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Development and evaluation of a student-centred multimedia self-assessment instrument for social-communicative competence

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Abstract. Communication plays an important role in many professional contexts. This is especially true for students in the field of social work. The aim of this study was to develop formative, self-regulated multimedia self-assessment of social-communicative competencies for social work students. First, a pilot study was conducted to gain insight into the students' specific characteristics. This insight was used to design guidelines for the development of the assessment instrument in order to tune these to the students' perceptions, instructional preferences, and personalities and thus enhancing the students' enthusiasm to use the self-assessment instrument. This might increase the chance for successful implementation of this new form of assessment.

A first version of a multimedia test was developed. A quality expert meeting was organised to gain insight into expert judgements on the quality of the test and to obtain indications for improvement of the assessment. A second version of the test was constructed and put on the Internet. Nearly 400 students completed the assessment and expressed their opinions on this new way of communication assessment.

We found it was possible to test social-communicative competence by means of multimedia, with the help of digital video. The use of Internet makes assessments available at any time to fit curriculum needs and also resolves time and space constraints. Our conclusion was that the multimedia test is reasonably valid. All students reported having liked the multimedia assessment.

Keywords: communication, evaluation, learning, multimedia, self assessment

Introduction

In many professions, social-communicative competence is crucial for effective work performance. Therefore, it is important that attention is paid to the development and acquisition of social-communicative competence (Smit & Van der Molen, 1996), especially with regard to professional

contexts in which communication is central, for example, teacher training colleges, colleges of management, and health care and nursing (Holsbrink-Engels, 1998). In learning environments which are designed to foster social-communicative competencies formative assessment instruments can be of great help. In this study we report on the construction of an assessment instrument regarding social-communicative competencies, which was suited especially for social work students. The method of assessment was based on a definition of social-communicative competence as an integrated system of knowledge, skills and a professional attitude regarding interpersonal communication (for details see Bakx, 2001).

Assessment of social-communicative competence is time-consuming and expensive (Smit & Van der Molen, 1996). As a consequence, assessment is rarely used in a formative way to guide and stimulate learning, but is usually limited to the end of a course. However, formative self-assessment and, for example, formative forms of peer-assessment can be valuable components of the learning environment (Ladyshewsky & Gotjamanos, 1996). This is true especially, when diagnostic tests provide learning support such as feedback.

A preferred strategy for assessing social-communicative competence is by direct observation in a natural environment, but this may prove to be impractical or impossible. Thus, a wide variety of paper-and-pencil tests, self-report inventories, in vivo observation of staged or simulated natural interactions, and role-play tests have been developed (Bellack, 1979). However, the teacher has to play an important role in order to organise and carry out such assessments. In this study, a computer-based assessment was investigated that effectively reduces the teachers' contact time with students (Hammond et al., 1996) and thus circumvents the high workload that is typical for other forms of assessment due to crowded classrooms and limited instruction time (Erwin & Rieppe, 1999; Issenberg et al., 1999; Kieley, 1996).

One of the aims of higher education is to make learners more self-reliant (Sadler-Smith & Riding, 1999). Computer-based simulations can provide highly motivational instruction and assessment that also can readily serve the need for self-regulated adaptive learning (Reigeluth & Schwartz, 1989). The assessment developed here supported active learning and encouraged students to study independently. In order to stimulate students to use the self-assessment instrument frequently, we deliberately tried to take students' characteristics into account in the design of the instrumnent.

First, we studied ways of optimally tuning the multimedia assessment on social-communicative assessment to social work students' individual learning theories and personalities. Second, we determined the reliability and the validity of the multimedia assessment. Third, we investigated students' opinions about this new assessment method.

Theoretical background

Multimedia assessment of social-communicative competence

Computer-based multimedia plays an increasingly important role in powerful learning environments which stress the active role of the learners. Erwin and Rieppi (1999) compared the effectiveness of traditional classes and multimedia classes and concluded that students perform better in the multimedia classrooms, while Parlangeli et al. (1999) found no differences in the performance between students in traditional classes and multimedia classes. The focus of educational multimedia has been mostly on development of critical thinking, problem solving, and reasoning skills (Hammond et al., 1996; Hannafin & Land, 1997). Indeed, little is known about the role of multimedia in the acquisition and assessment of social-communicative competence. We assume that social-communicative competence can be acquired and assessed partly by means of multimedia, when options like digital video are chosen with care and tested adequately.

Digital video provides a means of portraying real world social situations in a comprehensive, standardised, and economical manner (Reigeluth & Schwartz, 1989; Stricker, 1982). It conveys more information than print or another communication medium. Video can show important non-verbal cues such as gestures, smiles, and eye contact, and also intonation, voice volume, speech content and posture (Bellack, 1979). Assessment of social-communicative competence using video fragments of professional dialogues has educational as well as motivational value.

Formative (self-)assessment of social-communicative competence may contribute to learning in three ways. First, it provides the students with a better insight into their current competence levels. Second, completing the assessment and receiving feedback, might lead to a considerable learning effect. Third, easily available tools for self-assessment accessible through the internet may contribute to the self-reliance of learners, because these tools are flexible, can be used individually, and make students responsible for their own learning process.

Tuning the self-assessment instrument to students' characteristics

Individuals differ with respect to their preferences for instruction (Sadler-Smith & Riding, 1999), learning conceptions (e.g., Vermetten, 1999) and personality characteristics (e.g., Carver & Scheier, 1992). Taking such differences into account, this may help instructional designers in creating more effective products (Cennamo, 1993; Goldman et al., 1999). Therefore, we investigated the students' beliefs of communication, their learning

conceptions on the acquisition of social-communicative competence, their instructional preferences and their personality characteristics.

