

Developing a feedback tool to gain insights into the professional identity of STEM students



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Developing a feedback tool to gain insights into the professional identity of STEM students

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Abstract

It is expected that the number of jobs in the technical sector will grow the next years. Nevertheless, technical companies have to deal with a shortage of technical staff. This deficiency can be explained by the fact that many technical students leave the technical sector when they enter the labor market. The aim of this study was to develop a feedback tool to provide STEM students with personalized feedback about their professional identity. Insight in professional identity is an important step to make STEM students aware of their own professional identity and contributes to career choices that suit the student. Furthermore, a strong professional identity increases the motivation for a study and reduces the change of leaving the technical field. A literature review and focus group discussions with STEM students were used to determine the five design requirements for the feedback tool: informative, clear, goal oriented, concise and to the point, and the use of multimedia principles. In general, students indicated the feedback tool as useful to gain insights into their professional identity and the feedback turned out to be concise and to the point, informative, and clear. Students could identify themselves with the feedback and preferred to read all information about the profiles, the dimensions and the next steps. To make STEM students pro-active in their own learning and to meet the lack of the reflective nature of career guidance for STEM students the feedback tool could be used as a mapping tool to provide a starting point for a dialogue about a future career between STEM students and counselors.

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1. Problem statement

Technical companies represent a quarter of all companies in the Netherlands and yield a fifth of the Dutch job market (Volkerink, Berkhout, Bisschop & Heyma, 2013). It is expected that the number of jobs in the technical sector will grow with 300.000 jobs between 2015 and 2020. Yet, technical companies deal with a shortage of technical employees. At the moment, 31% of all technical students under the age of 35 decide to work outside the technical sector (van der Kaaden & van der Schier, 2016). In current literature, no apparent reasons are identified which could explain the large numbers of technical students leaving the technical field.

The Dutch Government has stated that more science, technology, engineering, and mathematics (STEM) students will have to work in the technical sector to reduce the shortage of technical staff (Ministerie van Onderwijs, 2016). Gelderblom and de Hek (2014) state that technical students who have received guidance from educational institutes in their search for a job work more often in the technical sector compared to students who have not received this guidance. Nevertheless, career guidance in most educational institutes often focuses on the educational program instead of the future career (Mittendorff, 2014). It can be concluded that too little attention is given to the future work field and future career of the student after completion of the educational program (Luken, 2011).

A few years ago, the Dutch government has determined career guidance as a tool to help students to make well-considered career decisions (Deursen & Jansen, 2006). To come to well-considered career decisions, students need to explore who they are and what they want. The focus of career guidance should be on the students themselves and their personality and interests. In essence, students have to develop and think about their own professional identity.

A professional identity is the interpretation of a person about himself in his professional role (Molinero & Pereira, 2013). Beijaard, Meijer & Verloop (2004) have pointed out that professional identity starts with self-knowledge about who you are at this moment and who you want to become. A strong professional identity increases students' motivation for their educational program and stimulates stable career choices (Meijers, Kuijpers & Gundy, 2013). Furthermore, it also reduces the number of switched between professions and reduces the chance of leaving the technical sector (Canrinus, Helms-Lorenz, Beijaard, Buitink & Hofman, 2012).

Previous research about professional identity was mostly focused on teachers (e.g. Hong, 2010) and doctors (e.g. Pratt, Rockmann & Kaufmann, 2006). Little research has been conducted about the professional identity of STEM students. However, professional identity gained more attention in recent research. Last year, an instrument to measure STEM students' professional identity, the Career Compass, was developed at the University of Twente (Möwes, 2016). Yet, it has not been investigated how feedback on students' professional identity can be presented. The first step of this research is to gain insight in which information STEM students seek about their professional identity to make well-considered career choices. The next step is to examine the needs, wants, and wishes of STEM students regarding a feedback tool which provides students with personalized feedback about their professional identity.

2. Theoretical Framework

In the next sections, the concepts career choice, professional identity, career guidance, and designing feedback on professional identity will be discussed. First, difficulties in making career choices will be introduced. Second, the importance of professional identity will be discussed. Third, the role of career guidance for STEM students will be examined. Last, requirements for effective feedback will be discussed and it will be considered how feedback on professional identity can be designed.

2.1 Career Choice

One of the most difficult decisions that people need to make in their life is their choice of career (Fabio, Palazzeschi, Asulin-Perets & Gati, 2013). Once people have chosen a career direction there is a high probability that they continue working in this field for the rest of their life. Therefore, career choice has a major impact on someone's life (Meng, 2016; Olamide & Oluwaseun, 2013). To achieve a career choice students must know themselves and use this self-knowledge to make good career decisions (Olamide & Oluwaseun, 2013). In addition, the process of making choices about a future career is a complex, dynamic and individual process which demands attention and serious thoughts (Mutha, Takayama & O'neil, 1997).

Gati, Krausz & Osipow (1996) distinguish three main difficulties that can occur during the process of attaining a career choice: lack of readiness, lack of information and inconsistent information. First, there are students who may have a lack of motivation to participate in the career decision process (lack of readiness). Second, students may receive unreliable information or have conflicts with themselves or other people, for example incompatible preferences (inconsistent information). Lastly, lack of information includes self-knowledge, lack of knowledge about opportunities that exist after completing the educational program and ignorance about ways to obtain information to come to a career choice (Gati et al., 1996).

Several difficulties can arise during the complex process of making a career choice. For this reason, students need information about themselves in order to develop self-knowledge and information about opportunities for a future career.

2.2 Professional identity

People are constantly trying to find out who they are and where they want to be in a few years. This is a continuing process of interpretation and re-interpretation of experiences, called identity (Beijaard et al., 2004). Identity can be described as a personal answer on the question 'Who am I at this moment?' (Beijaard et al., 2004; Crocetti, Avanzi, Hawk, Fraccaroli & Meeus, 2014). Identity is formed in relationship with others and consists of sub identities. Identity also includes social aspects, cultural sights, and emotions (Rodgers & Scott, 2008).

Professional identity is the interpretation of people about themselves in their professional role (Molinero & Pereira, 2013). It provides answers to the questions 'Who am I as a professional?' and 'Who do I want to become?' (Beijaard et al., 2004). In addition, professional identity is often defined as people's perception of themselves in their profession and the employee they wish to become (Canrinus, 2011).

Professional identity can be divided into identity content and identity strength. Identity content includes all components that form someone's professional identity, whereas identity strength can be defined as the extent to which someone matches these components (Becker & Wagner, 2009). Previous research was mostly aimed at identity strength, but recent research has shown that identity content influences students' career choices as well (Möwes, 2016). Identity content presents students' intrinsic drive to prefer a specific profession and provides insight in

students' ideas about themselves in their professional role (Ashforth, Harrison & Coley 2008). There are five components to measure the content of students' professional identity: personality traits, values, goals, interests, and competences (Ashforth et al., 2008). The focus of this research will be on the content of professional identity and the corresponding components.

Professional identity will not arise at a specific moment, but is a continuous and lifelong process which continues until someone's retirement (Moss, Gibson & Dollard, 2014). New experiences and someone's personal interpretations can adjust one's professional identity (Crogetti et al., 2014).

A strong professional identity is mostly seen when people are working, but the development of professional identity starts even before someone gets to work. Therefore research on professional identity development is often focused on students (e.g. Cannirius, 2011). During their study, students already focus on a career direction e.g. by selecting a company for their internship. Some students already have a detailed career direction in mind whereas other students have no ideas about their future career. Yet, it is important because a strong professional identity contributes to well-considered career choices (Meijers et al., 2013).

