

Project Report

Quantitative evaluation of the DesignME course

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Background

With an increasing proportion of minority language employees in the health and care sector in Norway, some municipalities are experiencing challenges related to communication between managers and employees, between employees and users and between employees and relatives. Challenges and misunderstandings can have undesirable consequences for patient safety. With the aim of helping minority language speakers to gain greater opportunities, build a sense of belonging, security and identity in the workplace, SpeechDesigner (hereafter SD) and the Norwegian Multicultural Centre (hereafter Nomkus) have developed an innovative, effective and intensive course programme (4x3 hours), DesignME (hereafter DM), for minority language speakers, where individuals can strengthen their communication skills by improving their pronunciation and cultural understanding. The pilot project DM was tested at Kvinesdal housing and day centre and the technical department cleaning, Nov. 2018 - Oct. 2019. The results show that it became easier for participants to speak and understand, and to be understood by their colleagues. Misunderstandings and mistakes that often occur in the workplace were reduced. The course received good feedback from participants and others involved, and input that provides a basis for further development.

The purpose of this pilot project is to:

Assess the effect of the DM course on the course participants:

- How does the course contribute to minority language employees becoming better at understanding and making themselves understood?
- How does the course contribute to minority language employees better understanding the Norwegian work culture?

Methodology

To measure progress after the course, the same test is conducted with each participant before and after the course and 3 months after the course. This test consists of 2 parts: pronunciation and cultural understanding. The pronunciation test contains three parts: audio, reading and conversation. The test is recorded and analyzed using Voice Analyst. Pronunciation is assessed according to 4 categories: 1. sound, 2. intonation, 3. elasticity and 4. rhythm. The cultural understanding test is conducted through a questionnaire and a conversation.

Participants

In this pilot project, 16 participants completed the course. Due to absence and technical errors, 4 data sets were excluded from the analysis.

Therefore, there are 12 data sets that form the basis for the analyses that follow.

Of these 12 participants, 10 are women and 2 are men.

Nationality varies from Serbia (x2), Burma, Vietnam (x3), Thailand (x3), Ethiopia and Eritrea (x2).

Data analysis

The data analysis was carried out using the software programme SPSS (IBM, version 28.0.0.0.0). A repeated measure ANOVA was used. An overview of the mean and standard deviation is used. An eta-squared (η^2) was also used to determine the effect size, i.e. how much of the variation can be explained by the learning effect.

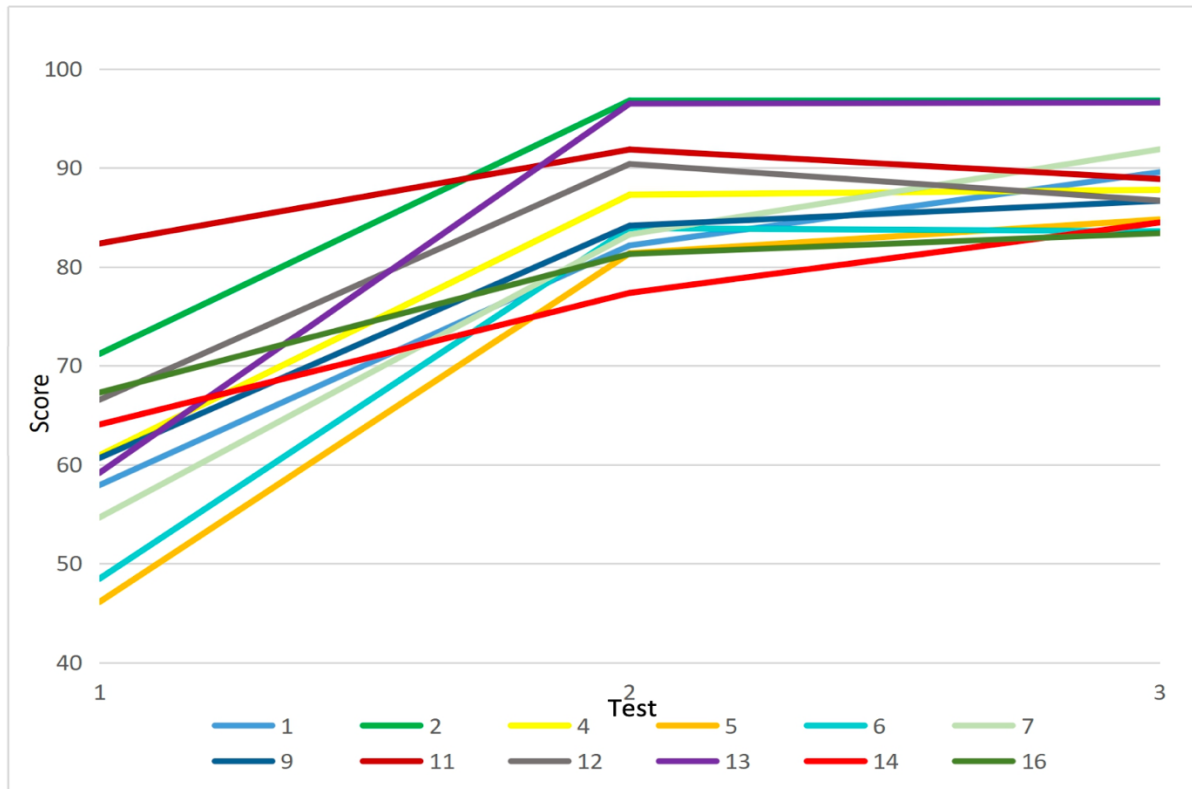
In addition, a test for sphericity (Mauchly's sphericity test) was conducted, which determines whether the variance of the differences between all 3 tests of each participant is the same. If sphericity is present, the F-value can be used with its associated significance level. However, if sphericity is not present, it is important to correct this by reducing the degrees of freedom. Depending on the value of the Qui-square, Greenhouse-Geisser correction or Huynh-Feldt correction must be used. If this is the case in the analysis, it is mentioned at the significance level.