Central to our study is a constructivistic view on learning. Learning is considered an active and constructive process in which new information is related to prior knowledge and beliefs which may vary considerably between students (Byrnes, 1996; Pintrich et al., 1993). For example, students' personal interests, values, and beliefs about themselves as learners are considered crucial for acquiring competencies (Bandura, 1986, 1989). The processes of selection and interpretation of new information are also influenced by students' instructional preferences with regard to teaching strategies and the instructional methods which are characteristic of a certain learning environment (Entwistle, 1991).

We suppose that students' beliefs on learning, their motivational orientations and their conceptions of communication are components of students' individual learning theories (ILT's): ILT's are personal theories, which serve as frames of reference to describe, categorise, and explain learning and school-related issues with regard to a particular domain (Van der Sanden et al., 2000). ILT's are composed of conceptual and procedural elements and consist of an integrated set of variables (Van der Sanden et al., 2000). We mention three aspects of ILT's in relation to communication as each of which are important for the construction of our assessment procedure: (1) Beliefs about the subjects that are dealt with in the communication domain (Vosniadou, 1991, 1994; Vosniadou & Brewer, 1994); (2) Domain-specific learning conceptions and views on learning in general (e.g., Prosser et al., 1996; Stodolsky et al., 1991; Vanderstoep et al., 1996), and (3) Preferred learning situations, learning-activities, instructional strategies and views on the role of others, such as teachers and fellow students in the acquisition of competence (Hamman et al., 2000).

Beliefs about communication
Students' views on communication and social-communicative competence, and their norms and values with respect to these matters might influence their learning. In this respect Brandsford et al. (1999) have stated that ". . . people's mental models of what it means to be an expert can affect the degree to which they learn throughout their lifetimes" (p. 50). Unlike experts, students have not acquired extensive knowledge that affects their awareness, organisation, and interpretation of information, and helps them to remember, reason, and solve problems. But students do have preconceptions on how communication works and, for example, can be optimised, largely based on their own experiences with communication. Students' views on what it means to be a competent social worker and more specific what it means to be competent with regard to communication, were investigated.

Domain-specific learning conceptions

Research in the domains of math and social studies showed that the nature of the subject influences students' views on instructional effectiveness of learning activities with regard to the domain (Stodolsky et al., 1991). In general two groups of learning conceptions are distinguished: a constructivistic and a reproductive learning conception. A constructivistic learning conception refers to the processing of information in a meaningful way to build up an adequate personal knowledge base and competence by elaborating and reflecting on personally acquired knowledge and competencies (Byrnes, 1996). A reproductive learning conception focuses on the intake of information for fact retention or superficial imitation (Slaats et al., 1999; Vermunt, 1996). For the domain of communication two additional learning conceptions may be important: an application-oriented learning conception, emphasizing the practical value of acquired knowledge and experiences (e.g., in learning during traineeships) (Vermunt, 1998), because the domain of communication is rather application-oriented by itself; and an observational learning conception (Bandura, 1986, 1989) because much on communication is learned by watching others communicating.

Preferred learning activities

Preferences for certain learning activities are based on individual views on the instructiveness of learning with regard to the acquisition of social-communicative competence. We expect students to differ in their preferences for three kinds of learning activities. Two of these were based on Kolb's (1984) experiential learning-theory. (1) The preference for abstract or concrete information (Van der Sanden, 1996); (2) learning from experiences versus learning by observing (Bandura, 1986, 1989); and (3) the organisation of learning: formal versus informal learning (Marsick, 1987). Informal learning is a natural form of learning, in which students learn more or less spontaneously and without much conscious effort (Boekaerts & Minnaert, 1999). Informal learning often takes place in situations that were not explicitly designed to acquire certain competencies (Lave & Wenger, 1991), such as in communicative situations. Formal learning activities fit the educational format (Brown et al., 1989; Reigeluth & Schwartz, 1989), which is typical of school-based learning. It is becoming increasingly clear, however, that informal learning can be very instructive as well (Eraut, 1997).

We assume that for communication the three dimensions of preferred learning situations will be relevant and we expect to find that students prefer certain learning activities more than other learning activities. Knowledge of preferred learning activities is relevant for tuning the self-assessment instrument towards these preferences. This might stimulate students to use the

assessment instrument more frequently, which could lead to better learning and deeper understanding of communication processes.

Personality characteristics

Differences in personality cause individuals to react differently to learning situations (Carver & Scheier, 1992). Personality traits and cognitive styles were found to be related and, as a consequence, educational institutes should consider these individual differences when designing learning environments (Furnham, 1992; Furnham & Gunter, 1983). It is assumed that personality consists of five superordinate traits, referred to as the 'Big Five' (Carver & Scheier, 1992; Mervielde, 1992). The Big Five personality traits are agreeableness, extraversion, conscientiousness, emotional stability and autonomy. Agreeableness refers to being friendly, flexible and co-operative. Extraversion is about being cheerful, active, energetic and vigorous. Conscientiousness is about being thorough, task-orientated, systematic and careful. Emotional stability refers to being calm and relaxed, having emotional control. Autonomy (De Raad & Van Heck, 1994) is about being creative, intelligent, imaginative, independent and, as a consequence, being open-minded [see, e.g., Hendriks (1997) for more details]. In learning contexts, extraversion, conscientiousness, and autonomy are often found to be the most relevant (Busato et al., 1999; De Raad & Schouwenburg, 1996).

