Multimedia Assessment of Social Communicative Competence, 6(1)

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Abstract

For many professionals, mastery of adequate and effective interpersonal communication skills is of vital importance nowadays. Thus, assessing and improving the communication competence of students are issues of interest in training situations. In this study, we examined the effectiveness of diagnostic multimedia assessment of communication competence of first-year radiological technology students. For this purpose, a series of ten multimedia tests was developed and put on the Internet, enabling flexible use. Each test contained a video conversation, where fragments were alternated with questions.

We supposed that individually working at one's own pace behind a computer screen, being able to see a videotaped real-life setting, as well as getting immediate elaborate feedback after answering questions would be appreciated by students who grew up in a multimedia world.

First, we examined how students value working with multimedia communication tests. As was expected, we found that students showed a great deal of enthusiasm with respect to the multimedia test, reporting that they liked to make use of the test. Next, we wanted to know if participation in the multimedia test would improve the results on their final regular end of the school year exam on communication competence. Therefore, we offered part of the student population the opportunity to participate in the multimedia test. The control group did not get this opportunity. We compared the results on the regular school exam of both groups and noticed that there was a slight difference. Although no strong significant effects were found, we believe that the regular use of multimedia tests can improve the students' communication competence in a way that is attractive for both students and their coaches.

Introduction

Nowadays, the education and training of professionals get much attention. Working in the health care field, in particular, demands the availability of good social-communicative skills. At Fontys University of Professional Education in the South of the Netherlands, much attention is paid to the improvement of training and assessment for their students. This study is about assessment of social-communicative competence by means of computer-based multimedia. The study was performed in the context of an educational program for first-year radiological technologists. For these students, educational programs are developed that contain the medical and technical aspects of their future job. They also learn how to communicate with patients, they became familiar with basic communication skills, with advising clients, and with counseling. The first-year student population is divided into nine groups of about ten students each. Materials used in the training sessions are readers with instructions, for instance, for role-playing. The school year is divided in four units, each unit has its own special demands. At the end of the units, each student's progress is assessed by means of paper and pencil tests, role-playing tests, or video tests. To optimize the existing situation, a project was started to use computer-based video simulations available on the Internet. The main idea behind this project was to incorporate a flexible way of self-regulated assessment, which might offer students more regular and diagnostic assessment on demand. The multimedia tests fit into the

educational first-year program. The tests are about basic communication skills, advising clients, bringing bad news, and counseling. In our research, the students participated in a test about counseling. For more details about the development of the ten multimedia tests on social-communicative assessment, we refer to Bakx, Sijtsma & Van der Sanden (2000).

The developers of these tests assumed that multimedia products help people to improve their learning. In our research, we examined how this improvement can be assessed. We decided to conduct a pilot study among the radiological technology students. We were interested to see how students judged the multimedia test, and we wanted to see if there were learning effects after making a multimedia test. Based on former research by Smit and Van der Molen (1996) and Bakx, Sijtsma & Van der Sanden (2000), we expected that students would appreciate the use of a multimedia test and that it would facilitate effective ways of learning.

Starting from a man—machine-like analogy for communication between people, psychologists were inspired to develop training techniques for social skills (Smit, 1995). From then on, training techniques for social skills were developed for many different categories of students, as well as for professionals. Programs generally focussed on enhancing professional social communicative competence. Research confirms the positive outcomes of these special programs; meta-analyses into the effectiveness of acquired social communication competence show that training affects behaviour. (Van der Molen, Smit, Hommes & Lang, 1995).

One of the techniques generally used in social-communication training, role-playing, is also part of the curriculum of the students of this research. Although role-playing is an effective way to learn, novice students can feel insecure when confronted with video cameras or observers. These feelings of insecurity might negatively affect their performance (Holsbrink-Engels, 1998; Kass, Burke, Blevis & Williamson, 1992). Role-playing may be seen as a complicated activity because of its high cognitive demands; according to Holsbrink-Engels (1998) role-playing is too complicated for novice students.