Many factors play a role in defining students' professional identity. For this reason, it is important to guide students during this process for example by specific career guidance.

2.3 Career Guidance

Career guidance can be seen as a helpful instrument to support students in taking thoughtful decisions with regard to their career (Deursen & Jansen, 2006). The main objective of career guidance is to make students pro-active and responsible for their own learning and career path (Kuijpers & Meijers, 2009; Mittendorff, Jochems, Meijers & den Brok, 2008). According to Mittendorff (2014) career guidance should specifically focus on students' motivation for a particular occupation, student's view on a particular profession, the type of work that suits the student, and the qualities of the student.

Students' expectations about a future profession can be identified through reflective conversations. Reflection on experiences in the technical field of work combined with personal questions and goals leads to awareness of students' interests and abilities. Vos and Vlas (2000) state that these reflections can stimulate the development of students' skills and professional identity. Furthermore, reflection leads to a better understanding of previous actions and connects knowledge with professional practice (Bolton, 2014). Reflection involves more than just talking about experiences of professionals and discussing the experiences of students in the field. There must be attention for students' own actions and creating knowledge about the consequences of these actions. Overall, career guidance should include reflection to develop skills that lead to involved, curious and enterprising students (Kuijpers, 2015).

Career guidance is relatively limited in most educational institutes, (Deursen & Jansen, 2006). One main reason is that educational institutes fail in the field of dialogue (Kuijpers and Meijers, 2012). Students communicate more with fellow students about their educational program and career ideas than with study counselors. Students receive too little personal attention and individual conversations, because higher education institutions are very large in size (Deursen & Jansen, 2006; Kuijpers & Meijers, 2012; Luken, 2011). Another reason is that career guidance often is focused on the educational program itself instead of future occupations (Luken, 2011). Third, when educational institutions provide personal conversations the counseling often focuses on providing assistance. Students get a lot of information about their future field of work, but are not sufficiently encouraged to think about their own careers (Kuijpers & Meijers, 2009). Lastly, students find it difficult to reflect

on themselves and their actions. Students experience difficulties with making establish links between the curriculum and their future career. Instead of a contribution to their own career development, students think of reflection as a mandatory component (Kuijpers & Meijers, 2009).

2.4 Designing feedback on professional identity

Two concepts that play an important role in the development of the feedback tool are the content and the presentation of the feedback. The first paragraph identifies requirements for effective feedback which should be included in the feedback tool. The second paragraph focusses on the design of the feedback tool and its presentation. In both paragraphs, important concepts are being explained and the available literature is being summarized.

2.4.1 Requirements of effective feedback

Feedback can be seen as information provided by an agent (e.g. person, book) that contains characteristics of one's performance. The aim of feedback is to reduce discrepancies between the current performance and the intended performance (Hattie & Timperley, 2007). Empirical research shows that students are often incapable of understanding feedback and interpreting the information correctly (Quinton & Smallbone, 2010). Furthermore, students sometimes refuse to read feedback, they reject received feedback or hesitate to take actions as a consequence of the feedback.

Effective feedback answers three questions: 'Where am I going?', 'How am I going?', and 'Where to next?' (Hattie & Timperley, 2007). In other words, feedback should contain goals to stimulate goal-directed actions, information about progress, and information that challenges students to greater possibilities for learning. Furthermore, students prefer clear feedback that can be interpreted easily to avoid confusion about the content (Rae & Cochrane, 2008; Weaver, 2006). The provided information of the feedback should be understandable for students so they can act upon it (Brookhart, 2017; Omer & Abdularhim, 2017). Therefore, feedback should contain language that students can understand (Weaver, 2006).

Feedback requires a balance between positive and critical feedback (Weaver, 2006). Positive feedback, described in non-evaluative language, increases students' confidence, motivation, and the expectation to successful goal attainment (Fishbach, Eyal & Finkelstein, 2010; Omer & Abdularhim, 2017; Weaver, 2006). To be effective, the positive formulated feedback needs to be purposeful and a goal setting plan needs to be included (Evans, 2013; Hattie & Timperley, 2007). Furthermore, effective feedback should be informative and meaningful to students to stimulate motivation and involvement (Evans, 2013; Hattie & Timperley, 2007). Lastly, the individual student should be at the center of the feedback (Weaver, 2006).

The discussion above shows that feedback needs to be understandable, informative, clear, positive, and goal-oriented. Such feedback could be assigned as effective feedback that gains insights into students' performance. In the current study, the feedback needs to gain insights into students' professional identity instead of their performance. Professional identity will not be improved after a certain period, but students' professional identity can become stronger. Therefore, the objective of the feedback is to gain insights into students' professional identity and into a career direction that suits the student, e.g. by the use of profiles to provide an image of a future career to stimulate further development of students. For the development of the feedback tool in this research we will take the above-listed requirements into consideration.

2.4.2 Design feedback tool through multimedia principles

Multimedia presentation has been researched extensively and is identified as a powerful tool to stimulate students to select, organize, and integrate texts and images (Mayer, 2009). Multimedia

learning can be defined as learning from materials whereby words and pictures are used (Mayer, 2002). Words could be presented as printed text or as spoken narration and pictures can include illustrations, photographs, charts, animations or videos (Issa et al., 2011; Mayer, 2002; Mayer & Moreno, 2003). Multimedia learning has shown to lead to better learning results (e.g. Issa et al., 2011). Therefore, multimedia presentation can be useful for the design of the feedback tool.

During the last decade, it has been investigated how people learn and how information can be presented in a way that supports people to learn (Mayer, 2002). People have two separate information channels; one channel for auditory/verbal materials and one channel for visual/pictorial materials. It can be concluded that people benefit the most from combining both channels and using both words and pictures in learning materials (Mayer & Moreno, 2003).

Mayer (2009) composed 12 principles for the design of learning materials to reach a maximal learning result by using both channels and combining different forms of multimedia in one lesson. For the design of the feedback of professional identity, not all principles can be used because the feedback will not include narration. This decision is made because the effect of the multimedia principle has been proven in research and research on narration varied in outcomes (e.g. Tabbers, Martens & Merriënboer, 2004). Therefore the remaining 6 principles of Mayer (2009) will be taken into account in this research.

Multimedia principle: students learn better from words and pictures than from words alone. When words and pictures are both presented in learning materials, students can construct verbal and pictorial models and build connections between them.

Spatial contiguity principle: students learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen. When corresponding words and pictures are presented near each other, students do not need to visually search the page or screen and thereby using cognitive sources. Consequently, students seem more able to hold representations of both in working memory at the same time.

Temporal contiguity principle: students learn better when corresponding words and pictures are presented simultaneously rather than successively. When corresponding words and pictures are presented simultaneously, students seem more able to build mental connections between verbal and pictorial representations while representations of both will be in working memory at the same time.

Signaling principle: students learn better when cues that highlight the organization of essential material are added. When signaling is used, students seem more able to pay attention to relevant materials whereby cognitive load will be reduced.

Segmenting principle: students learn better from a multimedia lesson when it is presented in user-paced segments rather than as a continuous unit. The use of user-paced segments by using a continue button will result in greater learning while students have the opportunity to reduce the load of information.

