Stand Tall and Raise your Voice! A Study on the Presentation Trainer

Stand Tall and Raise your Voice! A Study on the Presentation Trainer

Jan Schneider, Dirk Börner, Peter van Rosmalen and Marcus Specht

Welten Institute, Open University of the Netherlands, Heerlen, The Netherlands
{jan.schneider, dirk.boerner, peter.vanrosmalen, marcus.specht}@ou.nl

Abstract. The increasing accessibility of sensors has made it possible to create instructional tools able to present immediate feedback to their users. In order to study how this type of instruction can have an effect on learning, we created the *Presentation Trainer*: a prototype designed to help users to develop their non-verbal communication skills for public speaking. In this paper we present our work in progress on the *Presentation Trainer*, which includes two user studies. The studies showed that participants would gladly use the *Presentation Trainer* to prepare for oral presentations, and pointed out to some considerations required for the design of tools able to effectively support a complex learning task through immediate feedback.

Keywords: Immediate feedback interface, sensor-based learning support, public speaking, design-based research.

1 Introduction

Public speaking is a subject that has been studied for ages. The earliest identified vestiges about a systematical study of the art of public speaking comes from the ancient Greeks and are about 2500 years old [1]. Nowadays public speaking is required for almost any profession [2] and has an influence on many aspects of our daily life [3][1].

In a presentation, the speaker has the purpose to communicate her message to the audience. In order to do that successfully she has to be able to encode the message in the right format and deliver it effectively [3]. The nonverbal communication of the speaker plays an important role in the delivery of the message [4-6].

While currently it is possible to get access to different material such as seminars, courses, books, magazines, etc. that can teach us how to use our nonverbal communication effectively for public speaking, developing these skills requires practice and feedback. Having a human tutor to give us feedback is not always affordable or feasible, making it relevant to explore how technology can be used to solve this learning problem.

---

[1] http://www.nsaspeaker.org/
[2] https://www.processing.org/
[3] http://www.xbox.com/en-US/kinect

Sensors have shown to be a technology able to provide learners with feedback for many different learning applications [7], therefore we use them to develop the *Presentation Trainer*: a sensor-based prototype designed to support the development of nonverbal communication skills for public speaking.

In order to create an effective trainer for a complex task such as the development of nonverbal public speaking skills, we need to overcome technical challenges such as how to accurately track and interpret the nonverbal communication of the user. As well as educational challenges such as how to use the analyzed information to provide users with the kind of feedback that will help them with the improvement of their skills. Therefore, we decided to follow a design-based research methodology [8], which includes user tests at the end of each iteration providing us with guidance for the upcoming ones. The purpose of this paper is to present our findings from the two studies that have been conducted in our process of developing the *Presentation Trainer*.

2 Presentation Trainer Application

The *Presentation Trainer* is a tool designed to support learners in the development of their nonverbal communication skills for public speaking, by giving them feedback and instruction about the use of their voice and body language. The approach followed for its development is an iterative one, where each iteration is evaluated through user tests. The two versions of the *Presentation Trainer* presented in this article were implemented in Processing 2.1[2], an open source JAVA-based programming language. It has an OpenGL integration that allows fast graphic manipulation making it suitable for 2D and 3D programs. To track the learner's performance the Presentation Trainer makes use of the Kinect Sensor[3] and the computer integrated microphone.

2.1 Feedback Framework

Feedback is one of the most influential learning tools; learners' achievements both positive and negative vastly depend on it [9]. The means to present feedback vary greatly and several dimensions of feedback have been identified. One of these dimensions refers to the timing of feedback, which can be delayed or immediate [10]. While training for public speaking, immediate feedback has been proven to have a superior influence in the development of the nonverbal communication skills [11]. The channel of feedback is another feedback dimension that we considered to be relevant for our designs. While giving a presentation, the presenter is constantly receiving feedback from the audience through the visual channel, also the most important nonverbal communication aspect while presenting is giving eye contact to the audience [6]. Therefore the *Presentation Trainer* gives immediate feedback that is transmitted

[2] https://www.processing.org/
[3] http://www.xbox.com/en-US/kinect

through the visual channel, implicitly helping the user to learn how to receive feedback while giving a presentation.