We expected that personality traits play a role in the acquisition and development of social-communicative competence (Busato et al., 1999; O'Hair et al., 1995), because learning to behave adequately in professional communicative situations requires the active interaction of a student with certain personality characteristics with other people.

Pilot study

A pilot investigation was performed to measure students' beliefs of communication, their learning conceptions on the acquisition of social-communicative competence, their instructional preferences and their Big Five personality traits. The results were used for the development of the assessment instrument.

Sample of the pilot study

The participants were students from a university of professional education in the Netherlands. The sample consisted of 146 full-time first-year social work students, of which 92% were women (N = 134) and 8% were men (N = 12).

This ratio of females and males is representative of schools for social workers in the Netherlands. The average age was 18.5 years.

Materials

A questionnaire was used which contained four parts:

(1) Students were asked about their views on social-communicatively competent social workers. They were asked three open-ended questions (Haas & Arnold, 1995): "Which personal characteristics are typical for a social-communicatively social worker, and which characteristics are not?", "What kind of behaviour is typical for a communicative competent social worker and which behaviour is not?", and "What physical appearance is typical for social-communicatively competent social workers and what physical appearance is not?". In total we presented three different contexts, or scenarios, for these questions: a social worker talking with a client, a social worker talking with a client's family members and a social worker talking with a colleague. The three scenarios were divided among three equally large groups of students, but each individual was presented only with one scenario.

(2) To measure learning conceptions about the acquisition of social-communicative competence a list of 20 items was constructed. This list measured four learning conceptions: (a) constructivistic, (b) reproductive, (c) application-oriented, and (d) observation-oriented. Students responded to each item using a 5-point Likert scale running from 'I don't agree at all' (scored 1) to 'I strongly agree' (scored 5).

(3) One open-ended question was presented about learning activities: "Which learning activities, do you think to be important to develop social-communicative competence?".

(4) The Berkely Personality Profile was used to measure personality traits. Students indicated on a 5-point Likert scale to what extent the statements were descriptive of their personalities.

Procedure

All first-year social work students completed the questionnaire during a lecture in their first week at school. They were given the instruction orally, they were informed that the questionnaire was to be completed anonymously, and they were made aware of the purpose of the investigation.

Data analyses

All students' answers were categorised by two researchers, who worked independently. To determine the structure of the questionnaire on learning conceptions, principal component analyses were conducted, followed by rotation to simple structure (varimax rotation). For each factor, items were selected with loadings of at least 0.4 on that factor, and loadings below 0.4 on the other factors. Reliability analyses were used for scale construction. Mean scores were computed for learning conceptions and personality traits and students' t-tests were conducted to test for differences.

Results

Views on social-communicatively competent social workers
According to the students a social worker should be interested, open-minded, and friendly. Social-communicatively competent social workers listen actively, nod frequently, ask questions, and summarise at the right moments. The appearance of competent social workers is clean, healthy, and trim. The three different scenarios showed the same results.

Domain-specific learning conceptions
Based on the screeplot and on eigenvalues (> 1), one factor represented a constructivistic learning conception including an observational aspect, and another factor represented a reproductive learning conception. The constructivistic learning conception factor was defined by items referring to the processing of information to build up an adequate personal knowledge structure and competence (Byrnes, 1996), based on observing professionals, attending lectures, and integrating new information with existing information. The factor representing a reproductive learning conception was defined by items referring to shallow processing of information without giving it any further thought and memorising facts. Cronbach's alpha of the scale on constructivistic learning conception was 0.72 and 0.70 for the scale on the reproductive learning conception. Students scored significantly higher on the constructivistic learning conception (mean score 4.21) than on the reproductive learning conception (mean score 2.46) ($t = 28.58$; $p < 0.001$).

Preferred learning activities
In total 651 learning activities and situations were reported which were thought to be important to acquire social-communicative competence. Two of the three expected dimensions were found: abstract versus concrete information, and learning from experience versus learning by observation. The dimension formal versus informal learning was integrated in the other two

Table 1. Examples of reported learning activities

	Abstract	Concrete
Experiencing	Talk about communication	Learn by role playing
	Ask questions to professionals	Practise communication techniques in real life environments
Observing	Attend classes about communication techniques	Observe professionals
	Reading about communication principles	Learn from fellow students who act in a role play

dimensions. The dimension abstract versus concrete refers to the content of what is learned. The dimension learning from experience versus learning by observation refers to the direct or indirect role of the student in the learning activity or situation.

Examples of activities in these categories are presented in Table 1. Actions mentioned most frequently were direct, concrete activities (39.33%). Especially role-play learning was mentioned. Next, students reported indirect, abstract learning activities (32.54%), especially reading to build a theoretical framework to be used in practical situations. Indirect, concrete activities (14.56%) such as learning from observing fellow students in a role play and direct, and abstract learning activities (13.57%) such as asking questions to professionals were mentioned least. Not one student mentioned learning by computer or multimedia.

Personality characteristics
The mean scores were 3.76 for agreeableness, 3.94 for extraversion, 3.76 for conscientiousness, 3.24 for emotional stability, and 3.57 for autonomy. The mean score on extraversion was significantly higher than the means on the other four scales. Cronbach's alpha's were as follows: 0.48 for agreeableness; 0.73 for extraversion; 0.59 for conscientiousness; 0.81 for emotional stability; and 0.61 for autonomy.