The significance level is mentioned for all 3 tests together for each participant, but also for each pairing of tests, i.e. the significance between test 1 and test 2, between test 1 and test 3 and between test 2 and test 3.

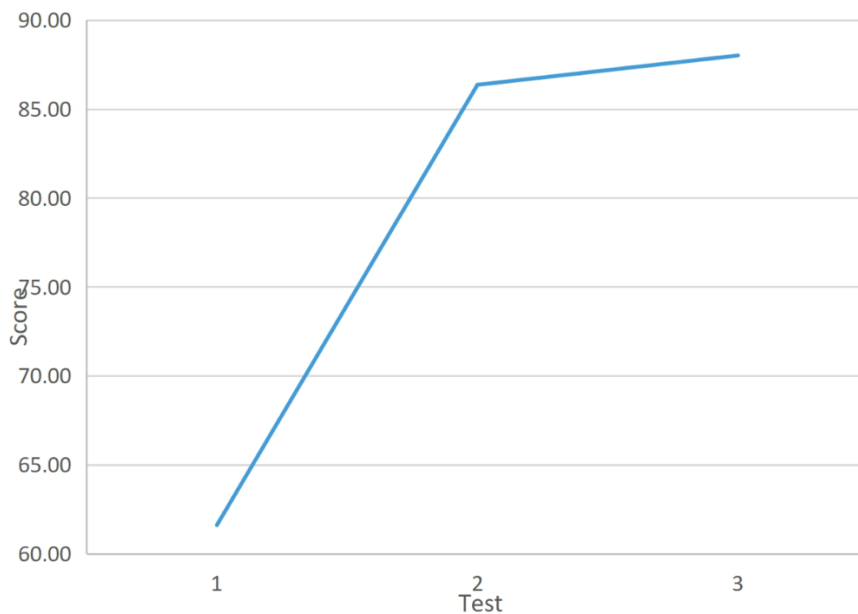
Finally, a line graph is shown to visualize the learning effect.

The Results

Graph 1 shows the learning effect of each individual participant who has completed test 1, test 2 and test 3. Graph 2 shows the learning effect of all participants on average.



Graph 1: The learning effect of each participant from test 1 to test 2 and test 3.



Graph 2. The learning effect of all participants on average.

There is a clear learning effect from test 1 to test 2. The progress from test 2 to test 3 is much smaller.

SpeechDesigner test

The following are the results of the SpeechDesigner test.

Sounds

Table 1 shows the mean, standard deviation and eta-squared (η^2) of the test section testing the sounds. The effect size is large at 81.7%.

Test	Mean	Standard Deviation	η^2
Sound SD 1	4.42	2.61	0.817
Sound SD 2	8.75	1.815	
Sound SD 3	9.5	1.382	