2.2 Voice Analysis

To track the user's voice the *Presentation Trainer* uses the integrated microphone of the computer together with the Minim audio library[4]. By analyzing the volume input retrieved from the microphone it is possible to give instruction to the user regarding her voice volume and speaking cadence. Having a good voice volume modulation while public speaking is fundamental to transmit a clear message and keeping the audience attention [3]. Therefore the *Presentation Trainer* gives feedback to the user when the volume of her voice has been too loud, too low or has not been modulated for an extended period of time.

Pauses are referred as a stop while speaking. Mastering them is an important skill for public speaking [6]. When used correctly, pauses allow the audience to take a breathe when information is dense in content or emotion, create spaces for the audience to refocus on the given information, prepare the audience for the following subject, and can add dramatic emphasis during the presentation. To help with the improvement of this skill the *Presentation Trainer* gives feedback about the proper use of pauses, indicating the user when it is time to pause and start talking again. The default values used by the Presentation Trainer to give these indications have been obtained by analyzing the average speaking and pausing time of 15 different Ted Talks.[5]

2.3 Body Language Analysis

The *Presentation Trainer* uses the Microsoft Kinect sensor in conjunction with the OpenNI SDK[6] to track and analyze the body of the user. This fusion allows the creation of a skeleton representation of the user's body. With the use of this skeleton representation, the *Presentation Trainer* is able to analyze the user's body posture and movements in order to give feedback and instructions. While speaking to an audience it is important to project confidence, openness and attentiveness towards the audience. The body posture of the speaker is a tool to convey those qualities. Therefore it is recommended to stand up in an upright position facing the audience and with the hands inside of the acceptable box space; in front of the body without covering it, above the hips, and without the arms being completely extended [6]. We defined these rules in terms of the relative coordinates between the different tracked limbs of the user. Following these rules the Presentation Trainer is able to give feedback about the user's posture.

Hand gestures in public speaking enhance a speech in different ways such as: strengthening the audience's understanding of verbal messages, painting vivid pic-

[4] http://code.compartmental.net/tools/minim/
[5] https://www.ted.com/talks
[6] http://www.openni.org

tures in the listeners' minds, conveying the speaker's feelings and attitudes, dissipate nervous tension, enhance audience attentiveness and retention, etc. [12] The current version of the *Presentation Trainer* does not identify specific gestures; nevertheless it gives feedback to the user whenever she is not using any gesture for a certain amount of time. In order to identify whether the user has been gesturing or not, the Presentation Trainer calculates the amount of movement of the user's hands.

3 First Study

The purpose of this first study was to explore the users' acceptance of the *Presentation Trainer* and to identify its usability challenges as an immediate feedback tool for learning. This section includes a description of the first version of the *Presentation Trainer's* output interface, a description of the setup used for our first user tests, and a report of our findings.

3.1 Output Interface Version 1

The output interface that has been used for the first user tests of the *Presentation Trainer,* was designed as a dashboard, it contains three columns with a total of seven different feedback modules (Fig. 1).

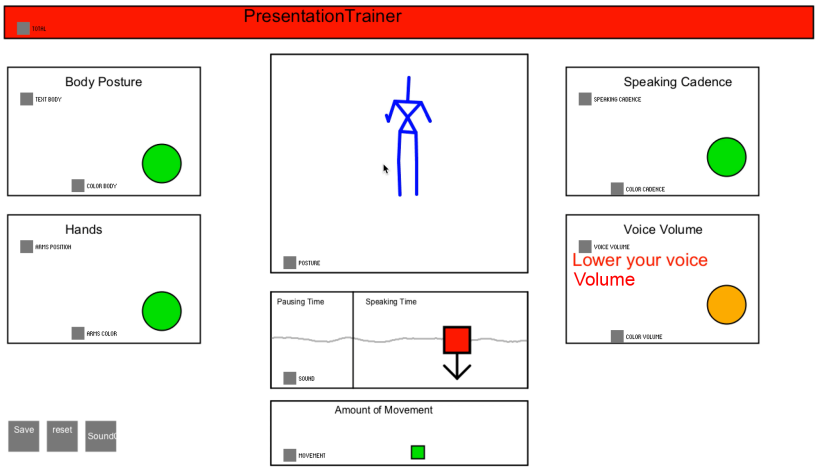

Fig. 1. Presentation Trainer interface showing that the user was speaking too loud.