Using the pilot study results for multimedia assessment

From the results of the pilot study we concluded that at the start of their education first-year social work students had stereotypic and non-differentiated views on communication in their future profession, and of communication abilities of social workers. Social-work students viewed learning from

a constructivistic perspective, they wanted to be actively involved in the acquisition process of professional social-communicative competence (e.g., by role playing), they had a key interest in theoretical backgrounds of communicational processes and they saw the potential of observational learning in order to learn how to communicate. Finally, it was found that the students were quite extravert.

These main findings were taken as starting points and related to research findings from studies on developing educational multimedia (e.g., Cennamo, 1993; Parlangeli et al., 1999; Hammond et al., 1996; Hannafin & Land, 1997), studies on learning (e.g., Baldwin, 1992; Brown et al., 1989) and literature on assessment (e.g., Schuwirth, 1998; Swaak, 1998).

First, we decided that it was necessary to broaden our students' horizons concerning professional communicative situations. Therefore, we chose to use video fragments of social workers communicating in (ten) different professional contexts. Additional learning material in the form of questions was offered. This choice was supported by research showing that video provides professional communicative behaviour to be observed in authentic settings which enables easy transfer to practical situations (Van der Zee et al., 1997). Video fragments should contain different authentic contexts (Brown et al., 1989; Reigeluth & Schwartz, 1989), different kinds of professional situations (Eisler, 1976; Hannafin & Land, 1997), and positive and negative role models (Baldwin, 1992). In this way the students receive the opportunity to establish a more differentiated view of communication in the field of social work. Learning from observing professionals fits to the constructivistic learning situation, but is also a way of learning that could be beneficial for reproductively oriented learners. The social work students view learning mainly from a constructivistic perspective, but in certain situations they learn reproductively. This video learning may support both ways of learning.

Assessments almost always contain questions. We found that 'triggering' and guiding questions are most beneficial for the learning process (Cennamo, 1994). Examples of questions we wanted to use were: 'What kind of question should you ask at this moment?', 'What is a correct professional response?' (skills), and 'What is non-verbal behaviour?' (knowledge). It was decided to develop a feedback module to inform students about communication in general and their actions in the communication-test in particular (Parlangeli et al., 1999; Reigeluth & Schwartz, 1989; Schuwirth, 1998; Swaak, 1998). Content material about basic communication skills should be included in this extensive feedback module as well (Gordijn, 1998), to inform students whether their answers were correct, what would be the best option in a particular situation, and why this was the best option.

The test should measure basic communication skills such as observing non-verbal behaviour, listening, summarizing, and asking explorative questions. The multimedia assessment should be easy to work with (Cennamo, 1993, 1994), so that double learning processes would be avoided (simultaneously learning how to interact with the system and acquiring skills and concepts) (Parlangeli et al., 1999). Workshops and guidance were prepared to introduce students to multimedia assessment.

Being extravert, the social work students should be involved actively in the assessment, for example, by working on open-ended questions, reflecting on the presented communicative situations and on their own behaviour in similar situations (Holsbrink-Engels, 1997a, b). This is in line with the constructivistic view on learning. Table 2 presents an overview of the implications derived from the pilot study and the literature used to develop the multimedia assessment.

Developing an instrument for the assessment of social-communicative competence

Test development

In total ten multimedia tests were developed: two tests for basic communication skills, four tests for 'bad news' dialogues, two tests for advising clients, and two tests for counselling. First, one test on basic communication skills was developed, and after it had been tried out and improved, the other nine tests were developed.

First, a script of one professional dialogue in an authentic context was written. Semi-professional actors played the script, which was recorded on video. The taped dialogue lasted 12.5 minutes and consisted of one complete dialogue from opening to closure. Two communication experts divided the dialogue into twenty fragments, which were used to develop the items for the test. Because of the story-line all fragments had to be viewed in a fixed sequence of related cuts (Cennamo, 1993).

The first test required students to observe non-verbal behaviour, to listen, to summarize, and to ask explorative questions. The two communication experts watched the video fragments several times, then developed and improved multiple-choice questions, multiple-response questions, open-ended questions and questions involving the ranking of alternatives questions. This was checked by two assessment experts. The first test version consisted of 58 questions.

An assessment tool for Internet (Question Mark Perception) was used to implement the tests. First, the system displayed instructions and pointed out

Table 2. Implications for the development of multimedia assessment for communication (based on the pilot study and a review on the literature)

Tune to the characteristics of the users
  – match between characteristics of the assessment materials and the students (Cennamo, 1992)
  – students' memory load should be minimised (Parlangeli et al., 1999)
  – students should feel in control of the system (Parlangeli et al., 1999; Merrill, 1980)
  – computer must respond to students' actions in a way that reflects that situation (Reigeluth & Schwartz, 1989)

Design process
  – design is an iterative process which involves evaluation and redesign phases (Rouet & Passerault, 1999)
  – all tests must be monitored by quality control mechanisms (Schuwirth, 1998)
  – prevent errors (Parlangeli et al., 1999)
  – thoroughly test the software (technical and content) (Hara et al., 2000)
  – allow the lecturer to edit, add to or resequence the materials (Hammond et al., 1996)

Use of video: content
  – use of concrete examples/scenes (Hammond et al., 1996)
  – create scenes as vividly as possible (Eisler, 1976)
  – provide a real life context (Brown et al., 1989; Hannafin & Land, 1997; Hammond et al., 1996; Reigeluth & Schwartz, 1989)
  – use critical elements of the communication process (Hannafin & Land, 1997)
  – make the content central, not the computer system (Cennamo, 1994)
  – reduce complexity
  – use simple and natural dialogue (Parlangeli et al., 1999)
  – use the user's language (Parlangeli et al., 1999)
  – be consistent (Parlangeli et al., 1999)
  – use a variety of scenes/representations (Eisler, 1976; Baldwin, 1992; Hannafin & Land, 1997)
  – use a combination of positive and negative role-models (Baldwin, 1992)