The use of computers can make the learning environment less complex for novice students. Experiments with computer-based role-playing suggest that it simplifies the learning environment compared to the traditional role-playing. According to Holsbrink-Engels (1998), computer-based role-playing uses a conversational model, which focuses students' attention on the necessary steps to solve social-communicative problems. In the ten Fontys University tests on communication, students are also familiarized with models of a conversation. Students have the opportunity to look at a dialogue between a professional radiological technologist and a patient in a hospital setting, similar to an authentic situation. There is no time constraint, unless the test is used as a summative test. Computer-based role-playing offers time for reflection, an essential part of learning (Hatton & Smit (1995), in Holsbrink-Engels, 1998).

As mentioned above, previous research suggests that students who participated in computer-based role-playing activities had better scores on communication tests than students who had not participated (Holsbrink-Engels, 1998; Issenberg, McGaghie, Hart et al., 1999). In our research, we tried to find out if students were aware of the opportunity for reflection that is built into the ten multimedia tests.

Although there are many structured communication courses available for higher vocational education (Smit, 1995), there is a lack of appropriate assessment methods for measuring social-communicative competence (Smit & Van der Molen, 1996). This is not surprising, because of the complexity of assessment of social-communicative competence (Bellack, 1979). A positive tendency is that assessment has become more and more sophisticated over the years (Schlundt & McFall, 1985). Decades ago, technologies like videotape playback and film simulations proved to be powerful aids in acquiring social-communicative competence for counselors (Kagan, 1973). This has not changed over the years: Smit & Van der Molen (1996) still recommend the use of video tests for assessing social-communicative competence. As indicated before, the computer is a powerful new instrument in education, offering experiences that are otherwise totally unobtainable (Kieley, 1996). Teacher guidance, organization, or feedback are less necessary when computer assessment is used (Bakx, Sijtsma & Van der Sanden, 2000).

For the people of Fontys University, the development of a test in which the possibilities of video-assessment and computer-assessment are combined was the logical next step in the existing practice of teaching social-communicative skills. Their ten multimedia tests are relatively new, and that is what inspired us to investigate students' reactions and results.

The present study represents an initial attempt to resolve some questions that aroused our interest. We have tried to find out if and how assessment can be built into multimedia tests.

Our main question was: I. What are students' views of the new assessment method of social-communicative competence? Do they appreciate the multimedia test or not? Our first hypothesis was that students would be enthusiastic about this new assessment instrument.

The next question for us was: IIa. Is the multimedia test effective? In other words, do students for whom the multimedia test is available learn more than others who do not get the opportunity to work with the multimedia test? To find an answer to this question, we offered half of the first-year students the opportunity to take part in the multimedia test. As mentioned in our introduction, we expected that the participating students would have better scores on the regular end-of-year school exam on social-communicative skills than the non-participating students.

A sub-question here was: IIb. Is there any indication that the multimedia test incites students to more reflection? Our hypothesis was that these indications would exist. Another interesting sub-question with regard to the effectiveness of the multimedia test for us was IIc: Do the scores on the multimedia test predict results at the regular end of the semester school exam? We expected that the results on the multimedia test would predict results on the end of the semester school exam.

Finally, we were interested in another —(for us, less important) question: III. Are the answers to our main research questions equally valid for all students? There are indications that student results depend partly on their preferred learning style (Stodolsky, Salk & Glaessner, 1991). This issue will be illustrated further in the method and results sections.

Method

Design and Participants

This study consisted of a quasi-experimental, pre-test — post-test design. Participants of the study were 92 fulltime first-year radiological technology students, the total first-year population. There was an experimental group (n=50) and a control group (n=42). Both groups took a course in communication training, and they received theoretical information as well as role-play training on a weekly basis throughout their first year. At the beginning of the second semester, the total radiological technologist population had to take a paper and pencil test; at the end of this semester, all students completed a communication role-play test. The only difference between the experimental and the control groups was that the experimental group had an intervention in the middle of the second semester, which consisted of participation in a multimedia test.