Personalization principle: students learn better from a multimedia lesson when words are in conversational style rather than formal style. When students receive learning materials in conversational style, the computer will be recognized as a social partner. For this reason students will focus more on the comprehension of the message.

The feedback about students' professional identity should include images and texts to stimulate maximal comprehension of the feedback. In addition, the six principles as discussed above will be taken into account for the design of the feedback tool.

2.5 The current study

Overall, the review of literature demonstrates that professional identity gained more attention over the last decennium. The importance of insight in professional identity to make well-developed career decisions and the professional identity of STEM students is examined in previous research (Möwes, 2016). However, still little is known about how information about STEM students' professional identity can be provided and how this feedback can be presented in the best way to enhance well-considered career choices. Therefore, the current study will examine which information students need to gain insights into their professional identity and how a feedback tool can be designed to provide STEM students the needed information in a personalized manner. The review of literature about feedback identified five elements to provide effective feedback; feedback should be understandable, informative, clear, positive, and goal-oriented. Furthermore, the feedback should include a combination of images and texts. For that reason, the multimedia principles of Mayer (2009) should be taken into consideration when designing the feedback tool.

3. Research question

In this research, the focus will be on gaining insight in professional identity. It will be investigated which information about professional identity is needed for STEM students to make well-considered career choices. Furthermore, it will be examined how a feedback tool can be designed to provide STEM students the needed information in a personalized manner.

This research is split into several steps. All steps are conducted to design a feedback tool that provides information about STEM students' professional identity. Therefore the following research question is designed:

How to develop a feedback tool that provides STEM students with personalized feedback about their professional identity?

4. Method

In this chapter, the several steps of this research will be discussed. First, the overall research design, followed by the respondents and instrumentation were described in detail. Lastly, the procedure and the analysis of the data were explained.

4.1 Research design

This study executed an educational design based research as described by McKenney and Reeves (2012) to answer the research question. An educational designed based research is defined as research in which iterative development of solutions to practical and intricate problems provides the circumstances for scientific inquiry (McKenney & Reeves, 2012). This study included three phases in line with the model of educational design based research (see Figure 1).

During this study, a feedback tool to provide STEM students information to gain insights into their professional identity was developed. At the same time, the goal of educational design research was to develop usable knowledge that gains insights among participants and can be shared with other researchers (McKenney & Reeves, 2012). Therefore, the importance of STEM students opinions about the needed information to motivate them to read all information about their professional identity and their opinion about how the information could be presented were taken into account.

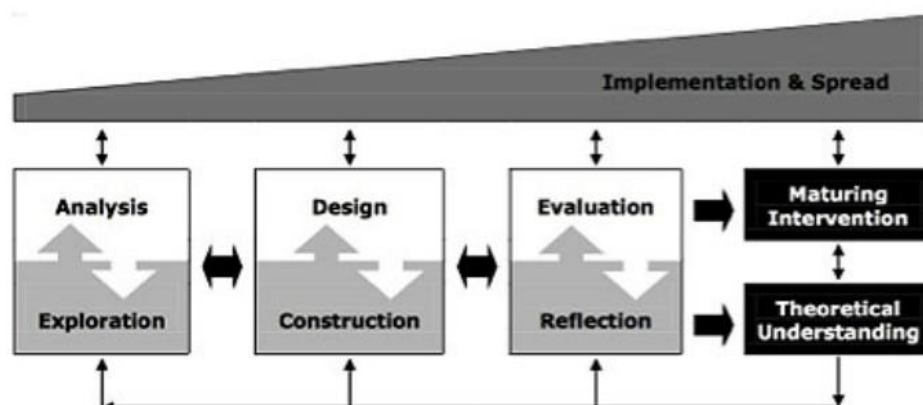


Figure 1. Model of Educational Design Research (McKenney & Reeves, 2012)

In the first phase (analysis), literature was used to analyze the concepts of career choice, professional identity, career guidance, and feedback. The first step was the performance of a literature review that resulted in the theoretical framework of this research. The second step included focus groups with STEM students to discuss design criteria for the feedback tool. The aim of the focus groups was to receive as much information as possible about the information STEM students needed to gain insight in their professional identity and how this information should be presented. The final aim of the first phase was to come up with design requirements for the feedback tool.

The second phase (design) consisted of the development of the feedback tool. The input of the STEM students during the focus groups was combined with the design criteria that arose out of the literature and focus groups. The feedback tool was developed in collaboration with a project team, consisting of a junior researcher, two master students and two senior researchers.

The third phase (evaluation) included the evaluation of the feedback tool as developed during phase 2. For this purpose, all STEM students who previously participated in the focus group

were approached by email (step 1) and a workshop for STEM students was given (step 2). STEM students were asked to evaluate the feedback tool and to discuss ways to improve the feedback. Furthermore, adjustments for the next version of the feedback tool will be discussed. The chronology of each iterative phase including the steps and the outcomes can be found in Table 1.

Table 1.
Chronology of the research design.

Phase 1 – analysis	
Step	Outcomes
Step 1: literature review	Design requirements feedback
Step 2: focus groups	Design requirements feedback Overview needed information about the content of professional identity Requirements for the presentation of the feedback
Phase 2- design	
Step	Outcomes
The design of the feedback tool	Web page that provides feedback about professional identity
Phase 3 – evaluation	
Step	Outcomes
Step 1: questionnaire	Evaluation of the feedback tool
Step 2: workshop students Applied Physics	
Output: recommendations revised version of the feedback tool	

4.2 Respondents

Phase 1, step 2 – Analysis

During the first phase of this research, STEM students were invited to discuss the needed information to gain insight in their professional identity during a focus group. Normally 3-5 focus groups are sufficient to reach saturation in the information (Morgan, 1997). A total of 36 STEM students participated voluntarily in the 6 focus groups; 14 STEM students of the University of Twente and 22 STEM students of Saxion University of Applied Sciences (6 female, 30 male). The size of the focus groups ranged from 4 to 11 STEM students. Krueger and Casey (2014) state that a focus group must be composed of 4 to 12 people to be small enough for all participants to share their ideas and to provide diversity of perceptions. Bachelor's and Master's students were contacted personally to participate in the focus groups and homogeneous sampling was used to form a group of students of the same educational program. Homogeneous sampling is often used to select focus groups and can be defined as sampling groups of participants because they have specific characteristics (Onwuegbuzie & Leech, 2007). In this study, all participants were selected because they were enrolled in a technical study program in Enschede.

Phase 2 – Design

No respondents were needed for the execution of phase 2.

Phase 3 - Evaluation

For the evaluation phase of this research, the same group of STEM students from phase 1 were asked to participate and approached by email to evaluate the feedback tool by the use of a questionnaire in

Qualtrics. All 36 STEM students were approached, whereby 5 students participated in the evaluation. Furthermore, a workshop was organized for a new group of STEM students. A total of 11 STEM students of the University of Twente participated voluntarily in this workshop; 9 male, 2 female. All students were in the final year of their bachelor's program Applied Physics and were selected by convenience sampling. Convenience sampling (Onwuegbuzie & Leech, 2007) was chosen, because a researcher of the project team had connections with the study advisor of Applied Physics. For the workshop, the same questionnaire as for previous participants was used to evaluate the feedback tool. Furthermore, the questionnaire was used as a starting point for the discussion at the end of the workshop and the open questions were used as a common thread in this discussion.

