four types of activities on the same web page to make differentiating easier, instead of separate pages which was the case in the AES 2022. Error messages appear to have made respondents change their answer, and we advise keeping them as it has not affected breakoff for specific questions. Simultaneously, it would have been difficult for respondents to differentiate between named activities in follow-up questions if several activities had the same name, also justifying the need for such error messages. Finally, we recommend

seeing both qualitative and quantitative data in relation to each other because it provides us with a more holistic understanding and thus a better basis for analysis.

For future research, we suggest comparing item nonresponse between telephone interviews and web interviews to analyse mode-effects. A limitation with our analysis we would have liked to explore further, is whether those who participate in few activities answer differently than those who participate in many, because we assume the response burden increases with more activities reported. Moreover, because demographic groups were offered the CATI mode before the web mode, all data may not be representative of the population. Analysing such mode-effects is an interesting point of departure for further research.

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Appendix

Figure A.1: Questionnaire flow for the first part of the section non-formal education and training:

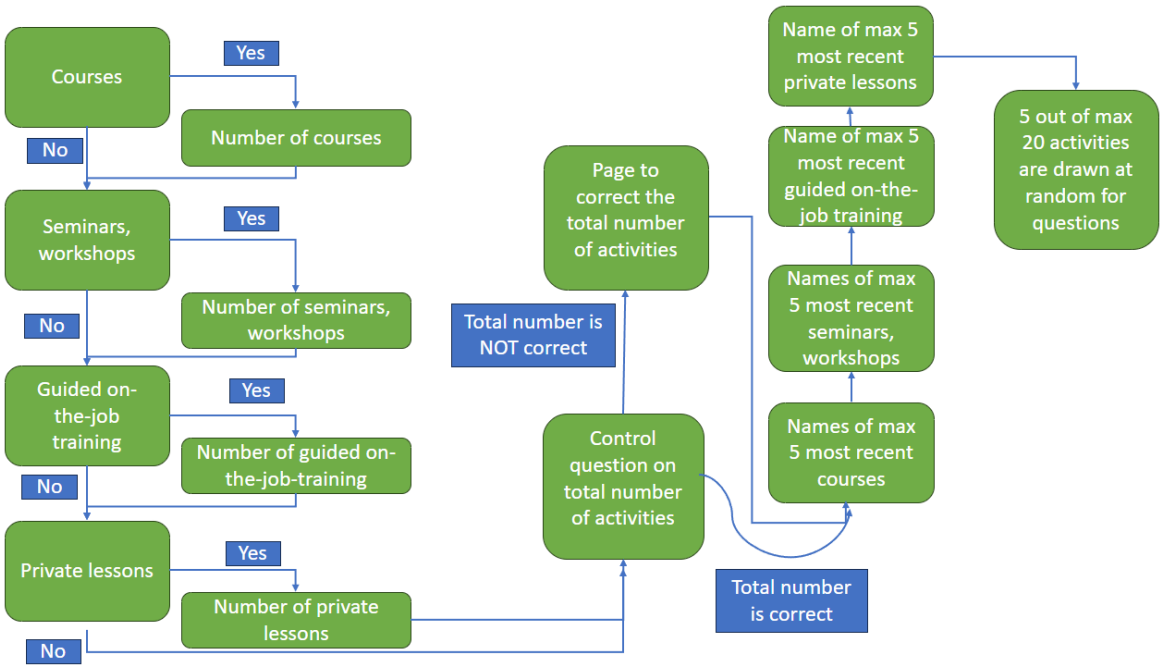

Figure A.2: Error message appearing when naming activities with identical names.