Each of the feedback modules located on the columns at the left and the right side of the interface, provide feedback on only one aspect of the user's nonverbal communication. They present their feedback using a circle whose colors fade indicating whether the user is performing correctly or not. In the case when a mistake is detected, these modules show a written instruction on how to correct it. The modules on the left column give feedback about the user's body posture and hand movements; and the mod-

ules on the column give feedback about the user's voice volume and speaking cadence.

The center column contains three feedback modules that continuously reflect the user's actions, highlighting her mistakes. The module at the top shows a skeleton representation of the user, highlighting the limbs that are in an incorrect position. The module in the middle shows a graph mirroring the users voice. Finally the module at the bottom indicates the amount of hand movement performed by the user.

3.2 User Tests Setup

The test consisted on doing a trial short presentation while using the *Presentation Trainer* as a coach. The experimental setup sketched in Fig. 2 shows the participant standing at a distance of approximately 2.5 meters in front of the Microsoft Kinect and 2 computer screens. One of the screens displayed the *Presentation Trainer;* the other displayed the slides that had to be presented. We deliberately chose to use two screens for the setup, because we wanted to simulate a real presentation scenario, where the presenter has to pay attention to the presented slides and to the audience.

After the trial presentation, participants were asked to fill in a System Usability Scale (SUS)[13] questionnaire followed by an interview. During the interview we showed the user interface of the Presentation Trainer to the participants and asked them questions to find out which components of the interface were the most used, helpful and interesting. We also asked questions on their general opinion about the Presentation Trainer and what they would like to get from it in the future.

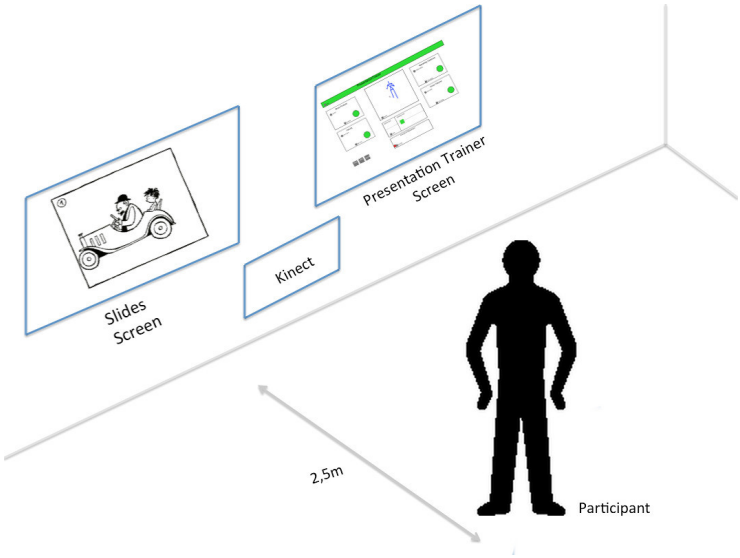

Fig. 2. The setup sketch of the first user test

3.3 Results of the First User Study

Six participants took part on the test we considered this amount reasonable since the recommended number of participants for user tests is five [14]. We had three female and three male participants, whose ages ranged from 24 to 45 years old. The working experience of all of them is in the field of learning or computer sciences. Moreover, as part of their work, they have to perform public presentations a couple of times a year. In a scale from 0 to 100 where 100 represents the best value, the average scores for the SUS were: 67.5 for SUS, 77.1 for learnability, and 65.1 for usability [15].