4.3 Instrumentation

Phase 1 - Analysis

The goal of the focus groups with STEM students was to determine the design requirements of the feedback tool and to map the information that STEM students would like to receive about their professional identity. The objective of a focus group is to obtain perceptions of people about a specific topic and is used to collect opinions and ideas (Krueger & Casey, 2014). Previously, a focus group guide was developed based on the design requirements of the literature review. The script of the focus group guide can be found in Appendix A.

The introduction of the focus group guide existed of three questions focused on professional identity. The first question during the focus group discussion was: *"Do you already have a clear picture of yourself in your professional role?"*. The aim of this introduction was to turn the STEM students in the right direction of professional identity. Next, the focus group discussion was split into two parts: the content of the feedback and the presentation of the feedback. The first part included ten key questions about the content of professional identity, such as *"What kind of information would you like to receive about yourself as a professional after filling in the Career Compass?"*. The second part comprised eight key questions about the design of the feedback. Meanwhile, a PowerPoint presentation was used to show visual feasible possibilities for the design of the feedback. The PowerPoint slides were shown after the discussion of the first open question *"Do you already have ideas about the presentation and visualization of the information about professional identity?"*.

Phase 2 - Design

No instruments were needed for the execution of phase 2.

Phase 3 - Evaluation

The goal of the questionnaire was to evaluate the feedback tool. Measured variables were informative, clear, goal oriented, concise and to the point, and the use of multimedia principles. These variables were measured for all components of the feedback tool: introduction, profiles, dimensions, and conclusion. The informative nature of the feedback tool was measured by the statement *"The texts about the profiles are informative"*. For the measurement of the variable clear, the statement *"The structure of the texts about the profiles is clear"* was used. The personalization principle was measured by the statement *"The texts about the profiles are written in a personalized style"*. These three variables were measured for all components and existed of four items in the questionnaire. To measure the variable concise and to the point, two statements were used for all components: *"The texts about the profiles are written concise and to the point"* and *"The texts about the profiles are written comprehensively"*. Concise and to the point existed of eight items in the questionnaire. The variable goal oriented was measured by the statements *"The texts about the*

profiles capture who I am as a professional” and “The texts about the profiles are useful for study-related choices” for the profile texts and dimension texts and existed of 4 items.

A seven-point Likert scale was used in which 1 = strongly agree and 7= strongly disagree. The questionnaire included 68 questions to evaluate the feedback tool; 50 Likert scale statements for the measurement of the variables and to check the clarity of all images and texts, 16 open questions with a text box to come up with more ideas or to substantiate the preference, and 2 multiple answer questions to get an overview of the texts and pictures that should be included in the feedback tool according to the students. The order of questions corresponded with the order of information provided by the feedback tool. The questionnaire can be found in Appendix B.

The questionnaire was tested on its reliability. Therefore, Cronbach’s Alpha (α) was used to measure the extent to which all items measured the same variable. Cronbach’s Alpha (α) ranged from .558 to .759 which can be found in Table 2. The variables informative and the personalization principle showed a Cronbach’s Alpha above .70 which is sufficient in the initial level of development of the instrument (Tavakol & Dennick, 2011). The variables concise and to the point and clear had a Cronbach’s Alpha between .60 and .70 which can be presumed as acceptable given the limited number of test items in the instrument (Berger and Hänze, 2015). Unfortunately, the variable goal oriented turned out to be insufficient.

Table 2.
Reliability design requirements

Design requirement	Reliability
Informative	.711
Clear	.669
Goal oriented	.558
Personalization principle	.759
Concise and to the point	.601

4.4 Procedure

Phase 1 - Analysis

The focus group discussions took place in a reserved room at the University of Twente or at Saxion University of Applied Sciences depending on the educational program of the group of STEM students. Appointments for the time and place of the focus groups were made in consultation with the STEM students. All students filled in the demo version of the Career Compass prior to the focus group discussions. Twenty-one open key questions formed the guiding principle of the group discussions and additionally supplementary questions were asked to get a clear and unambiguous picture of their ideas and opinions. First, the researcher introduced the ethical guidelines and the aim of the focus group. Next, all students introduced themselves before the focus group discussion started. The open questions allowed all STEM students to participate in the discussion. For example, it was asked if STEM students attached importance to compare their results with the average scores of all STEM students that filled in the Career Compass. Occasionally, individual students were asked to give their opinion to ensure input of all students was taken into account. All focus groups were recorded for analysis purposes.

Phase 2 - Design

The feedback tool was developed at the University of Twente. The findings of phase one formed the starting point for the design. Furthermore, the Career Compass and the existing profiles and dimensions of Möwes (2016) were taken into account.

The first step of the development of the feedback tool consisted of writing the texts. The texts existed of four parts: introduction, profiles, dimensions, and the conclusion. In the introduction, the purpose of the web page was explained. Next, a general profile was provided with dimensions that suits the student. These dimensions were explained for each element and finally the step from professional identity to a specific profession was described in the conclusion. We aimed to use as little text as possible, but at the same time provide the STEM students with valuable information on professional identity, the profiles, the dimensions, and the next steps (informative, concise and to the point). To ensure comprehension of all texts, complex words and specific terms were avoided and all terms that belong to a dimension were explained in terms of a future career (understandable, clear, goal oriented). The texts needed to stimulate STEM students to reflect on themselves and to take their own personality, interests etc. as a starting point. Therefore open questions were used in the written texts and the texts were formulated positively (positive). Lastly, the focus of the design of the texts should be responded to the signaling principle, segmenting principle, and personalization principle of Mayer (2009) (use of multimedia principles). Texts were written in a personalized style whereby the individual students must be able to identify themselves to correspond with the personalization principle. Furthermore, on each page paragraphs were used to offer the students segments and to ensure that students understood where they could find specific information.

The second step in the development of the feedback tool was the design of images to give students the opportunity to combine visual materials with texts which suits the multimedia principle. The aim of the images was to provide visual information that should be clear to students in a glance without textual explanation. Furthermore, the images should be informative and understandable, and the multimedia principles should be taken into account. The first draft of the feedback tool was developed during the iterative process within the project team consisting of a junior researcher, two master students and two senior researchers.

The last step in the development of the feedback tool was the presentation of the texts and images on a web page.

Phase 3 - Evaluation

STEM students who participated in the focus groups received an email with the URL to the questionnaire. The questionnaire in Qualtrics included an introduction that briefly explained the purpose of the questionnaire and asked students to evaluate the feedback tool that included their input. The feedback was provided to students by the use of a webpage. On this webpage, they could find general feedback that was concentrated on a fictive STEM student. In fact, students received feedback that did not concerned themselves and they needed to judge if the feedback gains insights into their professional identity. In line with the ethical guidelines participants were informed of their voluntary participation, the possibility to stop at any moment and the anonymous processing of their data. One key user was asked for the pilot of the questionnaire. Afterwards, small adjustments, such as adding a blank line after five questions were made.

Furthermore, STEM students in the final year of their bachelor's program Applied Physics participated in a workshop during lecture time. The workshop consisted of three parts: providing information about professional identity and the Career Compass, filling in the Career Compass, and the evaluation of the feedback tool. In the first twenty minutes students received information about

professional identity and the Career Compass. Then students were asked to fill in the Career Compass themselves. They received general outcomes within a week. After filling in the Career Compass, students were asked to evaluate the feedback tool by using the same questionnaire and webpage as the first group of participants. Lastly, a group discussion was started to gain more insights into advantages of the feedback tool and adjustments that can be made according to this group of STEM students.