Use of video: system
  – use related cuts in video segments (Cennamo, 1993)
  – use a high degree of correspondence between auditory and visual information (Cennamo, 1993)

Multimedia assessment system
  – use a simple interface and a simple navigation system (Cennamo, 1993, 1994)
  – provide clearly marked exits (Parlangeli et al., 1999)
  – prevent errors (Parlangeli et al., 1999)
  – allow action reversal (Parlangeli et al., 1999)
  – provide appropriate guidance (Hammond et al., 1996)
  – direct the learners to learn and inform them of the learning objectives (Cennamo, 1994)
  – provide feedback (Parlangeli et al., 1999; Swaak, 1998; Schuwirth, 1998)
  – use guiding questions to use while attending to the program (Cennamo, 1994)

Table 2. Continued

Item construction
- − use simple and natural dialogue (Parlangeli et al., 1999)
- − items must be comprehensive (Schuwirth, 1998)
- − use the user's language (Parlangeli et al., 1999)
- − break down long arguments in statements (Tait, 1998)
- − avoid justifications and periphrastic and discursive styles (Tait, 1998)
- − write items in the second person singular (Hendriks et al., 1999)
- − exclude negotiations (Hendriks et al., 1999)
- − avoid formulations that are conspiratorial in one way or another (Hendriks et al., 1999)
- − ban dispositional terms, particularly trait-descriptive adjectives and nouns (Hendriks et al., 1999)

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that the assessment was designed to be educational and that the students would learn from the assessment (Cennamo, 1993). Figure 1 presents this opening page. Next, the two characters in the assessment were introduced. The student was asked to take on the role of the social worker on the video and pretend to be Mr Beeks (see Figure 2). After this introduction the assessment started. The student could watch a video fragment by clicking the view button. Each fragment could be watched as many times as desired. Each page contained one question (Figure 3). The students read a question, watched the video, and answered the question. Action reversal was allowed. When the student was certain about his answer, he clicked the feedback button and immediately received extensive feedback.

Quality expert meeting

It is an important condition for the quality of an assessment that experts agree on the effectiveness of the questions and the answers (Van der Maesen et al., 1999; Messick, 1995). Eighteen communication experts and 13 research experts judged the quality of the first multimedia test, using a printed version of the test and a videotape of the fragments. First, each expert judged the quality of the questions individually on a 5-point Likert scale running from 'This question has a very bad quality' (scored 1) to 'This is a 'good quality' question' (scored 5). The questions were presented separately without the possible answers (in case of multiple-choice and multiple-response questions). Next, the questions *and* the answers were presented and the experts judged the quality of the answers on a 5-point Likert scale. This was all done in writing. (The first version of the test *did not contain any feedback*, because first the final version of the questions had to be developed and
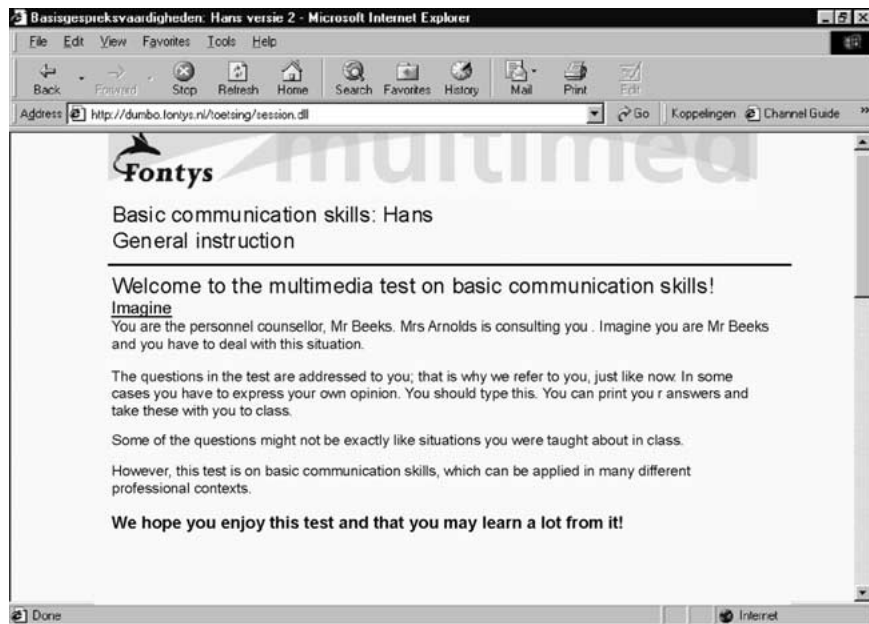
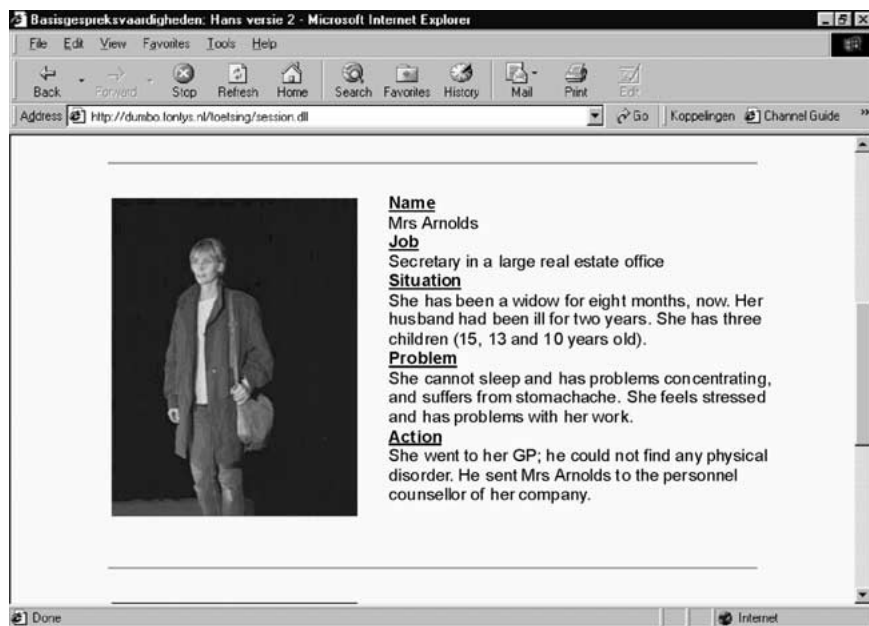*Figure 1.* (Translated) opening page with instruction and educational message.