All participants concluded that the most observed modules where the ones located in the center column paying a special attention to the one showing the Skeleton. The colored circles were observed but participants did not know how to change their behavior based on them. The users did not observe the displayed texts with instructions. Some participants suggested using icons instead of the circles to make the feedback more explicit.

Participants remarked about the overload of attention required to give a presentation and be aware of all the feedback at the same time. Therefore it was suggested to use a learning strategy focusing on giving feedback only about on one aspect of the trained skills at the time.

3.4 Evaluation of First Results

Participants in the user tests show great enthusiasm towards using a tool such as the Presentation *Trainer* to practice for their future presentations. The observations executed during the user tests showed that participants did not always adapt their behavior according to the feedback presented by the tool. We attribute this lack of responsiveness mainly to the amount of cognitive load required to give a presentation, which constrains the amount of attention that can be paid to the tool. Hence, we can conclude that an immediate feedback interface for learning needs to be carefully designed, in order for it to be effective.

4 Second Study

For this study we created a second version of the *Presentation Trainer,* carefully redesigning it according to the challenges exposed by our first evaluation. In this second study we conducted again some user tests exploring the impressions, interactions and challenges of the second version of the *Presentation Trainer*. This section describes the approach used to improve our prototype, including the description and results of our second user study.

4.1 Tackling the complexity

Our first study showed that the amount of attention that a learner can pay to feedback while giving a trial presentation is quite constrained. To tackle this problem we decid-

ed to follow two strategies. The first strategy was to make the task of training for a presentation simpler for the user by the implementation of an instructional design model on the *Presentation Trainer* that deals with the difficulty of learning complex tasks. The second strategy deals with the improvement of the interface so that users find it easier to act on its feedback.

Instructional Design for Complex Learning

Since developing nonverbal public speaking skills has shown to be a complex learning task, we decided to start implementing the four-component instructional design (4C-ID) model [16] in the design of the *Presentation Trainer*. In order to develop complex skills, instructional design models usually divide the complex skill, into sub-skills and teach these sub-skills separately. The 4C-ID also encourages a holistic approach with realistic, complete tasks so learners can understand the relevance of these sub-skills in the whole task [17].

To start with the implementation of the 4C-ID model, for this version of the trainer we created two modes:

- The *Freestyle Mode* with the purpose to allow learners to develop integrated knowledge while practicing a real life task, which is giving a presentation.
- The *Exercise Mode* for sub-skills practice.

Freestyle Mode

This mode has the purpose to let users practice the real life task (giving a presentation) while receiving feedback and instruction from the *Presentation Trainer*. It has the same functionality as the previous version of the tool, by standing in front of the Microsoft Kinect and speaking, the user will start to receive immediate feedback and instruction about her nonverbal communication. We called it *Freestyle Mode* because in this mode users are not restricted to perform specific tasks.

Our previous study showed us that the complexity of the previous version of the *Presentation Trainer* should be reduced in order for users to assimilate its feedback. Before making drastic changes on the interface, for this study we wanted to explore whether a nicely and clearly designed dashboard interface (Fig. 3) is practical for this type of learning scenarios.