Materials

In order to improve the existing course, the ten multimedia communication tests were developed at Fontys University. The multimedia tests combine theory and practice; students have to answer questions on theory as well as on practical skills. A team of education experts and teachers first developed one test on communication, which was evaluated by thirty-one communication and research experts. After testing and improving this test, nine other tests were developed in the same way: two communication experts and two assessment experts (all belonging to the Fontys University) were responsible for the test development. For the ten tests, different professional dialogues in a real work setting were written, played by semi-professional actors and recorded on video. The dialogues last about 7.5 minutes each. These dialogues include an opening stage, a presentation of the problem/issue, and a closure. Communication experts divided these video films into fragments. Each fragment was used for developing test items, including multiple-choice or multiple-response questions (to assess knowledge or skills), open-ended questions (to encourage reflection on one's own professional attitude), and numeric questions involving the ranking of alternatives. Students work on these tests via the Internet. (For a more detailed description of the development of this instrument, see also Bakx, Sijtsma & Van der Sanden, 2000).

For our research, we used a digital video of a professional counseling dialogue in a hospital setting , lasting 5 minutes and 45 seconds. The dialogue was divided in 11 fragments. The test consisted of 40 multiple-choice and multiple-response questions (31 questions to assess skills and 9 to assess knowledge) and 9 open-ended questions (for reflection upon the personal attitude of the student). A feedback module gave the students immediate elaborate feedback and showed their accumulated scores. Figure 1 shows the opening page with general instructions. In figure 2 the main character is introduced. Figures 3 and 4 show examples of questions from the multimedia test.

Figure 1: (Translated) opening page with instruction and educational message

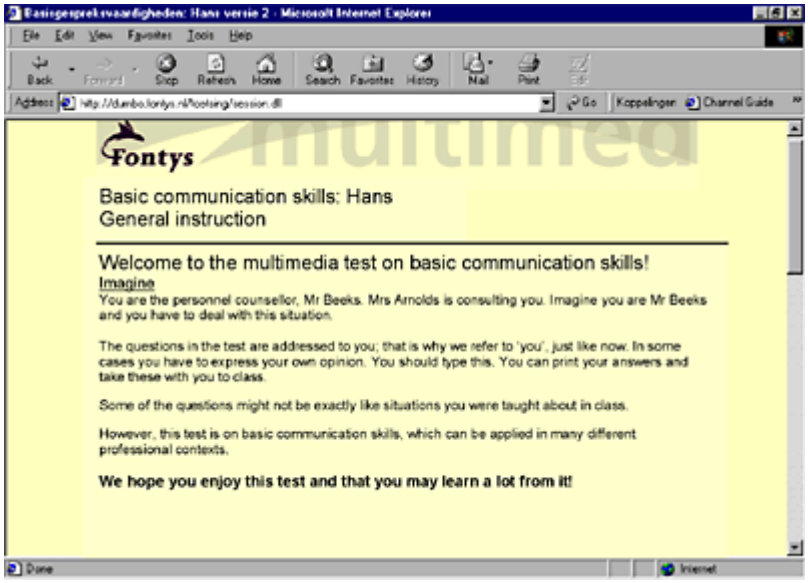


Figure 2: (Translated) introduction page of the main characters in the assessment