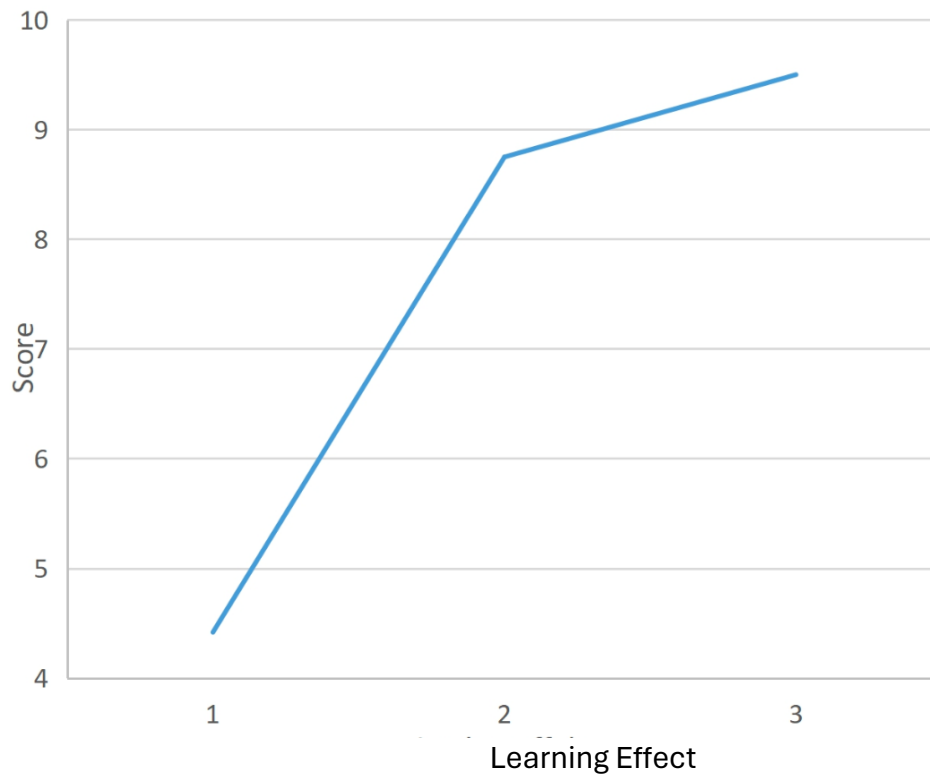
Table 1: Mean, standard deviation and eta-squared of the audio results (SD)

Table 2 shows the significance values of the audio results. There is a significant difference between all tests and between all combinations of the two tests.

Test	Significance Value
Test1/Test2/Test3	<0.001 (Greenhouse-Geisser)
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	0.036

Table 2: Significance values of the audio results (SD)

Graph 3 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 3: Learning effect of the audio results

Reading

Table 3 shows the mean, standard deviation and eta-squared (η^2) of the test section testing reading. The effect size is large at 88.6%.

Test	Mean	Standard Deviation	η^2
Reading SD 1	12.083	3.4101	0.886
Reading SD 2	21.375	2.0463	
Reading SD 3	21.042	1.2873	

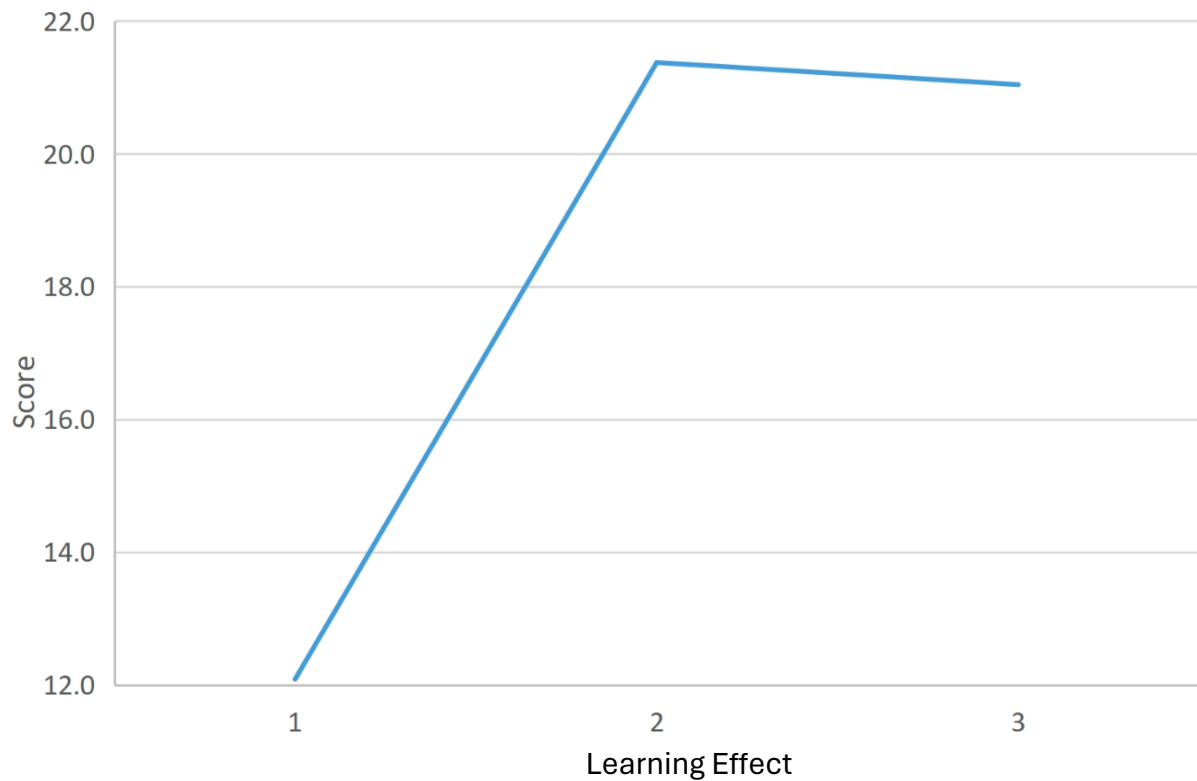
Table 3: Mean, standard deviation and eta-squared of the reading results (SD)