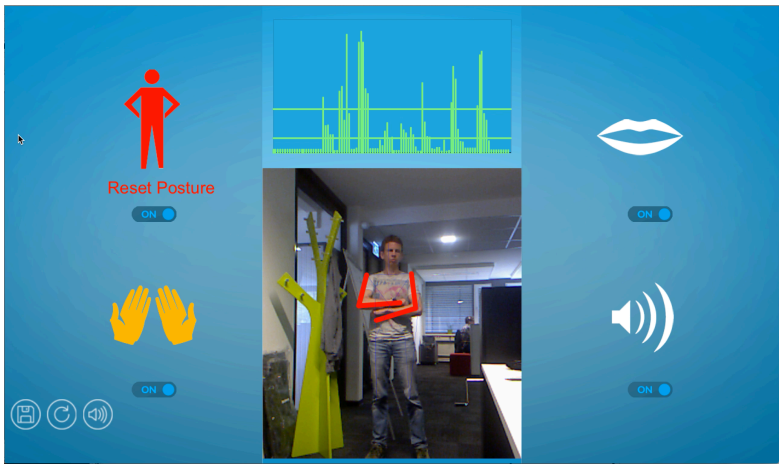

Fig. 3. Freestyle Mode Interface

To improve on the interface modules for Body Posture and Hands were merged into one module responsible to give instruction about the user's posture, including the posture of the hands and the body. In order to reduce the amount of possible instructions that the user can get about her posture, such as: uncross your arms, straighten up, look forward, do not hide your left hand behind your body, etc.; we decided to let the system tell the user to *Reset Posture*. The *Reset Posture* is a posture used by many public speakers, where they stand straight, facing the audience, with their legs uncrossed, their hands in front of their body, above their hips, and letting the fingers of the right hand touch the fingers of the left one (Fig. 4).

For immediate feedback the use of keywords have shown to be more effective than the use ad hoc explanations [18] therefore we shortened the text instructions from the feedback modules to maximum two word phrases such as: Reset Posture, Move More, Pause, Speak, Raise Volume, Lower Volume, and Modulate Volume.

In the first version the users commented that they noticed the color changes in the circles but did not understand how to respond. Additionally they suggested the use of icons instead of circles. Therefore this new version substituted the circles with icons fading their color from white when everything is correct to red when the user is making a mistake on the corresponding aspect of her nonverbal communication.

Additional changes in the interface deal with the skeleton representation, which changed into an enhanced mirrored image of the user. This image highlights user's limbs that are in a wrong position. Also the *Voice Feedback* module changed into a voice histogram, allowing the user to have an overview about the volume of her voice and how much has been talking.

Fig. 4. Examples of influential speakers standing in the Reset Posture

Exercise Mode

To implement the sub-skills practice defined in the 4C-ID model we created the exercise mode for the *Presentation Trainer*. This mode fractionates the task of developing nonverbal public speaking skills into different exercises or learning tasks. Each exercise is designed to train the user in a specific sub-skill of her nonverbal communication. Each exercise provides the user with information that highlights its relevance, instructions explaining the steps that the user is supposed to follow at the precise moment and feedback about her current performance (Fig. 5).

The exercises developed so far are: *Reset Posture*, *Voice Volume, Hands Gesticulation*, *Pause Control*, *Leaning in while speaking soft*, and *Questions and Answers* section. The *Reset Posture* exercise should get the user acquainted with the *Reset Posture*, a posture that is commonly used by well-trained presenters that allows them to be perceived open and attentive towards the audience. During this exercise the user is asked to go back to the *Reset Posture* after speaking for a few moments.

The *Voice Volume* exercise intends to make the user aware of the importance of modulating her voice volume while public speaking. It asks the user to speak using different voice volumes for a predefined amount of time.

The *Hand Gesticulation* exercise aims at training the use of hand gestures that are inside of the acceptable box space, while teaching the importance of using these types of gestures. In these exercise the image mirror of the user is shown in the screen, and the user is asked to reach certain virtual targets with their hands while speaking, helping her to automate the use of hand gestures while doing a presentation.

The *Pause Control* exercise has the purpose to teach and train users about the proper way to use pauses while public speaking. In this exercise the user is instructed to speak for some seconds and then make a pause that is at least 2 seconds long, before instructing her to start speaking again.

In the previous exercises the purpose was to either train the body language or the voice. In the *leaning in while speaking soft* exercise we explore the combination of

training both aspects at the same time. The *technique of leaning in and speaking soft* can be used in public speaking to help you to connect at a personal level with the audience while sharing some secrets or personal opinions [3]. So this exercises instructs the user to lean in and speak at a low voice volume for some seconds. After performing the exercise correctly the *Presentation Trainer* instructs the user to return to the *Reset Posture* in order to restart the exercise.