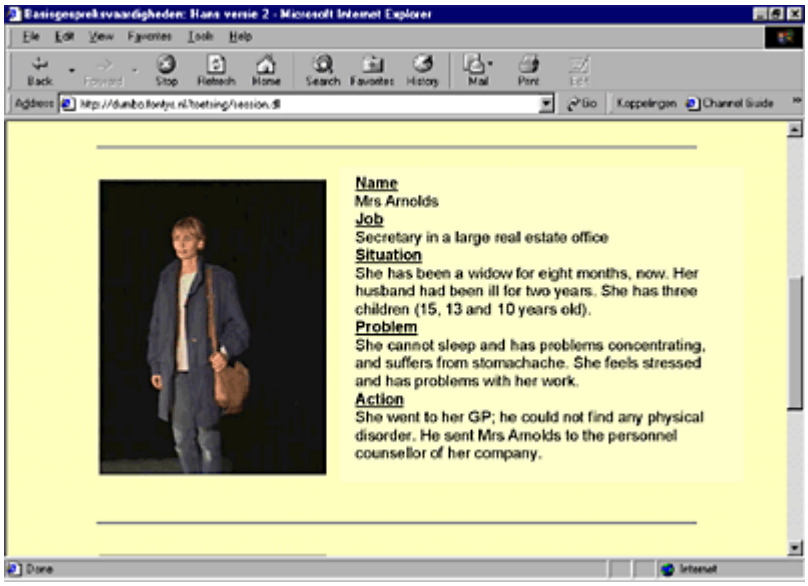


Figure 3: (Translated) typical open-ended question page with video (view button)

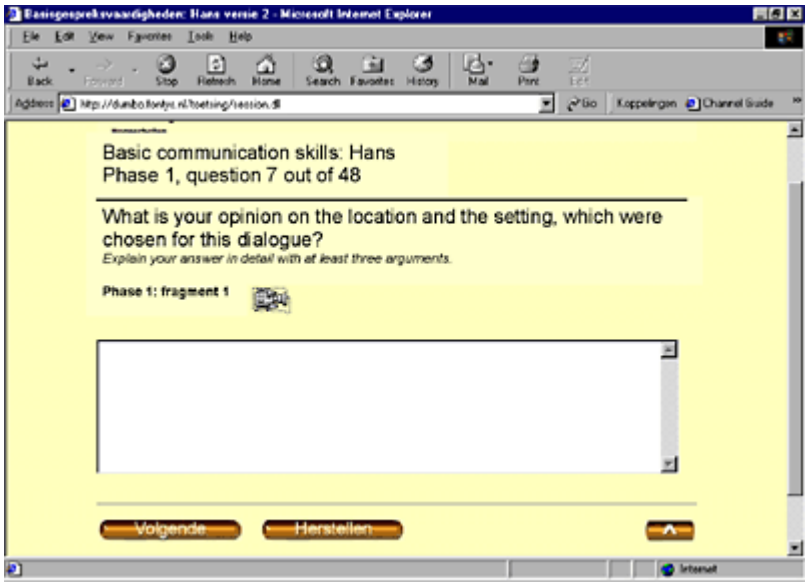
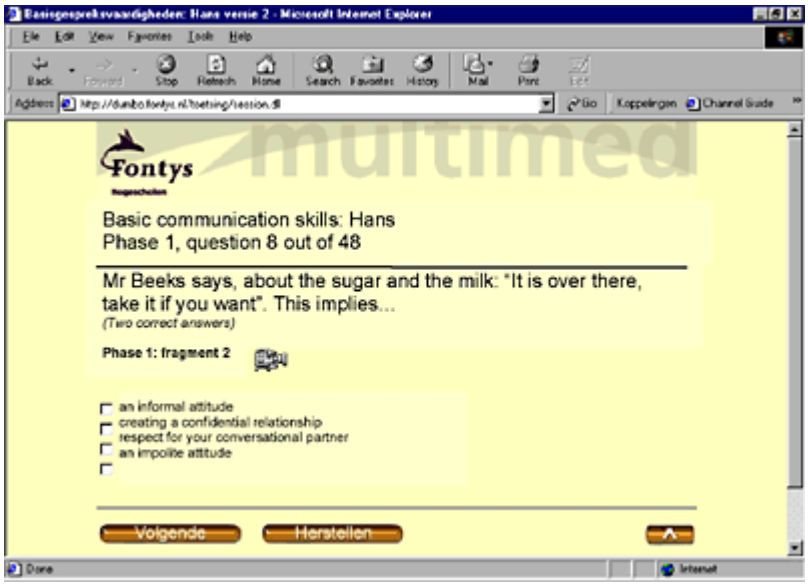


Figure 4: (Translated) typical multiple-choice question page with video (view button)



The second instrument used in this investigation consisted of an evaluation questionnaire with five questions, using a five-point Likert scale. We used this instrument to measure the satisfaction of the students on the multimedia test. One question was about the amount of time taken to complete the multimedia test. Furthermore, students were asked if they liked the test. Next, they were asked if they thought the test would be useful for learning how to communicate. A next question was, if they thought the test was useful as a summative test. Space was left for students' comments. Finally, they could give their general ranking on a 10-point scale, ranging from 1 to 10 (extremely bad to extremely good).