Table 4 shows the significance values of the reading results. There is a significant difference between all tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001 (Greenhouse-Geisser)
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	1.0

Table 4. Significance values of the reading results (SD)

Graph 4 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 4: The learning effect of the reading results

Conversation

Table 5 shows the mean, standard deviation and eta-squared (η^2) of the test section testing conversation. The effect size is large at 82.8%.

Test	Mean	Standard Deviation	η^2
Conversation SD 1	12.417	3.103	0.828
Conversation SD 2	20.167	2.5966	
Conversation SD 3	19.667	2.1356	

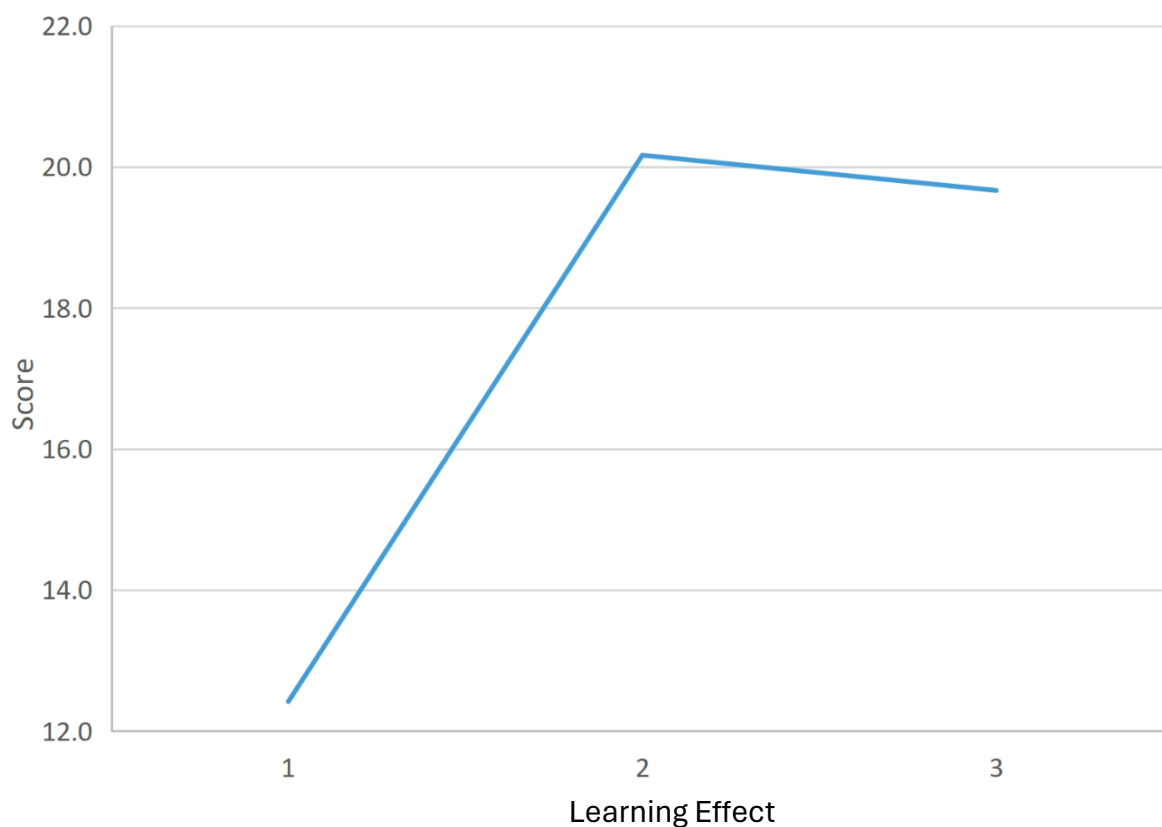
Table 5. Mean, standard deviation and eta-squared of the call results (SD)

Table 6 shows the significance values of the conversation results. There is a significant difference between all tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001 (Greenhouse-Geisser)
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	0.852

Table 6: Significance values of the call results (SD)

Graph 5 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 5: The learning effect of the dialogue results

Interim results - SpeechDesigner

Table 7 shows the mean, standard deviation and eta-squared (η^2) of the entire SpeechDesigner test, which includes audio, reading and conversation. The effect size is large at 88.9%.