4.5 Data analysis

Phase 1 - Analysis

The voice records of the focus group discussions were transcribed afterwards and analyzed within Atlas.ti. The analysis was done by the use of a codebook which can be found in Appendix C. After the development of the first draft version one focus group was coded by the researcher and inter-rater reliability was calculated to account for variation between coders. Next, small adjustments were made and the codebook was finalized.

The final codebook existed of 26 codes; 11 codes for the introduction of professional identity, 6 codes for the content of professional identity, and 9 codes for the presentation of the feedback. The introduction part included sub codes such as *"Students show insight in their own competences"* and *"Making appropriate study-related choices"*. Sub codes for the content of professional identity were for example *"Students described their preferences for the content of the feedback about the five dimensions"* and *"Students' opinions about the current profile names"*. For the presentation of the feedback sub codes such as *"Students opinions about comparing their outcomes with the average scores of employees"* and *"Provide texts and images that match each other simultaneously"* were used. Useful statements of students were coded and received one or more sub codes, depending on the statements. For example, the statement *"Suppose you select profile 2 and when you click on this profile the image emerges and another click will show the profile text next to the image"* received the sub codes 3a1: *"A description of the design of the feedback"*, 3c1: *"Multimedia principle: Combine texts and images"* and 3f1: *"Segmenting principle: present the information in user-paced segments rather than as a continuous unit"*. As a second step, statements from the same sub codes were compared to find differences and similarities. Last, the cohesion between the codes was analyzed.

At the end of each focus group discussion, the most important aspects were summarized by the researcher to ensure a correct interpretation of the input. Important aspects that were indicated by the majority of the students in the focus group discussions were taken into consideration for the design of the feedback tool.

From the total of 6 transcripts of the focus groups, 16,67% of the data (one full transcript of a focus group) was coded by an independent second researcher to compute inter-rater reliability. The Cohen's Kappa κ varied from 0.656 to 0.937 with an overall Cohen's κ of 0.802. As 0.656 was a moderate score (McHugh, 2012), part 3 of the codebook was described more clearly. For example, the definition of *'suggestions'* did not describe clearly enough that this was specifically related to the suggestions of the students about the presentation. As a consequence, fragments of suggestions about profiles and dimensions were frequently coded as suggestions about the presentation. The second coding resulted in an inter-rater agreement of 0.709 for part 3 and an overall Cohen's κ of 0.824 which could be described as 'almost perfect' (McHugh, 2012).

Phase 2 – Design

There was no data analysis needed for the execution of phase 2.

Phase 3 – Evaluation

The data from the questionnaire was analyzed in IBM SPSS Statistics 23 for descriptive statistics to analyze the mean and standard deviation for each design requirement. Furthermore, the mean and standard deviation were measured for the design requirements for each separate text. Data from the open questions was summarized to gain more insights into advantages of the feedback tool and adjustments that can be made. Last, the next version of the feedback tool was described.

5. Results

In this chapter the results of the three phases of this study will be discussed. The current research aimed to examine how feedback about professional identity can be presented to STEM students to support them in making well-considered career choices. The first goal of this study, phase 1, was to establish design requirements for the feedback tool. Furthermore, it was investigated which information about professional identity STEM students find important and how this information could be presented attractively. Next, during phase 2, the first draft of the feedback tool was created. Lastly, STEM students were invited to evaluate the feedback tool in phase 3.

5.1 Phase 1

The literature review resulted in a list of four design requirements which the feedback in the tool must comply: informative, clear, goal oriented, and the use of multimedia principles. Subsequently, the focus group guide for the focus group discussions of step 2 was based on these design requirements.

The aim of the feedback tool was to provide STEM students insights into their professional identity and to encourage them to orientate themselves towards their future career. These results show opinions about the content and the presentation of the feedback tool which are mostly shared by the majority of the group. However, also individual opinions are shown to illustrate interesting thoughts of students. The checkmarks in Table 3 represent important aspects for the feedback tool and the crosses represent unimportant aspects for the feedback tool according to the STEM students. Furthermore, an empty box in the figure represents an aspect that is not discussed during the focus group. The different aspects will be explained further on in the results.

Table 3.
Most and least important aspects for the feedback tool.

	Focus group 1 UT	Focus group 2 UT	Focus group 3 UT	Focus group 4 Saxion	Focus group 5 Saxion	Focus group 6 Saxion
Feedback Career Compass						
Profiles		✓				
Dimensions	✓					
Combination of profiles and dimensions			✓	✓	✓	✓
Current profile names						
Negative	✓	✓	✓	✓	✓	✓
Use current names	✓	X	X	X	X	✓
Other suggestions						
Concise and to the point	✓		✓	✓	✓	✓
Strengths and weaknesses			✓	✓	✓	✓
Movie	✓					
Persona/caricature			✓			✓
Comparison outcomes						
Students	X	X	X	X	X	X
Employees	✓	✓	✓	✓	✓	✓
Visual display feedback						
Pie chart		✓				
Percentages	✓	✓	✓			✓
Top 3 profiles			✓			✓
Radar chart	✓		✓	✓	✓	✓

The compass		✓		✓		✓		✓
Combination of the radar chart and the compass				✓		✓		✓
Multimedia principles								
Spatial contiguity principle								
Temporal contiguity principle		✓		✓			✓	✓
Signaling Principle						✓		✓
Segmenting principle	✓		✓		✓		✓	✓
Multimedia principle	✓		✓		✓		✓	✓
Personalization principle								

5.1.1 Professional identity

As an introduction, students were asked about their knowledge and ideas about their own professional identity.

In general, the majority of the students are enthusiastic and curious about getting insight in their professional identity and the development of the feedback tool. One student indicated: *"I believe it is a useful tool that supports you to get to know yourself better"*. Furthermore another student mentioned: *"I think you will get more aware of your own personality if the outcome is in line with your own thoughts."* In addition, insight in professional identity was considered positive in all focus groups. The following excerpts showed this: *"I really want to know my strengths, my weaknesses, and towards what kind of career I am working."*, *"I believe it is always important to have an idea about the possible options for your future career."* Most students did not have a clear picture of their professional identity yet. A student indicated: *"I made the decision for a technical study. At least, that is a direction, but my focus was not on a future career already."* On the other hand, there were also students who already had a clear picture of themselves, what they wanted, and what they could do in their future career. One student indicated: *"For the research project I am looking for a career in the security direction, because I would like to choose that direction for a master education. So I am going to see if the master fits my ideas"*.

Students saw potential in the feedback tool and argued that feedback could help to raise awareness of themselves: *"What you want is students to come home and talk about their professional identity with their parents or other students"*. This excerpt demonstrated that students were interested in their future career and that the feedback tool could ensure students are encouraged to talk to others about their personal feedback. Furthermore, the outcomes of the feedback tool could stimulate students to conversations about the future career.

Situations for the usage of the feedback

In most focus groups, students indicated that it brings added value when you get to know yourself during the educational program. The students believed this information has a positive impact on making study-related choices. One student indicated: *"Once you know yourself, you can make better choices, such as what specific master you want to choose"*. Another student presented a practical example: *"At the moment, it might be useful for me, since I still have doubts about what I would like to do for my internship"*.

Besides students' internship, they came up with more moments during the educational program in which they can use the information received in the feedback tool about their professional identity: by the orientation on a minor, bachelor assignment, and master's thesis. At these moments the feedback could be used to explore an appropriate future career direction. The majority of the

students mentioned that it is important to choose a direction that suits you to get a better idea of a profession for the future career.