Finally, an adapted version of an inventory of learning conceptions was used in this investigation, based on the ILS (Inventory of Learning Styles) of Vermunt (1996). The ILS was developed to assess information-processing, regularization-strategies, motivation, and preferred learning-styles. The basic assumption here is that individuals differ in terms of their instructional preferences (Sadler-Smith & Riding, 1999). In order to adapt the multimedia

assessment to the characteristics of individual students, their preferred learning styles were first investigated (Bakx, Sijtsma & Van der Sanden, 2000). By preferred learning style, we mean the ideas and beliefs students have with regard to learning (Stodolsky, Salk & Glaessner, 1991). The questionnaire was an adapted version of the relevant section of the Inventory of Learning Styles Three categories are copied from the ILS, learning as building, learning as copying, and learning as applying. Bakx (2001) added one extra category: learning by observing — here called a 'model-based reproductive' learning style. The questions were adapted for Fontys University students, who had to communicate with patients or clients in health care situations. Bakx, Sijtsma & Van der Sanden (2000) found four different kinds of learning styles: the first one was constructivist learning, which is manifested in learning activities such as comparing, analyzing, and integrating subject matter. Second, in the pragmatic learning style, storing and the use of information and skills is central. The third style, text-based memorizing, refers to learning sentences and phrases by heart. The fourth learning style, model-based reproductive, means that information and observed behaviour are mainly copied without much personal input (Bakx, Vermetten, & Van der Sanden, in press).

In order to investigate the learning conceptions of our experimental group of first-year students, a domain-related preferred learning style questionnaire consisting of 32 questions was used (Bakx, 2001). The items were graded on a five-point Likert scale, ranging from (1) "This is a bad way to learn how to communicate" to (5) "This is a good way to learn how to communicate."

Procedure

Students of five out of nine groups (n=92) were randomly selected for participation. These five groups (n=50) completed the multimedia test and filled in two questionnaires in addition to their regular assessments. The other four groups were the control group (n=42), who only completed the regular assessments within the 1999/2000 curriculum. Participation in the experiment was compulsory for the selected students. The multimedia test was used in a diagnostic way.

First, one group of selected students took part in the experiment. After they had completed the questionnaires and the multimedia test, two other groups of students were invited to take part. After finishing their work, the remaining two groups of students came in to participate. The experiment began at 9 a.m. and lasted until 3 p.m. All activities took place in two special, almost identical, classrooms with computer equipment; each student worked individually at his or her own computer using a headset.

The procedure was the same for all groups. Students received a standard oral instruction, and the first questionnaire was handed out. After handing in the completed questionnaire, the students received a multimedia headset for use with a personal computer, as well as an instruction manual with guidelines for doing the multimedia test.

The students completed the multimedia test at their own pace, individually and without any help. They immediately received elaborate feedback on the multiple-choice and multiple-response questions. They could watch the video-fragments as often as they liked. After completion of the multimedia test, the evaluation questionnaire was handed out. The students received the headset as a gift for their cooperation.

The selected students completed the multimedia test and the questionnaires in the middle of the semester. The results on the regular tests (of the experimental and the control group) were retrieved from institutional files. Pre-test data consisted of communication assessments completed at the beginning of the semester. Post-test data were gathered at the end of the semester in the final communication test.