Test	Mean	Standard Deviation	η^2
SpeechDesigner 1	47.3633	12.30913	0.889
SpeechDesigner 2	81.8908	8.09845	
SpeechDesigner 3	81.8558	8.69232	

Table 7. mean, standard deviation and eta-squared of the SpeechDesigner test

Table 8 shows the significance values of the SpeechDesigner test. There is a significant difference between all tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001 (Greenhouse-Geisser)
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	1.0

Table 8: Significance values of the SpeechDesigner test

Graph 6 shows the learning effect of test 1, test 2 and test 3 on average.

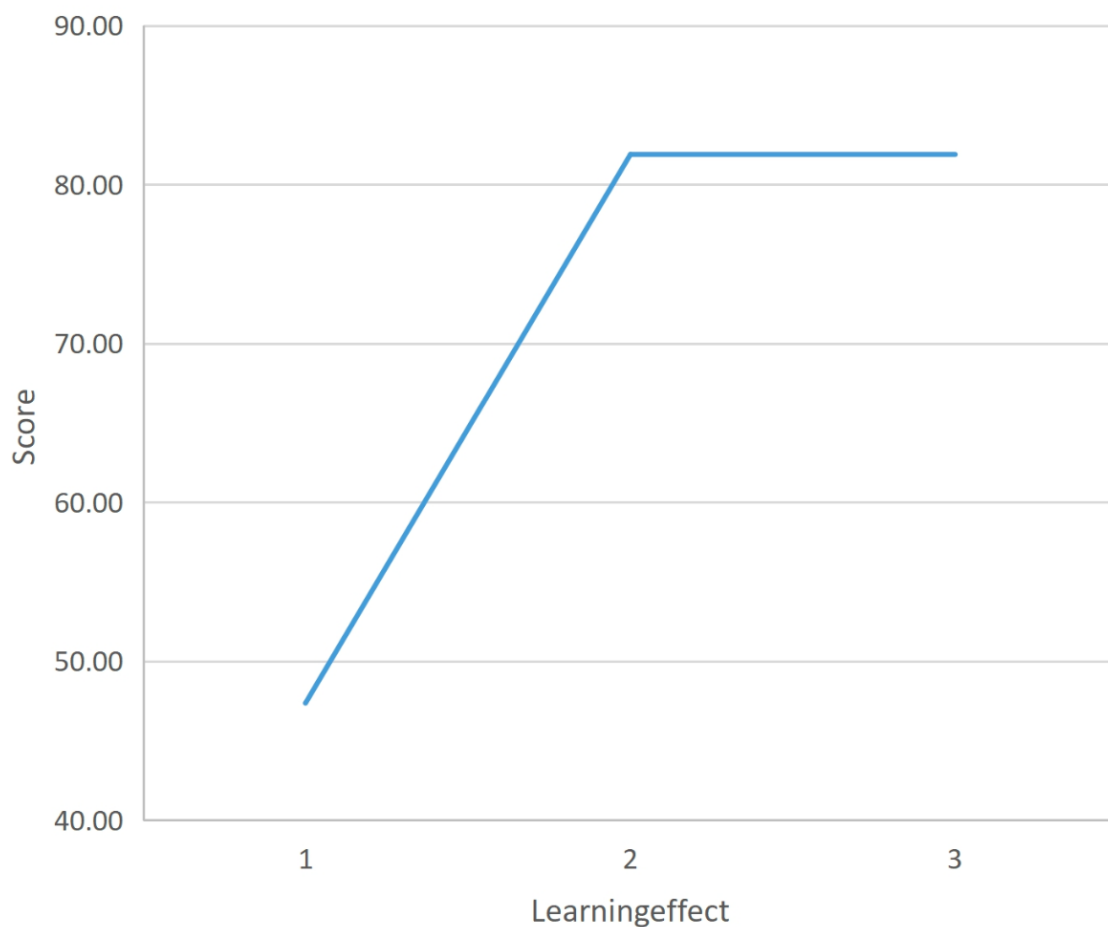


Figure 6: The learning effect of the SpeechDesigner test

Nomkus test

These are the following results for the Nomkus test.

Reading/Multiple Choice

Table 9 shows the mean, standard deviation and eta-squared (η^2) of the test section that tests cultural understanding by selecting the correct answers to a questionnaire. The effect size is small at 8.3%.