5.1.2 Content of the feedback of the Career Compass

The design of the feedback tool can be divided in the content and the presentation of professional identity. In this paragraph, the content of the feedback will be discussed to clarify which information about professional identity should be presented to STEM students.

Profiles and dimensions

After completion of the career compass the feedback about professional identity could be presented in profiles or dimensions. First, students were asked to brainstorm about obtaining feedback in profiles. Next, students' opinions about feedback in dimensions were examined. Lastly, the combination of profiles and dimensions was discussed.

In most focus groups, students' first reactions about profiles were quite negative. Students felt being labeled when profiles were used: *"I am not quite a fan of profiles"*. Another student mentioned: *"As if there are only five kinds of people on this earth"*. Remarkable was that especially students of the University of Twente were negative about the idea of using profiles. However, after the first resistance students in almost all focus groups came up with the positive characteristics of profiles. Advocates of the use of profiles argued that profiles entail a lot of information in their content. One student specified: *"This gives more content of what a particular interest or value has to do with a specific profile. It will give you extra information."* Opponents of profiles became more enthusiastic of profiles when they heard the idea of presenting more than one profile in the feedback. Furthermore, during the group discussion they began to see the advantage of getting a general idea of themselves in a profile which will be specified by the personal dimensions.

Students were more enthusiastic about feedback which focused on dimensions. One student indicated: *"You definitely want to see the words that characterize you"*. Furthermore, another student argued: *"You will receive more information about yourself and not only a standardized profile"*. There is only one point of improvement, pointed out by the students, because in the current version of the feedback tool, only words of the dimensions are mentioned and they would like to know how the current feedback of dimensions can be used towards a future profession. One student illustrated: *"Imagine being very emotional according to the test. Than you would like to know in what occupations this characteristic can be useful."* These excerpts showed that students would like to get an explanation of the dimensions to encourage them to think about their future career.

Although students seem more interested in dimensions, the majority of the students favored a combination of the two types of feedback where they would see a profile which they align with and the corresponding dimensions. In the first place students criticized the profiles, because they only gave a general idea of a person instead of dimensions which were more specifically describing your personal characteristics. One student indicated: *"Dimensions are a bit more personal than a profile. Then you know what kind of person you are and you also see that you do not fit 100% within such a profile"*.

Profile names

Most students believed the current profile names were negatively formulated. The following excerpt illustrated how students felt about the current names: *"All profile names have a negative approach and the names are so exaggerated. I believe everyone is a more sophisticated version of that."* They

did not believe the profile names encouraged students to read all feedback and stimulated students to think about themselves as a professional. The following excerpt showed these thoughts: *"It just sounds unfriendly. You are not satisfied with the results and will be discouraged to read all information"*. As a consequence, four groups of students discommend using these profile names in the feedback. According to half of the groups profile names were not necessary for the feedback. Furthermore, they suggested formulating the profile names in a positive way when names will be used. Conversely, when students were asked to think about profile names themselves they come up with negative formulations such as: *"shadow, autistic, and control freak"*.

Other suggestions about the content

Concise and to the point was mentioned as an important requirement that should be taken into account for the development of the content of the feedback tool. Students of five focus groups specified this aspect as important considering the length of the texts. One student indicated: *"I would like to receive feedback that includes a concise, punctual summary of the dimensions that suit me"*. Another student mentioned: *"A concise and to the point overview of typical characteristics of students in that specific profile"*.

Strengths and weaknesses were mentioned by students in four focus groups as an important aspect for the content of the feedback. One student mentioned: *"I believe that a list of strengths and weaknesses from a person that fits with a specific profile would be very clear"*. The preference for 'strengths and weaknesses' is particularly mentioned by students of Saxion University of Applied Sciences. All groups of Saxion University of Applied Sciences mentioned this aspect as important: *"I believe you will become aware of your strengths and the skills that need improvement"*. In addition, all students of Saxion University of Applied Sciences believed the feedback must be positively formulated and presented with few words. They believe this kind of feedback would motivate students to read all information and stimulate them to work towards their future career.

Comparison outcomes

Most students of all focus groups indicated that they were not interested in comparing feedback with other students, because the feedback will suit your personality. One student explained: *"You can compare yourself with someone else, but the feedback is about your own skills and qualities. You want to get those things clear"*. Students misinterpreted the idea of comparing feedback with other students. The idea was to find out if students wanted to compare their scores with the average score of all students, but they interpreted it differently. Students thought their feedback would not remain anonymously and would be provided to other students. One student indicated: *"I prefer to keep the feedback to myself"*.

In contrast to the comparison with other students, all students were enthusiastic about the possibility to make a comparison with employees: *"I would like to get a better idea between what kind of people and in which sector I would fit"*. Students of two focus groups suggested to connect the feedback to the specific educational program they follow. One student argued: *"By generating a job profile; this profile fits your outcomes. This fits the education and represents the personal future career opportunities"*.

5.1.3 The presentation of the feedback tool

In this paragraph the presentation of the feedback tool will be discussed. It will be examined which visual materials can be used to provide STEM students insights into their professional identity. In a PowerPoint presentation examples of visual materials were presented to the students to start the brainstorm session.

Images and charts

In almost all focus groups the 'radar chart' was mentioned as an important aspect of the visual display of the feedback tool. The radar chart contained all five profiles and students could find to what extent they matched with a specific profile. The chart could be interpreted easily and the message was clear. One student indicated: *"With the radar chart you can easily identify in which profile you fit"*. Another student pointed out: *"You already receive a lot of information from the radar chart."* Furthermore, 'the compass' in the current design was mentioned by four focus groups as an important aspect to clarify all dimensions. The compass displayed pictures of all dimensions. Most students were enthusiastic about the design of the compass: *"I believe the compass has a good-looking design"*. Combining 'the radar chart' and 'the compass' in the feedback tool was mentioned by three groups.

Furthermore, 'using percentages' was mentioned by students in four groups. Students in these four groups would like to see the distribution of profiles by the use of percentages. One student suggested: *"Preferably expressed as a percentage; a match of 60% with that profile"*. Another student explained: *"Using percentages is just like filling in a test about a political party; 60% VVD, so 60% profile 1"*. It is remarkable that all groups of UT students mentioned this aspect in contrast to only one group of students of Saxion University of Applied Sciences. In the other two groups of students of Saxion University of Applied Sciences the radar chart instead of percentages was discussed, because the radar chart and the percentages were presented on the same slide. These groups of students talked a lot about the radar chart and the researcher did not focus specifically on their opinion about the use of percentages. Lastly, in two focus groups students talked about making a top three from profiles that fits with student's preferences. The following excerpt demonstrated this idea: *"You would not only want to know everything about the most dominant profile, but also the profile thereafter. A top three."* As shown in Table 1, 'the radar chart', 'the compass', and 'percentages' are considered as the most important aspects for the visual display of the feedback.

Multimedia principles

As shown in Table 1, four multimedia principles were mentioned during the focus group discussions. In all focus groups students mentioned the preference for the combination of text and visual data (multimedia principle). One student indicated: *"The use of something visual is better than just a written text. It will become more interesting to look at"*. In addition, students already came with concrete ideas: *"Using the spider web in combination with a text to explain the outcomes; Why does profile 2 suits me?"*. Furthermore, students talked about presenting words and pictures simultaneously (temporal contiguity principle). One student suggested: *"Click on a part of the spider web and then get the extended information about what it means to score high on that profile"*.