Results

The results indicated that the students were positive and enthusiastic about the new assessment instrument (mean score of 4.06). To evaluate the students' opinions about the new method of assessment, mean scores of the data of the evaluation questionnaire were computed. Correlations between the five evaluative questions were analyzed using Pearson correlation coefficients. The average time needed for completing the test was sixty minutes. Most students reported that they had enjoyed the multimedia test (mean score of 4.08, standard deviation 0.44). Table 1 and figure 5 show how students enjoyed making the multimedia test. Table 1 represents the raw data, whereas the figure shows the effect in a graph. Students indicated that this multimedia test was helpful to them in learning communication skills (mean score of 3.96, standard deviation 0.60). This is shown in table 2 and in figure 6. Students also reported that the immediate feedback was useful (mean score of 4.22, standard deviation 1.05). In their written comments to this question, at least thirteen students mentioned the fact that immediate correction is very helpful in the learning process and may prevent future mistakes. Just one student wrote down that he/she might forget the explanation of the correct answer in the elaborate feedback. Table 3 and figure 7 show the students' opinion on the elaborate feedback.

Results indicated that, according to the students, the multimedia test could also be used as a summative exam, and not just in the sense of a diagnostic exam (mean score of 4.00, standard deviation 0.70). These results are shown in table 4 and in figure 8. In their written comments, students expressed the wish to use this way of assessment at home. They were also positive about the resemblance with real life situations. Students reacted generally positively to the multimedia assessment, which was expressed in an average score of 7.14 points, standard deviation 0.88. This general reaction on the multimedia test is shown below in table5 and in figure 9. The given judgment correlated moderate with the degree of enjoyment, when using the instrument for learning to communicate (r=0.44). There was also a moderate correlation between the students' reaction to the test and their perception of its utility as a learning instrument (r=0.32).

Table 1: enjoying test

Likert Scale	1	2	3	4	5
	not at all	not enough	neutral	somewahat	very much
Percentage	0	0	6	80	14

Figure 5: Students' evaluation: enjoyment

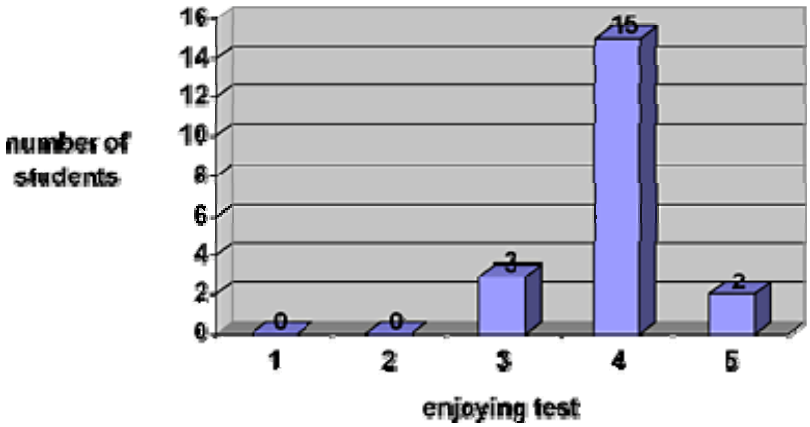


Table 2: 'useful to learn' score

Likert Scale	1	2	3	4	5
	not at all	not enough	neutral	somewahat	very much
Percentage	0	2	14	70	14

Figure 6: Students' evaluation: usefulness

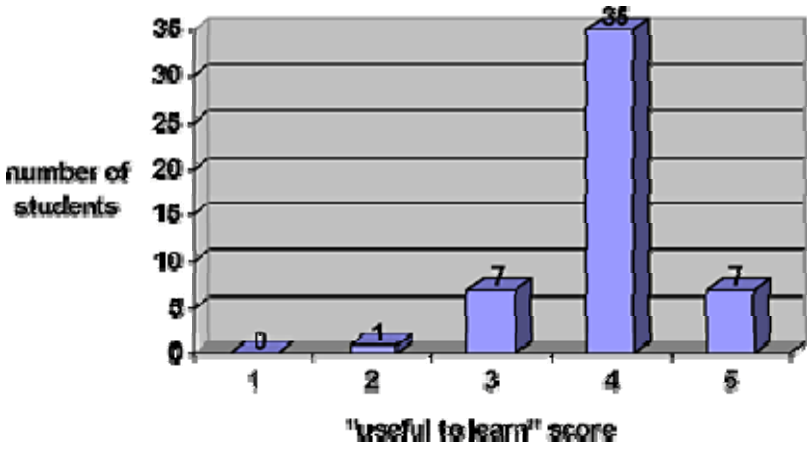


Table 3: feedback score

Likert Scale	1	2	3	4	5
	not at all	not enough	neutral	somewahat	very much
Percentage	0	12	8	24	54