The purpose of the *Questions* exercise is to teach users to keep composure, while waiting for questions asked by an audience and answering them. During this exercise the user has to stand in the *Reset Posture* waiting for the *Presentation Trainer* to ask a question. The questions asked by the *Presentation Trainer* are related to the already trained nonverbal communication practices for public speaking. An example question is: "What are the benefits of pauses while public speaking?" Once the user answers the question, the *Presentation Trainer* instructs the user to stay quietly in the *Reset Posture* while waiting for the next question. The Presentation Trainer does not assess the answer to the questions; it only assesses the nonverbal communication of the user while waiting for the questions and answering them.

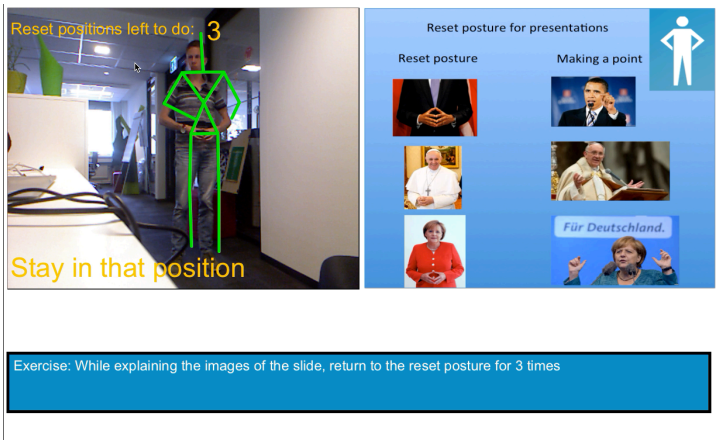

Fig. 5. Interface of Reset Posture exercise. Top Left: Enhanced Mirror. Top Right: Sample slide to use for the exercise. Bottom: Exercise instruction.

4.2 Second Study User Tests Setup

Prior to the test participants were asked to create six slides of a short presentation based on a template that was proportionated to them beforehand. The template includes topics such as the participant's origin, profession, personal hobbies and favorite movies.

Upon the arrival to the test, the participant was asked to sign up a form of consent to confirm the agreement that the recordings done during the test were going to be used only for academic purposes. After that we gave each participant a briefing about the purpose of the *Presentation Trainer* and explained the tasks to be done during the test.

Each user test consists of two phases. On the first phase the participant had a session using the *Exercise Mode* of the *Presentation Trainer.* In this session the participant followed the instructions provided by the Presentation Trainer, that guided him/her through the six different exercises: *Reset Posture, Voice Volume ,Hand Gesticulation, Pause Control*, *Leaning in while speaking soft*, and *Questions.* In order to move from one exercise to the next the participant had to perform the exercise correctly three times. The experimental setup for this phase consisted on the participant standing at approximately 2.5m in front of the Microsoft Kinect sensor and a 27-inch display displaying the *Presentation Trainer* interface. Once completing all the exercises, the participant was asked to start with the second phase of the test. For this second phase, the participant stood 2.5m in front of the Microsoft Kinect sensor, a 27-inch display showing the *Presentation Trainer* interface on *Freestyle Mode,* and another screen showing the slides of the presentation (figure 2). During this phase of the test, the participant was asked to give a trial presentation of the prepared slides, while paying attention to the feedback from the *Presentation Trainer*.

After completing the two phases of the test, the participant was asked to fill in a SUS questionnaire followed by an interview. During the interview the examiner asked about:

- Personal impressions of the *Presentation Trainer.*
- Opinions about the *Exercise Mode*.
- The added value of the Presentation Trainer in contrast of preparing for a presentation in front of a mirror without any tool giving feedback.
- Additional comments and suggestions.

The tests and the interviews were recorded in order to make a proper analysis of the results.

4.3 Results of the Second Study

To make this study comparable with the previous one, we decided to recruit participants from the same age and background as in the first user test, and who never used the Presentation Trainer before. The amount of participants for these tests was five, three females, and two males. Once again the age of the participants ranged from 24 to 45 years old, they all worked also in the field of learning or computer sciences, and have to give oral presentations a couple of times a year. In a scale from 0 to 100 where 100 represents the best value, the results of the SUS questionnaire gave the Presentation Trainer an average of 57.0 in the SUS, 59.4 in usability and 47.5 in learnability [15].