As a result of this suggestion, students in all focus groups talked about the text. The main question was: Do you offer the entire text at once, or do you use segments? (segmenting principle) One student suggested: *"Features; a short line. After that, you could specify all those features in an extended explanation text"*. Another student indicated: *"At the moment, there is a lot of text presented at once. What you know about a presentation is that if you use too much text, people quit participating"*. Even when there was a short text on a web page, it could be hard to examine where to start reading. Therefore, students in some focus groups talked about signaling. They would like to have a clear direction where their attention needed to go on the feedback page (signaling principle). *"Perhaps you would show the most and the least corresponding profile. These profiles are shown first and the other profiles will appear when students click on them"*.

5.1.4 Summary phase 1 towards design requirements

In this paragraph design requirements, important aspects, and misinterpretations that should be taken into account by the design of the feedback tool are specified. An overview can be found in Table 4.

STEM students were all unanimous that they would like to receive feedback about professional identity. As a result, they came up with a lot of ideas about the feedback tool.

It was examined that students preferred feedback that contains a combination of feedback in profiles and dimensions. Furthermore, students indicated the need for an explanation about the dimensions in the feedback tool to understand how they can benefit from a specific dimension in a future career. Overall, in almost all focus groups students mentioned concise and to the point as a design requirement for the texts of the feedback.

A lot of students highlighted the negatively formulated profile names. Consequently, they were asked to come up with profile names themselves. In all focus groups, only negative formulated profile names were mentioned. Therefore, the current profile names will be used in caution and combined with the radar chart. To find out how students experienced this combination, this topic should be discussed in the evaluation.

During the focus group discussions the idea of comparing outcomes was not obvious for students. They believed their scores would be shared and not remain anonymous instead of being able to compare their own score with the average of all STEM students. Therefore, individual scores of students will be compared with the average score of all students in the first draft of the feedback tool. It will be examined in the evaluation phase how students feel about this solution to compare their feedback in an anonymous way.

Although there are five dimensions specified in the Career Compass it was remarkable that a lot of students only mentioned strengths and weaknesses when discussing the content of the feedback tool. The other dimensions remained underexposed, in particular in the focus groups with students of Saxion University of Applied Sciences. Therefore, the focus of the feedback tool should be on all five dimensions.

Students in most focus groups were interested in outcomes that focused on specific future jobs. The main goal of the feedback tool is presenting information about their own professional identity to stimulate thinking about future career jobs. Therefore, making a step from professional identity to specific professions needs attention in the feedback tool.

Lastly, for the presentation of the feedback students preferred the radar chart, the compass, and percentages. Furthermore, all six multimedia principles need to be taken into account in the development of the web page: spatial contiguity principle, temporal contiguity principal, multimedia principle, signaling principal, segmenting principle, and personalization principle.

Table 4
Input of STEM students in the focus group discussions.

Input focus group discussions
A combination of feedback in profiles and dimensions
Concise and to the point texts
Profile names combined with the radar chart
Comparison with average scores of all students
Focus on all five dimensions
Attention for the step from professional identity to specific professions
Usage of the radar chart, compass, percentages and multimedia principles

Phase 2 – Design

The developed web page started with an explanation of professional identity and the goal of the feedback tool. The second page consisted of the profiles. First, a stage with the top 3 of corresponding profiles was shown. At the same time, the radar chart with corresponding percentages for all profiles was presented (see Figure 2). A trendy image and an informative image were both chosen to find out if students were interested in a quick result or in details. On the next pages, the profile texts with the radar chart were presented simultaneously and near each other on the screen. The third part of the web page was focused on the dimensions and started with the image of the compass designed by Möwes (2016). All dimension texts were presented with the image of the compass and a corresponding bar chart of their individual scores and the average scores of all STEM students on that specific dimension (see Figure 3). To conclude, the next steps to gain insight in yourself as a professional and to find out which career fits your professional identity were described on the last part of the web page. The feedback tool can be found at <http://feedbackcc.jouwweb.nl>.

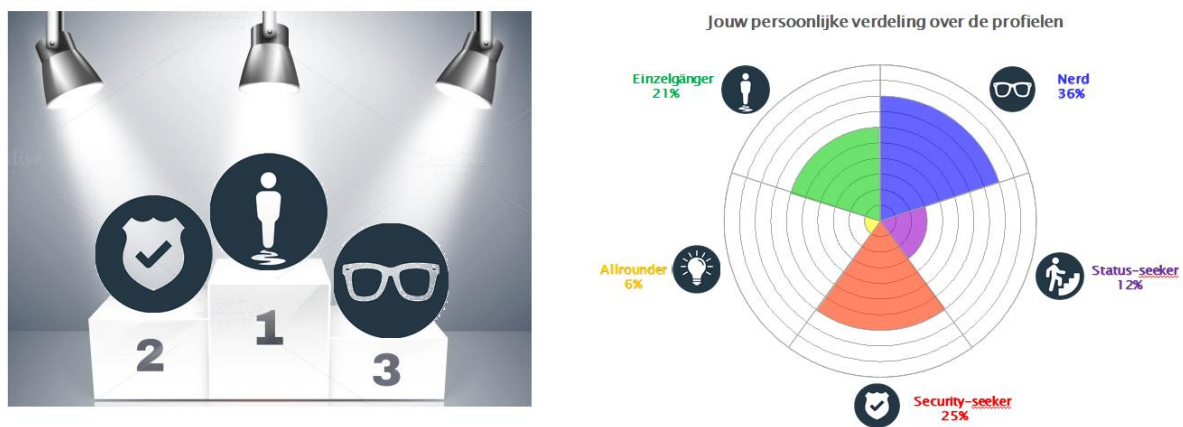


Figure 2. The top 3 and the radar chart for the profiles

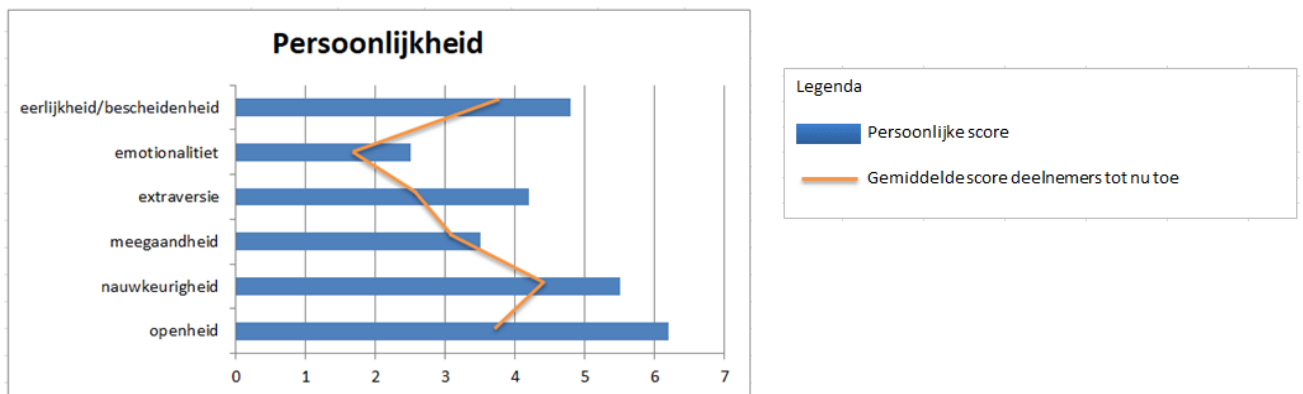


Figure 3. Bar chart 'personality'

The feedback existed of many pictures to provide the information to the students. Furthermore, concise texts were used to encourage students to read all information and the texts included clear headings and paragraphs. The profile texts and the dimension texts had a clear structure that was used for each profile and each dimension (see Figure 4). To meet the multimedia principles, images were presented simultaneously and near each other, texts were combined with images, the texts were written in a personalized style, and paragraphs were used. In Table 5, an overview is provided to show how the output of the focus group discussion was used in the feedback tool.