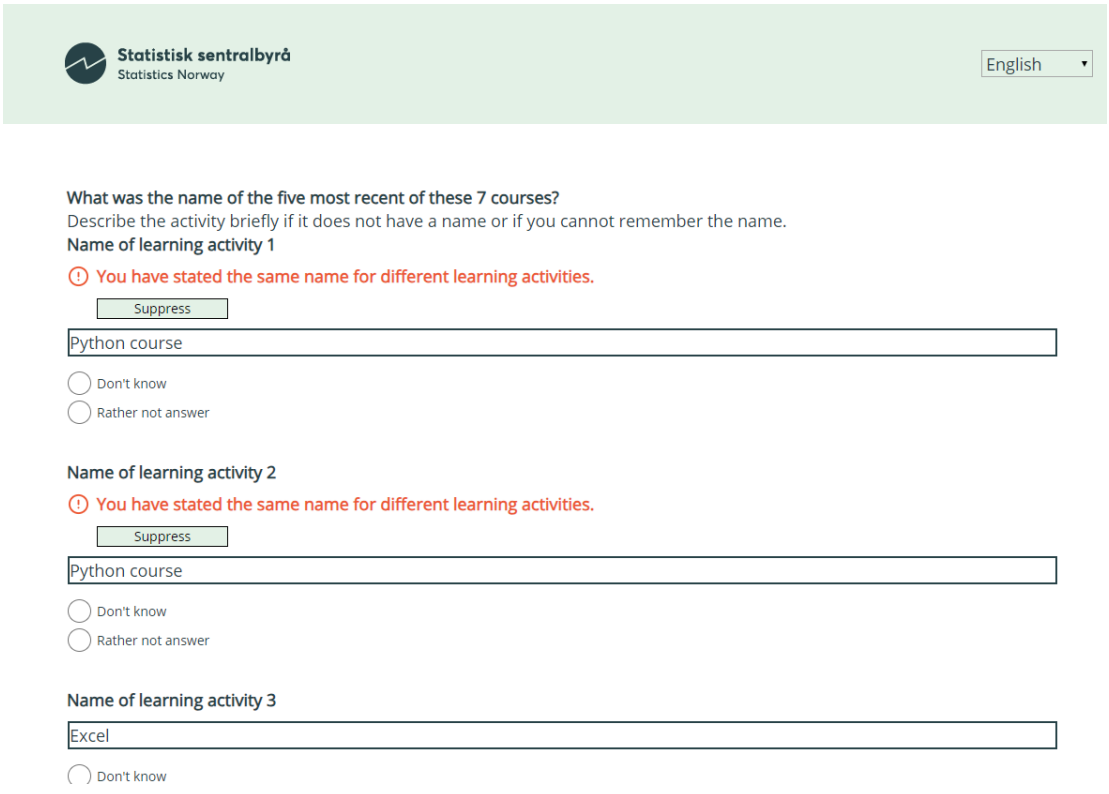

Figure A.3: Percentage of “Don’t know” and “Rather not answer” answers for naming 1 to 3.

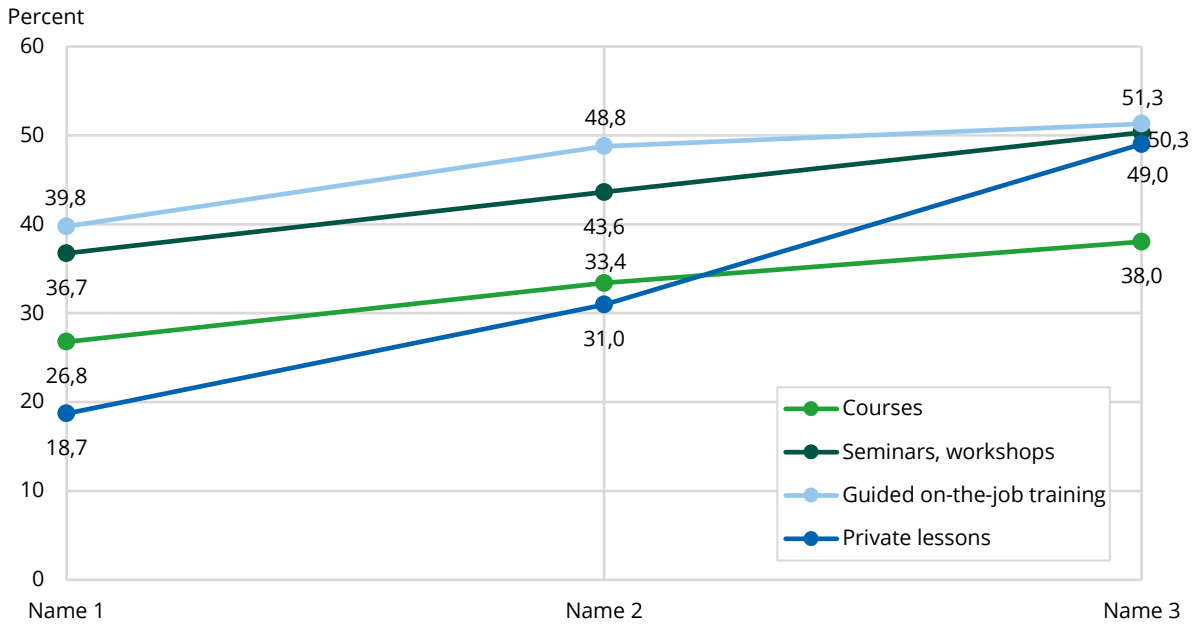

Figure A.4: Mean share of “Don’t know” and “Rather not answer” for all four types of learning activities.