Test	Mean	Standard Deviation	η^2
Questionnaire 1	5.00	0.00	0.083
Questionnaire 2	5.00	0.00	
Questionnaire 3	4.92	0.289	

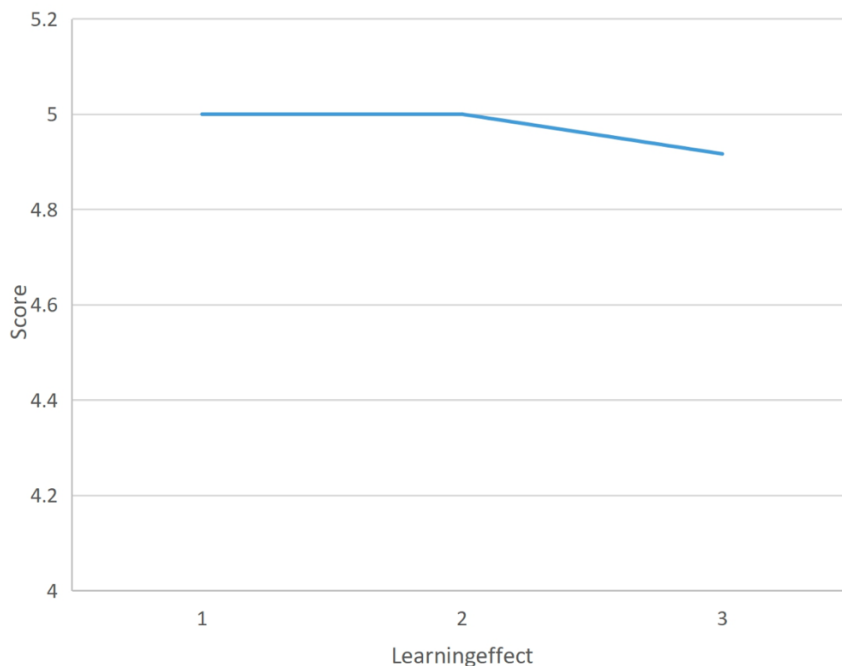
Table 9: Mean, standard deviation and eta-squared of the questionnaire results (Nomkus)

Table 10 shows the significance values of the results of the questionnaire. There is no significant difference between all tests and no significant difference between all combinations of the two tests.

Test	Significance Value
Test1/Test2/Test3	1.0
Test1-Test2	0.384
Test1-Test3	1.0
Test2-Test3	1.0

Table 10: Significance values of the questionnaire results (Nomkus)

Graph 7 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 7: The learning effect of the questionnaire results (Nomkus)

Conversation

Table 11 shows the mean, standard deviation and eta-squared (η^2) of the test section that tests cultural understanding by having a conversation. The effect size is large at 73.1%.

Test	Mean	Standard Deviation	η^2
Conversation 1	10.17	2.082	0.731
Conversation 2	13.17	1.528	
Conversation 3	13.92	1.311	

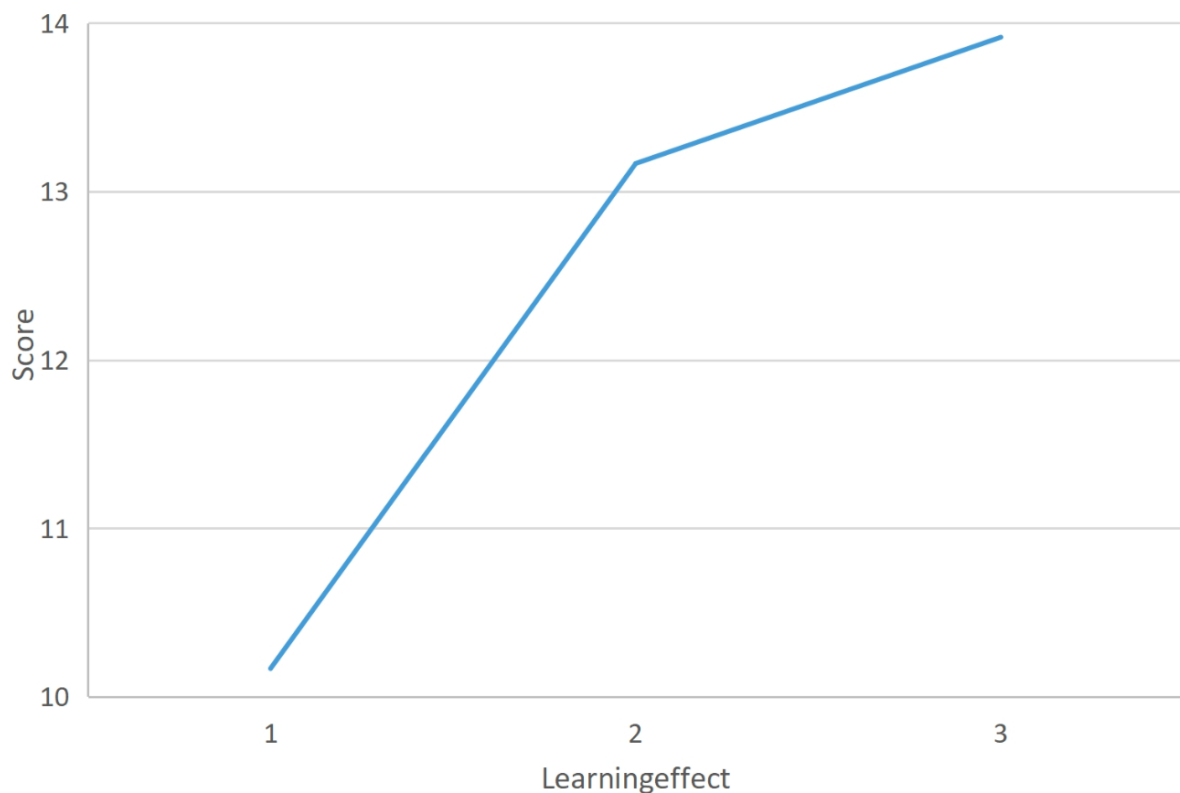
Table 11: Mean, standard deviation and eta-squared of the call results (Nomkus)