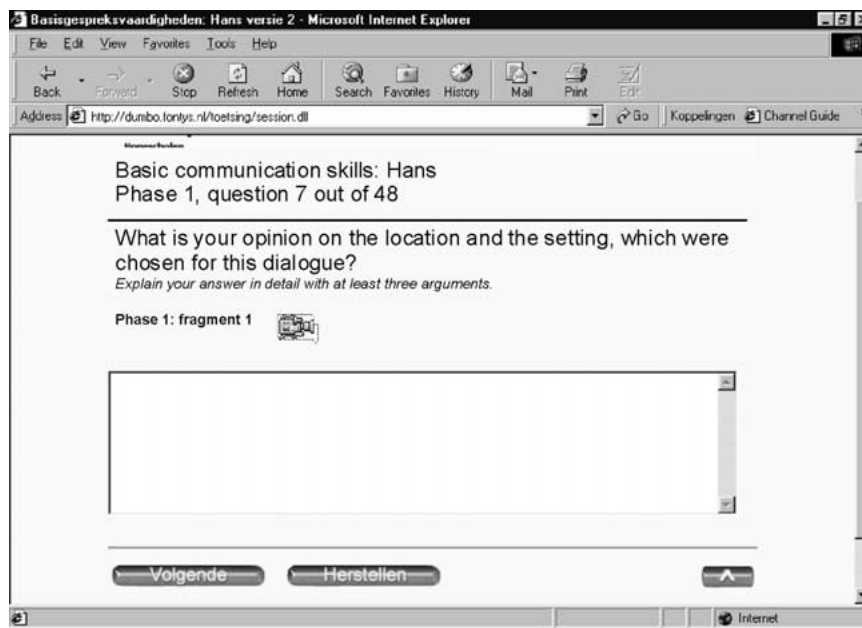*Figure 2.* (Translated) introduction page of the main characters in the assessment.

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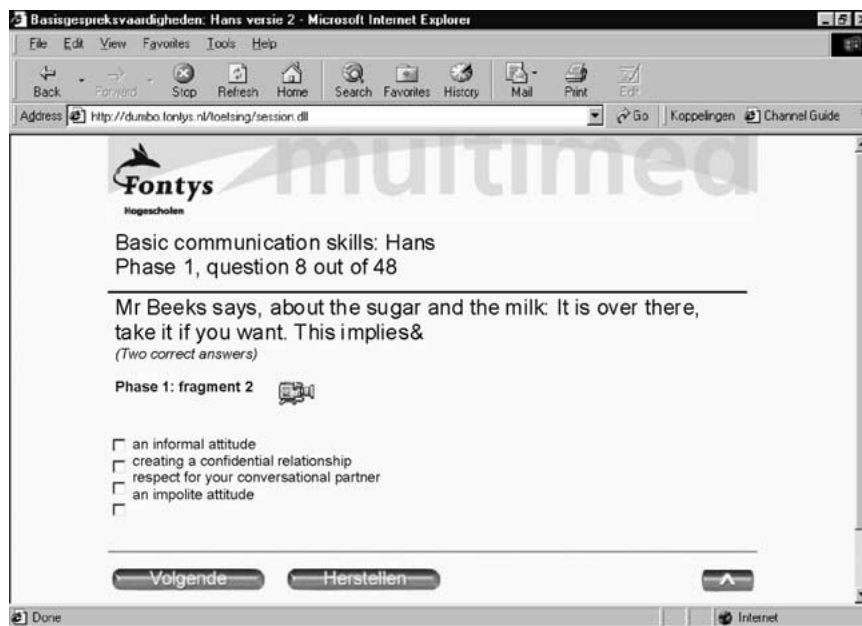

Figure 4. (Translated) typical multiple response question page with video view button.

then the feedback could be written. Therefore, the experts had not judged the feedback.) All experts' suggestions and comments were analysed by a team of four communication and assessment experts. This resulted in a large number of mainly textual adaptations. Eventually an improved last version was investigated by students.

Method

Sample
Participants in this study were 396 full-time social work students: 176 first-year students, 147 second-year students and 73 fourth-year students. The first-year and second-year students participated obligatorily as part of their 1999/2000 curriculum, resulting in an almost 100% response rate. The fourth-year students volunteered to participate and this resulted in a 19% response rate. The sample consisted of 8 percent men and 92 percent women. The average age of the total sample was 19.2 years.