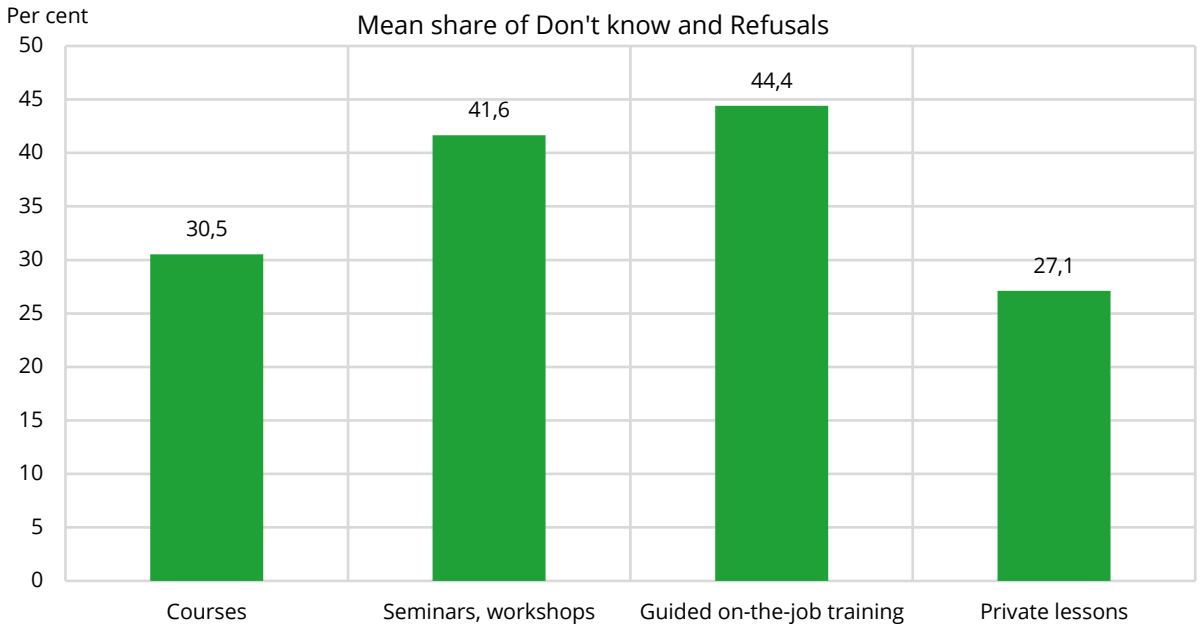

Figure A.5: Question where respondents are asked to confirm the total number of activities.