Figure 7. Students' evaluation: feedback

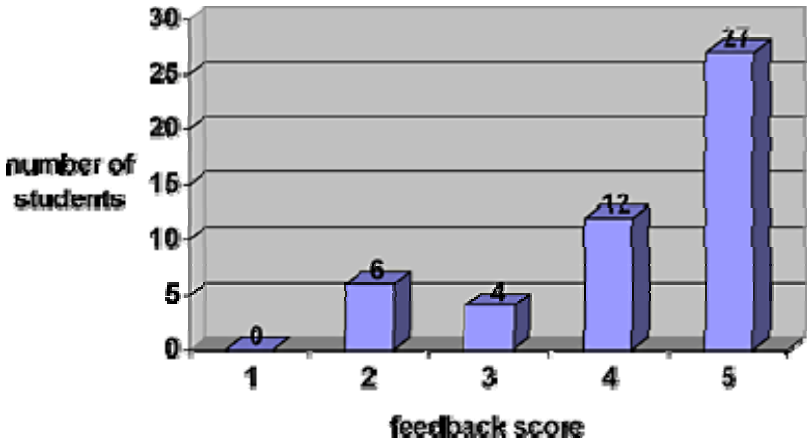


Table 4: summative score

Likert Scale	1	2	3	4	5
	not at all	not enough	neutral	somewahat	very much
Percentage	0	2	18	58	22

Figure 8. Students' evaluation: diagnostic usefulness

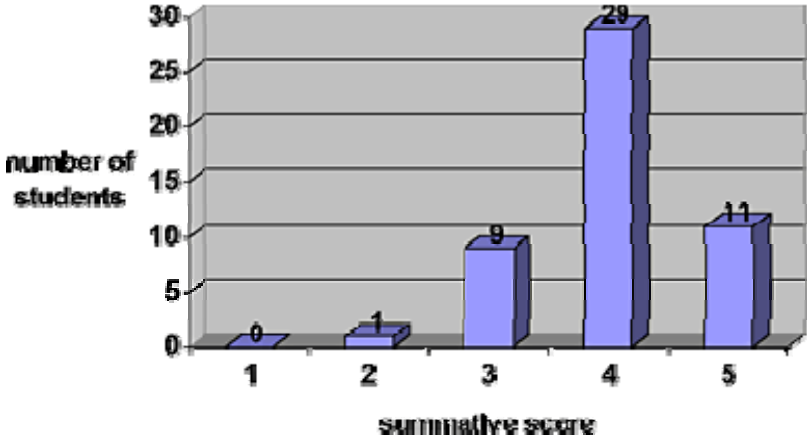


Table 5: general judgement score:

General Score	1	2	3	4	5	6	7	8	9	10
	very bad		bad			satisfactory		very good		perfect
Percentage	0	0	0	0	4	16	46	30	4	0

Figure 9. Students' evaluation: judgement

T-tests were used to test the effectiveness of the multimedia test (our hypothesis IIa). T-tests showed a difference between the control group and the experimental group with regard to the scores on the final test, but the results were not significant (p=0.14).

Our expectation (hypothesis IIb) that students are positive about the opportunities for reflection offered by the multimedia test was confirmed (as mentioned above in the results of the evaluation questionnaires).

Our hypothesis IIc was not confirmed: regression analyses showed that the students' results on the multimedia test did not predict results on the end of the semester school exam.