All participants during the interviews stated that the load of attention for giving a presentation and using the system for the first time is too much to handle, therefore they all indicated that would need some time to get used to the tool before being able to assimilate the feedback and instructions provided by it. All participants pointed out that they perceived the Presentation Trainer as a useful tool and that they would like to use it in order to prepare for their upcoming presentations. Pointing out the relevance of receiving objective immediate feedback while preparing for them.

With regard to the Exercise Mode, all participants found this mode necessary to develop their nonverbal skills. Nonetheless, they remarked on improving the tutorial for each of the exercises. Two participants made a suggestion about making the feedback while performing the exercise more explicit, by giving clear indications on how to correct their current behavior when the exercise is being performed incorrectly.

During this user study we observed that the feedback provided by the *Presentation Trainer* had some effects on the participants' behavior, nevertheless this change of behavior was not always the desired one. For example when the *Move More* caption was presented, users shook their body or took one or two small steps to the sides, instead of gesticulating more with their arms while speaking. We also identified that all participants mastered the *Reset Posture* by using it throughout their trial presentation, providing us an indicator that some learning has happened while using the system.

4.4 Discussion of Second Study

The scores of the SUS questionnaire were considerably lower than in the previous study, this might give the impression that the older version of the trainer was more usable and learnable than the new version. However, in contrast with the tests of the previous study where participants did not change their behavior while receiving feedback from the trainer, during the tests of this second study participants modified their behavior when feedback and instruction was given to them. Also we found it very encouraging observing all participants using the *Reset Posture* while giving their presentation, suggesting us that some learning took place while using the *Presentation Trainer*. These observations indicate us that the trainer became more usable and learnable even when users perceived the opposite. We attribute the lower SUS scores to two different factors. The first one is that while giving the trial presentation, participants were able to identify in the feedback proportionated by the *Presentation Trainer* that there was something wrong with their performance, but that the feedback was not clear enough for them to know how to correct their mistakes. This led them to realize about the time needed to learn how to use the system correctly. The second factor deals with the expectations of the participants towards the Presentation Trainer. We explain these increasing expectations to the fact that the interface of this second tested version does not look like a prototype anymore, leading participants to expect from the *Presentation Trainer* to work as a commercial system and not as a experimental prototype.

Examining the impressions and observations of the use of the *Freestyle Mode*, we can conclude that the cognitive load is an important issue that needs to be further tackled. We observed that a clear interface allows users to perceive and adapt to some of its feedback. Showing us that a dashboard interface could be used to give immediate feedback for learning, but with some limitations. To make full use of this type of interfaces a user needs to pay attention to all the elements displayed on the screen and identify how to follow them; in order to be able to adapt her behavior and learn something, while performing a complex task. This requires an amount of a cognitive load that surpasses the capacity of the user.

We also observed that while using the Freestyle mode, in some cases participants were able to perceive the feedback, but adapted their behavior in an incorrect way. This pointed out the importance of adding a learning module to the system, explaining the meaning of the feedback and teaching users, the proper way to interpret it.

The Exercise Mode looks really promising; nonetheless it has room for improvement. Feedback showing whether the exercise is being performed correct or incorrect should become more explicit, and should give clear instructions on how to correct the mistakes. Exercises need to be well designed so that users are able to transfer the skills acquired during the exercises to the presentations. For example as shown during the tests, participants learned how to gesticulate, but not how to gesticulate while presenting. This was reflected during their trial presentations where none of them used enough hand gestures while presenting.

5 Conclusion and Future Work

The rising availability of sensors has created the space to design, develop and explore tutoring tools able to provide users with immediate feedback about their performance. In this article we present the findings of our ongoing studies on the *Presentation Trainer*: An example of a sensor-based tutoring system that by providing users with immediate feedback and instruction, is able to support them with acquisition and development of complex skills. The two studies described in this article showed us that users seem to be really enthusiastic and open towards the new learning experiences that this type of tools can provide. Furthermore, they also provided us with three findings that serve as guidelines for the design of this type of learning tools:

- Regardless of the explicitness of the feedback, the user requires an explanation on how to respond to it, before starting her training using the tool.
- The interface should be simple and clear; a dashboard giving feedback in multiple aspects at the same time is not optimal for learning.
- Decreasing the complexity of a learning task, by following the principles of an instructional design model helps users to assimilate the feedback given by the system, allowing them to learn specific skills. As the participants of our tests show by using the *Reset Posture*.