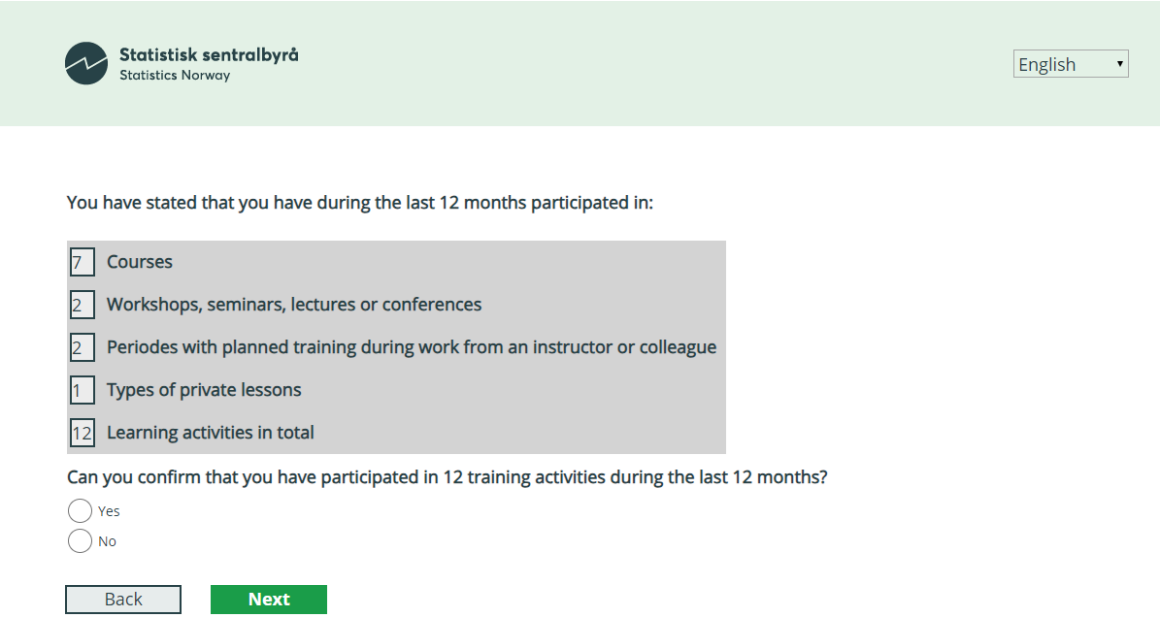

Figure A.6: Question where respondents are asked to correct the total number of activities.

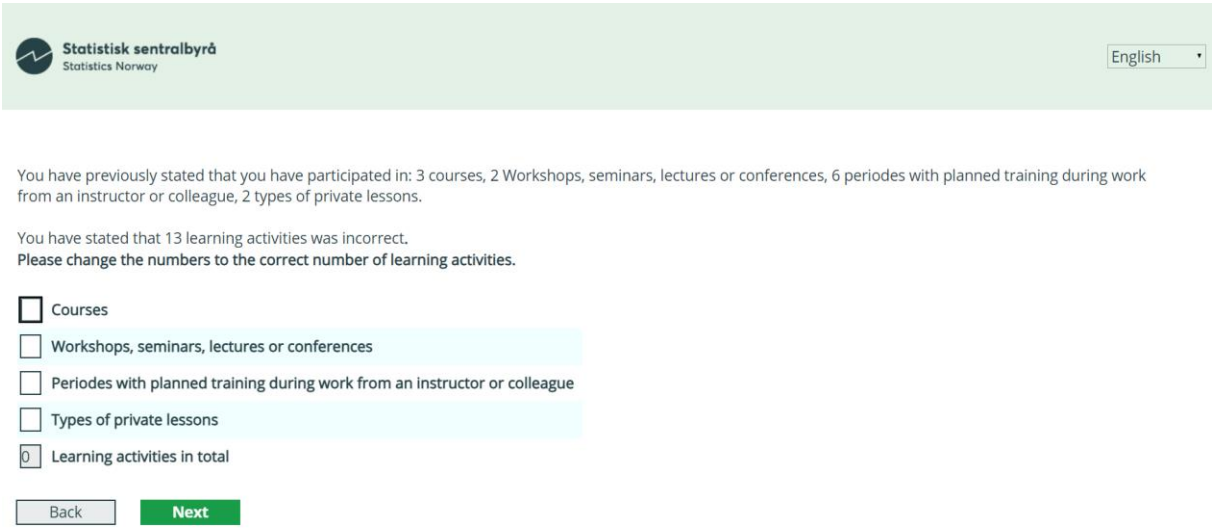

Table A.1: Share of error messages, previous page clicks, breakoff rates and “Don’t know” and “Rather not answer” for each section in the questionnaire.

Question	Breakoff rate	Share of 'Don’t know' and 'Rather not answer'	Number of respondents
Educational attainment	1,4	1,3	1174
Main activity status	1,5	3,1	3868
Not completed formal education	0,2	0,8	3815
Access to information about learning possibilities	0,8	2,2	3809
Participation in formal education	2,0	5,5	3781
Participation in non-formal education and training	5,3	11,6	3721
Obstacles to participation in education	1,5	5,5	3495
Informal learning	0,5	1,7	3520
Languages	1,0	3,5	3512
Parental information	0,2	1,0	1188
Health	0,2	1,0	3482

Table A.2: Share of previous page clicks for naming learning activities. Each type of activity was presented on the same page.

Question	Share of previous page clicks	Number of responses
Course names	9,3	956
Seminar names	9,8	1110
Job training names	7,4	942
Private lessons names	8,6	169