Table 12 shows the significance values of the conversation results. There is a significant difference between all the tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	0.285

Table 12: Significance values of the conversation results (Nomkus)

Graph 8 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 8: The learning effect of the dialogue results (Nomkus)

Interim results - Nomkus

Table 13 shows the mean, standard deviation and eta-squared (η^2) of the entire Nomkus test, which includes questionnaire and conversation. The effect size is large at 71.2%.

Test	Mean	Standard Deviation	η^2
Nomkus 1	75.833	10.4083	0.712
Nomkus 2	90.833	7.6376	
Nomkus 3	94.167	6.6856	

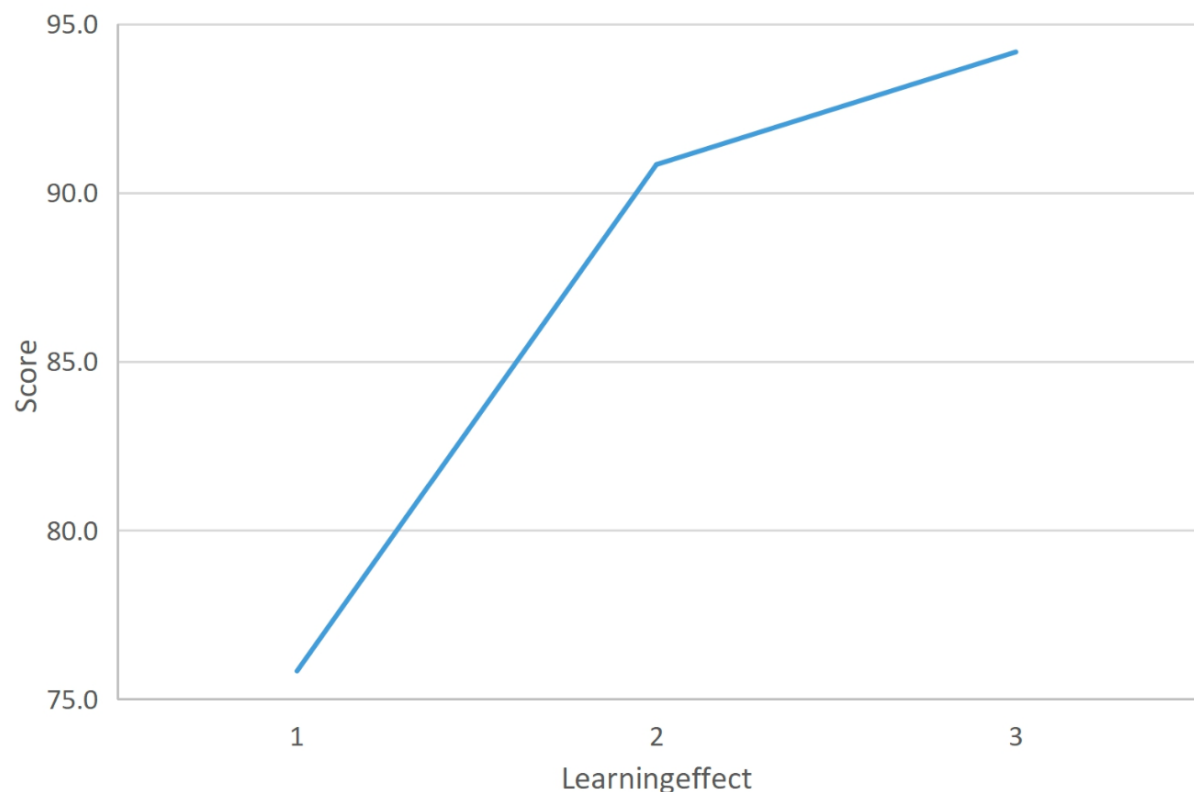
Table 13: Mean, standard deviation and eta-squared of the Nomkus test

Table 14 shows the significance values of the Nomkus test. There is a significant difference between all the tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	0.285

Table 14: Significance values of the Nomkus test

Graph 9 shows the learning effect of test 1, test 2 and test 3 on average.