Design

The study was cross-sectional. The first-year students had to complete the multimedia assessment at the entrance of their study and again after having attended classes for half a year. We did not provide the feedback module because we were primarily interested in the students' reactions on this new assessment form. In this stage of the project, we could still make adaptations to the assessment, when the students would lead us to that. An additional reason for not providing feedback in this phase was, that we wanted to investigate students' answers without possibly assessing learning potential as well (Resing, 1997). All students received the same assessment and procedure (first, second and fourth year).

Materials

Multimedia computers with Internet facilities were available for every individual student. Multimedia headsets were used for better concentration. For evaluating the new assessment method, a paper-and-pencil questionnaire with five questions was used. First, students were asked how long they had worked on the assessment. Next, they were asked whether they liked the multimedia assessment, whether they thought this kind of assessment could be useful to learn how to communicate, and whether they thought this kind of assessment could be used as a form of summative testing; for these four questions 5-point Likert scales were used. Finally, they gave a general judgement of the test, ranging from extremely bad (scored 1) to extremely good (scored 10).

All students had to complete their regular assessments at the end of the first semester: first-year students completed a communication role-play test (and the multimedia test), second-year students completed a test on family intervention skills, and fourth-year students completed a test on group-communication skills. The tests for the second- and fourth-year students were role-play tests which included basic communication skills. Students' grades on these communication assessments (ranging from 1 to 10) were collected from institutional files.

Procedure

In the first weeks of their study students completed the multimedia assessment and the questionnaire. After a brief set of directions was read out, the students started the multimedia assessment. After completion they received the evaluation questionnaire. They completed the assessment and the questionnaires in their own pace, without feedback. Students' grades on other communication assessments were collected from institutional files.

Data analyses

Only 340 data records of students that could be retrieved from the database were analysed: 161 data records from first-year students, 123 from second-year students, and 56 from fourth-year students. Two analyses were performed to determine the validity of the multimedia assessment:
(1) Analyses of variance (ANOVA's) and post-hoc comparisons of means (Scheffé tests) were performed on the assessment scores of the three groups to investigate possible differences;
(2) Correlations were determined between assessment scores and scores on other communication tests. The evaluation questionnaire scores were compared between the three groups by means of ANOVA's and post-hoc comparisons of means; and
(3) A principal component analysis of the tetrachoric correlation matrix was conducted to investigate possible multidimensionality of the assessment. The correlation was computed between the first and the second multimedia test for the first-year students to investigate the stability (test-retest reliability) of the assessment.

Results

One-way ANOVA's indicated significant differences on the assessment between students' of different academic years (F = 25.34; $p < 0.001$). Post

Table 3. Mean scores on the multimedia assessment and scores on other communication tests

Study year	Mean (*sd*)		
	First-year	Second-year	Fourth-year
Multimedia assessment 1 (in %)	34.43 (*sd* 8.58)	40.29 (*sd* 8.87)	42.76 (*sd* 9.06)
Communicative role-play test (1 to 10)	7.22 (*sd* 1.05)	–	–
Multimedia assessment 2 (in %)	38.07 (*sd* 10.02)	–	–
Family intervention skills (1 to 10)	–	6.58 (*sd* 0.95)	–
Group communication skills (1 to 10)	–	–	6.98 (*sd* 0.69)

hoc comparisons (Scheffé-test) showed that first-year students scored significantly lower than the other two groups, whereas no significant difference was found between tests scores of second-year students and fourth-year students. Mean scores on the communication assessments are presented in Table 3. Scores on a communication role-play test for first-year students correlated positively to scores on the multimedia assessment ($r = 0.30$, $p < 0.01$). Scores on a test on group communication skills for fourth-year students correlated positively with the scores on the multimedia assessment ($r = 0.33$, $p < 0.05$). Test results on family intervention skills for second-year students were not related to scores on the multimedia assessment.

Principal component analysis on items of the multimedia test resulted in two components (eigenvalues > 1.0). For each factor resulting from rotation to simple structure, items were selected with loadings of at least 0.4. The first factor was interpreted as a skills factor and the second factor as a knowledge factor. Cronbach's alpha, based on the items loading at least 0.4, for scale scores on the first factor was 0.48 and for scale scores on the second factor 0.38. Cronbach's alpha for the whole test was 0.56 (based on all items).

The correlation between the multimedia assessment test scores at the beginning of the academic year and half a year later was 0.23 ($p < 0.001$). First-year students performed significantly better on the second assessment (mean score of 38.07; *sd* 10.02) than on the first assessment (mean score of 34.43; *sd* 8.58) ($t = 3.82$; $p < 0.001$).

It took students approximately one hour and a half to work on the assessment. Students evaluated the multimedia assessment as being rather positive. Fourth-year students were significantly more positive about the new method than the other two groups. Many students considered the assessment to be useful for learning (see Table 4 for mean scores). Fourth-year students reported that the assessment would be adequate as a form of summative assessment. First-year and second-year students were significantly ($F =$

Table 4. Analysis of variance concerning the evaluation of the multimedia assessment

Study year	Mean			F
	First-year	Second-year	Fourth-year	
Time spend on assessment (minutes)	90	85	92	2.08
Like assessment	3.6	3.6	4.1	9.86***
Useful for learning	3.4	3.6	3.6	1.43
Summative test	3.2	3.5	4.0	12.39***
Judgement	6.7	6.9	7.4	11.13***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

11.13, $p < 0.0001$) less positive about summative multimedia assessment of social-communicative competence. Almost all students judged the new assessment as sufficient (a score of 6 or higher on a ten-point scale), whereas fourth-year students were significantly more positive than the other students. Voluntary comments given most frequently were: "I've learned to observe a conversation; this is very valuable", "My concentration at work has increased because of this method", "I compare my own behaviour with the role-model's behaviour", "I don't like working with computers, so I like this neither", and "I prefer real-life situations".