To test our last hypothesis (III), frequency tables and reliability analyses were performed to analyze the students' preferred learning styles. Next, regression analysis was used in order to measure the predictive value of learning styles on the scores of the multimedia test. It turned out that the majority of the students showed a preference for constructivistic learning . A smaller group preferred a pragmatic learning style. The two reproductive learning styles were favoured least. Regression analyses showed that the constructivist learning style predicted the result on the multimedia test (ß =.34; R_=.14). The results are presented in Table 1.

Table 6: Beta-weights of learning conceptions as predictors of scores on Christmas and final tests of first-year radiological technologist students (N = 50)

	Multimedia assessment
Constructivistic	.34*
Pragmatic	
Textual memorizing	
Reproductive	
SV2	.25
SV4	
R	.42
Adjusted R_	.14
F	4.42*

* $p < .05$; ** $p < .01$

Discussion

The positive reaction of the students to this new assessment instrument suggests that using multimedia enhances the social communicative competence in a motivating way. This motivation is obvious in the students' positive judgments and written comments. We believe that this motivation will be a promising condition for successful integration of the multimedia test in the educational program.

Students confirm, as previous research suggests, that multimedia assessment offers time for reflection (Holsbrink-Engels, 1998). Some students are positive about the fact that real-life situations are used. Brown, Collins & Duguid (1989) indicate that video simulations of real-life situations can serve as role models for the students' future professional role. Students mention that video fragments make it easier to imagine a situation. This statement supports the conclusion of Hammond, McKendree, & Scott (1996) that multimedia can make topics more accessible, which are difficult to convey through lectures or conventional printed material.

Students received elaborate feedback during the assessment, which was regarded positive and motivating. Elaborate feedback gave students the opportunity to understand why the given answer was right or wrong. The purpose of this type of feedback is to stimulate students to reflect on their own learning processes (Gordijn, 1998). In this way, the multimedia test is not only an instrument for assessment, but also a device for acquiring new knowledge. The use of the Internet makes assessments available at any time to fit curriculum needs . Diagnostic multimedia assessment via the Internet, with direct feedback, could be part of a method to promote self-directed lifelong learning. The answers to the open questions offer insight into student attitudes. These answers can be valuable topics for discussions in classroom situations.

A slight, but not significant, difference was found between the control group and the experimental group in the final test scores. This means that our question on the effectiveness of multimedia tests cannot be answered conclusively. The difference might become significant if students have the opportunity to take more than just one multimedia test. In this instance, they were not familiar with this way of testing. Regular participation in multimedia testing might also better predict future exams scores. Unfortunately, we did not have the opportunity to investigate this hypothesis in our research. We had expected that the test results on the multimedia test would predict results on the final test, but this was not the case. It is possible that the content of the multimedia test and the final tests are related but not identical. This could explain why the scores on the multimedia test do not predict scores on the final test: the two tests do not assess the same thing. Nevertheless, we think it would be useful to include diagnostic multimedia assessment in the regular education program.

Multimedia assessment seems to be a very promising and flexible device for acquiring and testing social-communicative competence. In further research, the validity and reliability of the assessment instrument should be central. Our findings suggest that acquiring social-communicative competence by means of high-quality multimedia assessment is very motivating and stimulating for students. There seems to be a good chance of success when integrating this instrument into training programs. However, it is extremely important that the assessment be valid and reliable!

As mentioned before, in a secondary analysis, we examined whether students with different learning styles achieve better results. Previous research suggests that there is a relatively strong correlation between learning conceptions and achievement.

Our students preferred a constructivist learning style, which suggests that learning by observing professionals can be an efficient way to acquire communicative competence. Multimedia assessment offers this opportunity. Answering the questions provides the opportunity for reflection. After each question, the score is presented, so students can immediately see if their answer was right or wrong. In this way, learning and assessment are combined. In their comments, students wrote that the resemblance with real-life situations is stronger than in paper and pencil tests, which makes it easier for them to empathize with their role.

In future research, it would be very interesting to integrate learning styles and achievement in one design.

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