We consider that the learning effects of the *Presentation Trainer* and any other immediate feedback tool depend partly on their usability; therefore for near future work, we plan to continue with our current design-based research approach; keep on developing and conducting user test with the upcoming versions of the *Presentation Trainer*, until we consider it mature enough to test its learning effects on users. Furthermore we will conduct interviews with experts in the field of public speaking in order to come up with valid expertise model to analyze the nonverbal communication for presentations, and study the experts' opinion on how a tool such as the *Presentation Trainer* can be used to support the development nonverbal communication skills.

Acknowledgment. The underlying research project is partly funded by the METALOGUE project. METALOGUE is a Seventh Framework Programme collaborative project funded by the European Commission, grant agreement number: 611073 (http://www.metalogue.eu).

References

1. Peter A. DeCaro: Origins of public speaking. In The Public Speaking Project. http://www.publicspeakingproject.org/psvirtualtext.html, Chapter 2, (2011)
2. Parvis, L.F.: The Importance of Communication and Public-Speaking Skills. Journal of Environmental Health. 35-44 (2001)
3. DeVito J.A.: The Essential Elements of Public Speaking. Pearson (2014)
4. DeCoske, M. A., & White, S. J.: Public speaking revisited: delivery, structure, and style. American Journal of Health-System Pharmacy 67(15), 1225–7 (2010)
5. Trimboli, A., & Walker, M. B.: Nonverbal dominance in the communication of affect: A myth? Journal of Nonverbal Behavior 11(3), 180–190(1987)
6. Bjerregaard, M. & Compton, E.: Public Speaking Handbook. Snow College, Supplement for Public Speaking (2011)
7. Schneider, J., Börner, D., van Rosmalen, P., & Specht, M.: Augmenting the Senses: A Review on Sensor-Based Learning Support. Sensors 15(2), 4097-4133 (2015).
8. Anderson, T., Shattuck, J.: Design-Based Research A Decade of Progress in Education Research? Educational Researcher 41(1), 16-25 (2012)
9. Hattie, J., & Timperley, H.: The power of feedback. Review of Educational Research, 81–112 (2007)
10. Mory, E. H.: Feedback research revisited. In Handbook of research on educational communications, 745–784. (2004)
11. King, P., Young, M., & Behnke, R.: Public speaking performance improvement as a function of information processing in immediate and delayed feedback interventions. Communication Education, 49(4), 365-374 (2000).
12. Toastmasters International. Gestures: your body speaks. http://www.toastmasters.org/ (2011)
13. Brooke, J.: SUS: a "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, B. A. Weerdmeester, & A. L. McClelland. Usability Evaluation in Industry. London: Taylor and Francis (1996)
14. Nielsen, J. & Landauer, T., K.: A mathematical model of the finding of usability problems. Proceedings of ACM INTERCHI'93 Conference, pp. 206-213 (1993)
15. Lewis, J. R., & Sauro, J.: The Factor Structure of the System Usability Scale. Human Centered Design, 94–103. Berlin, Heidelberg: Springer Berlin Heidelberg (2009)
16. Van Merriënboer, J. J. G.: Training complex cognitive skills: A four-component instructional design model for technical training. Englewood Cliffs, NJ: Educational Technology Publications, (1997).
17. Van Merriënboer, J. J. G., & Kirschner, P. A.: Ten steps to complex learning (2nd Rev. Ed.). New York: Routledge, (2013)
18. Coninx, N., Kreijns, K., & Jochems, W.: The use of keywords for delivering immediate performance feedback on teacher competence development. European Journal of Teacher Education, 36(2), 164–182 (2013)