Discussion and conclusion

Validation of multimedia assessment

The reliability and validity of most social competence assessment procedures are uncertain (Bellack, 1979). It is important, however, that assessment procedures contribute to the prediction of a student's behaviour in different related situations (Schlundt & McFall, 1985). Experts were asked to judge the validity of the assessment procedure we developed with regard to social-communicative competence for social work students. Face validity was sufficient, but the experts also had many suggestions to improve the assessment.

Schuwirth (1998) states that performance on assessments should increase with increased expertise, which should be an indication of stability and validity of the test. Indeed, the first-year students performed significantly better on the second multimedia assessment than on the first one. The correlation between the two test results was rather low. However, this may be explained by the fact that the first-year students made their first test in the first academic week, when they had not received any training at all. Another

indicator of validity is the degree to which differences between students from different academic years are found (Smit & van der Molen, 1996). Indeed, first-year students performed significantly worse on the test than the older students. This implies that the assessment is reasonably valid. We related scores on other assessments of social-communicative competence to scores on the multimedia assessment. Scores on two out of three tests were positively related to scores on the multimedia assessment, while scores on a test on family intervention skills did not. The family intervention skill-test assesses more than basic communication skills; the same goes for group communication skills, but the latter is more comparable to a test on basic communication skills. It might have been better to choose tests which had more in common, but unfortunately such tests were not available in the regular curriculum. Our conclusion is that the reliability of this first multimedia test could still be improved. It is possible that the test does not only measure social-communicative competence, but other psychological skills and abilities as well. This should be investigated in future research.

Tuning to future users and students' attitudes towards multimedia assessment

The pilot study in combination with a literature research resulted in a useful set of guidelines to develop multimedia assessment for our group of students. The students reported to like the multimedia assessment, even though they did not receive feedback yet. Approximately half of the students indicated that they would have appreciated feedback. The fourth-year students were most positive about a future version of this assessment which would contain feedback. In contrast to the first-year and second-year students, the fourth-year students reported that this kind of assessment could be used very well as summative assessment in the future. A possible explanation for the more positive attitudes towards multimedia assessment is that the fourth-year students had more practical communication experience, since they had already 'worked' in a professional organisation during their traineeships. Another possible explanation for the more positive attitude of fourth-year students is that they signed up to participate in the study voluntarily, whereas first-year and second-year students had to participate as part of their curriculum.

The students mentioned that the assessment was easy and straightforward to use. The 'simple' structure and interface were deliberate design decisions in order to prevent overload for the students in finding out how a particular page was organised, which features were available and how to interact with these. Students soon became familiar with the possibilities and were free to concentrate on the content (Tait, 1998). Altogether, the tuning of the students'

characteristics to the characteristics of the multimedia assessment seemed to be quite successful. However, this does not mean that the materials developed are relevant for social work education only. The tests can be applied to other fields of education in which social-communicative competence plays an important role, for example, in Teacher Training Colleges or in Management Training. At this moment, the multimedia tests are used in the educational programme for radiotherapists (Pisters et al., 2002) and social law.

Development of formative multimedia self-assessment as learning tool

Social-communicative competence can (diagnostically) be assessed by means of multimedia. Students can assess themselves when they are well prepared, because of the formative nature of the assessment. Formative self-assessments can be seen as powerful tools in a learning environment, which stresses active and self-directed learning. Indeed, as constructivists have claimed learning and assessment are inseparable and closely intertwined. The questions presented during the assessment direct the students to the key contents and enhance interactive learning (Issenberg et al., 1999). This kind of formative assessment (with direct feedback) may be integrated throughout the entire curriculum so that deliberate practising to acquire expertise over time is possible (curriculum embedded assessment). Properly constructed multi-media materials can be useful in many instructional situations (Kieley, 1996). Multimedia can make topics more accessible, which are otherwise difficult to convey through lectures or conventional printed material (Hammond et al., 1996).

For a basic course in communication Smit and her colleagues (1996) recommend the use of video tests in combination with paper-and-pencil tests, because they are both efficient tests for the assessment of knowledge, insight, and skills. We recommend multimedia tests as formative as well as summative assessment (summative multimedia assessment should be without feedback), in combination with summative role-play tests. Development of reliable and valid material that is well adjusted to the target group is expensive and time-consuming. If the multimedia tests are used to supplement existing tests will it be a large investment. If the tests are meant to replace an existing element, such as role-play with professional actors and two observers (carried out individually with each student, with groups of 200 students or more), then it will be worthwhile it to see if one can design the tests oneself.

Results of our study need to be verified and extended in further research using large samples and possibly other indices of social-communicative competence to investigate the validity more thoroughly. It is recommendable to use groups of equal size, which in this study was not possible due to practical circumstances. Not all data from the participating students could

be used, because some incomplete datasets were retrieved from the database. In next studies, we will take special care of database management.

In future research, the reliability of the developed multimedia assessment should further be improved and the assessment should be refined further. Effects of the guidelines for development of the assessment instrument can be subjected to further research, as well as the relation between students' characteristics and the way they learn from video, and make use of assessment with and without feedback.

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