Graph 9: The learning effect of the Nomkus test

Final results - SpeechDesigner and Nomkus

Table 15 shows the mean, standard deviation and eta-squared (η^2) of the entire DesignME test, both the SpeechDesigner and Nomkus sections. The effect size is large at 87.8%.

Test	Mean	Standard Deviation	η^2
DesignME 1	61.6	9.8509	0.878
DesignME 2	86.3608	6.24078	
DesignME 3	88.01	4.89573	

Table 15. mean, standard deviation and eta-squared of the full DesignME test

Table 16 shows the significance values of the entire DesignME test. There is a significant difference between all the tests and between test 1 and test 2 and between test 1 and test 3. There is no significant difference between test 2 and test 3.

Test	Significance Value
Test1/Test2/Test3	<0.001 (Greenhouse-Geisser)
Test1-Test2	<0.001
Test1-Test3	<0.001
Test2-Test3	0.660

Table 16: Significance values of the full DesignMe test

Graph 10 shows the learning effect of test 1, test 2 and test 3 on average.

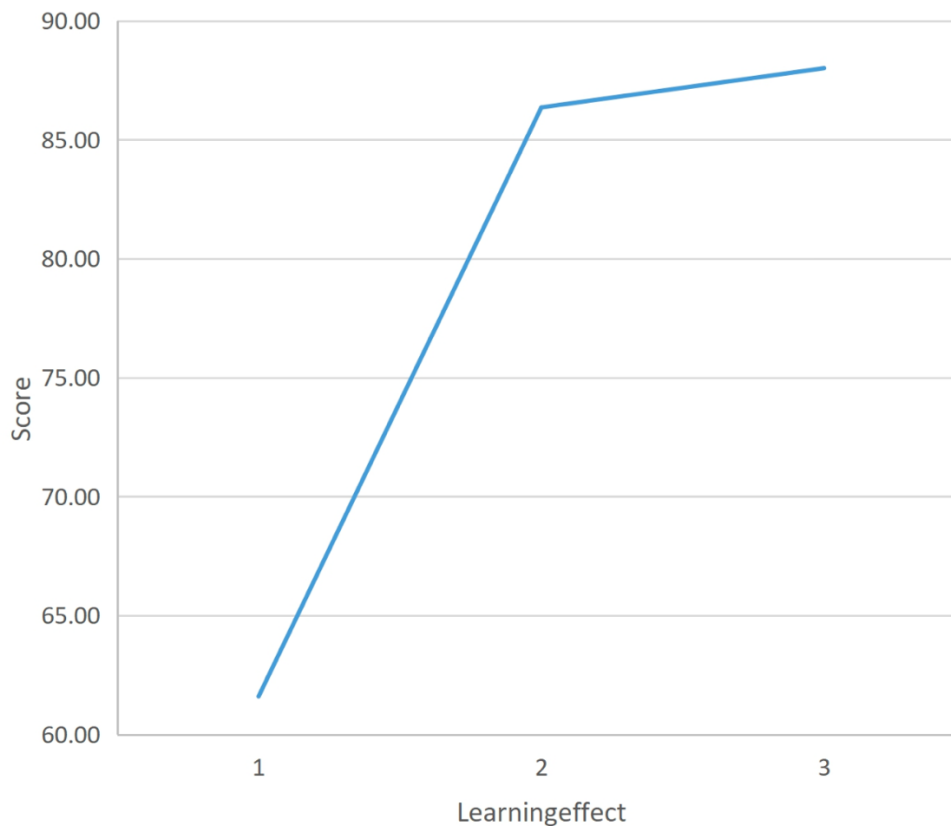


Figure 10. The learning effect of the DesignME test

Discussion

The results show a clear learning effect for participants.

This learning effect is demonstrated between test 1 and test 2 and between test 1 and test 3, but not between test 2 and test 3. This means that participants significantly improve their pronunciation and cultural understanding by completing the course. Pronunciation and cultural understanding competence does not increase after completing the course, but it does not decrease either. Therefore, we can say that the DesignME course provides a lasting improvement in pronunciation and cultural understanding.

The result also shows that the questionnaire is too simple for the participants. They choose 100% correct choices before completing the course. Therefore, this test does not say anything about the learning effect.

Finally, it is important to point out that this course lasts only 12 hours and shows a very good effect on pronunciation and cultural understanding. It is a simple intervention that every employer can offer to their minority language employees to improve communication at work with their colleagues, patients or customers.

Further research

An important aspect that was not tested here is the control group. Since it was only a small project, this control group was not part of the setup. This needs to be done in the next step to be able to say exactly how high the actual learning effect is and how much is the habituation effect.

The data has not been analyzed with regard to gender or nationality, due to the size of the project. It would have been interesting to be able to test whether there are differences between cultures or cultural circles with regard to the effect of the DesignME course.