Figure 4. Profile text and dimension text

Table 5.

Output of the focus groups and rendition of the output in the feedback tool.

Output focus groups	Feedback tool
A combination of feedback in profiles and dimensions	Profile texts and dimensions texts are both used in the feedback tool (see Figure 4)
Profile names combined with the radar chart	The radar chart for the profiles (see Figure 2)
Comparison with average scores of all students	By the use of a bar chart (see Figure 3)
Focus on all five dimensions	There is a dimension text for each dimension
Attention for the step from professional identity to specific professions	Next steps are described in the conclusion text
Usage of the radar chart, the compass and percentages	All these images can be found at the web page (see Figure 2 and Figure 4)
Use of multimedia principles	
Spatial contiguity principle	Texts and images were presented near each other
Temporal contiguity principle	Texts and images were presented simultaneously
Signaling principle	Structure + paragraphs with headings
Segmenting principle	Pacer-used segments were used on the web page by the use of paragraphs and pages
Personalization principle	All texts were written in a personalized style
Multimedia principle	Texts and images were combined to provide information

Phase 3 - Evaluation

Two steps can be divided for the evaluation of the feedback tool. The first step included the results of the questionnaire. The second step was to describe the next version of the feedback tool.

Results questionnaire

For the evaluation by the use of a questionnaire a seven-point Likert scale was used in which 1 = strongly agree and 7= strongly disagree. In order to examine the views of STEM students about the five design requirements in the feedback tool, the mean and standard deviation were measured. First, a general mean of the design requirement was determined for all texts of the feedback tool. Next, a closer look was taken for each separate text.

Students were positive about the informative character of the written texts that were provided on the web page ($M= 2.41$, $SD = .611$). Furthermore, students evaluated the texts as clear ($M= 2.19$, $SD = .393$). The scale of clear turned out to be acceptable after deleting one item: the

introduction (Berger and Hänze, 2015). It should be kept in mind that only one item was used in the questionnaire to measure this design requirement. Furthermore, the four texts had different structures, which could explain different opinions between texts. The scale for goal oriented turned out to be unacceptable after the measurement of Cronbach's Alpha even after deleting one item. Therefore, no statements could be done about the goal oriented view of the texts.

Students were able to identify themselves with the texts and to focus on the comprehension of the message in the texts ($M= 2.44, SD =.777$). Furthermore, students believed the texts were concise and to the point ($M= 3.13, SD =.693$). This scale turned out to be acceptable after the measurement of Cronbach's Alpha (Berger and Hänze, 2015). For the same reason as for clearness, the moderate value of Alpha could be explained by the low number of questions that measured the design requirement (Tavakol & Dennick, 2011). The mean and standard deviation for each design requirement and for each component can be found in Table 6.

Table 6.
Mean and standard deviation for the design requirements

	In general	Introduction	Profiles	Dimensions	Conclusion
Informative	$M= 2.41$ $SD = .611$	$M= 2.31$ $SD=.946$	$M=2.31$ $SD=.793$	$M= 2.38$ $SD=.806$	$M=2.63$ $SD=1.310$
Clear	$M= 2.19$ $SD =.393$	$M=1.81$ $SD=.655$	$M=2.31$ $SD= .873$	$M=2.44$ $SD=.629$	$M=2.19,$ $SD=.655$
Concise and to the point	$M= 3.13$ $SD =.693$	$M= 2.94$ $SD =.929$	$M= 3.00$ $SD =.949$	$M= 3.38$ $SD =1.27$	$M= 3.22$ $SD =1.18$
Goal oriented	-	-	-	-	-
Personalization principle	$M= 2.44$ $SD =.777$	$M= 2.13,$ $SD=1.204$	$M=2.75$ $SD=1.065$	$M=2.50$ $SD =.894$	$M=2.38$ $SD =.885$

Besides Likert scale statements, the questionnaire included open questions to come up with more ideas or to substantiate the preferences. These open questions also formed the common thread for the discussion at the end of the workshop. In general, the remarks confirmed the outcomes of the questionnaire, e.g. about the informative character of the bar charts. Additional remarks were particularly made on the image of the top 3, the profile names, and the amount of the text. Students stated that the image of the top 3 had no added value for the feedback, because the radar chart provided more details and included all needed information. Furthermore, students described the contrast between the profile names. Nerd and Einzelgänger had a negative exposure whereas the Allrounder had a positive exposure according to the students. They preferred names for the profiles, but the profile names needed to be positive formulated. In general, all students would read the information, but they had divided opinions about the amount of text. Some students would scan all information, whereas other students would quit reading when they read information that does not suit them and the last group of students would read all information.

Feedback tool version 2.0

STEM students evaluated the feedback tool positively. Feedback of STEM students indicated that the feedback tool was informative and written in a personalized style. Students were interested in information about their professional identity and as a consequence a lot of students indicated that they would read all information on the web page. Both texts and images were understandable and STEM students were able to identify themselves with the feedback.

However, STEM students also criticized a few aspects of the feedback tool. A lot of questions are used in the introduction and conclusion, such as *"Do you fit in a function as a specialist or does a traineeship suits you better?"*. Students preferred to read fewer questions to illustrate career options or next steps and therefore these questions should be left out in the second version. Furthermore, there was no enthusiasm for the image of the top 3 in combination with the profile texts. Students indicated that this image should be eliminated in the feedback tool, because it had no added value. Another adjustment for the profiles could be to change the profile names and find a positively formulated name for them. For example, 'the nerd' could be changed into 'the researcher'. For the dimensions and the conclusion, some students indicated the texts as too extensive. For the next version, it should be taken in consideration if some parts or sentences could be left out. Lastly, students expected to read concrete functions and companies that suit them. Therefore, it can be examined if employees that match a specific profile work in similar functions. This could be an addition that can be written at the end of the profile texts.

6. Discussion

The current research aimed to examine how feedback about professional identity can be presented to STEM students to gain insights into their professional identity. In the following sections will be discussed how the aim of this research was achieved, whether the findings were in line with existing research and what limitations could be considered when interpreting the results. Afterwards, practical implications that derive from this research will be discussed and suggestions for further research will be offered. Subsequently, final conclusions about the current research will be drawn.

The feedback tool

The aim of this study was to develop a feedback tool to provide STEM students with personalized feedback about their professional identity. In line with most research on the content of professional identity, a small study was used to analyze students' professional identity (Trede, Macklin & Bridges, 2012) and the educational research design of McKenney and Reeves (2012) was followed. At the same time, existing literature on feedback was used as a starting point, thus a theoretical foundation was combined with practical research.

The utility of development of professional identity has been demonstrated in previous research (e.g. Moss et al., 2010), but students find it challenging to identify with their profession which makes it difficult for them to develop their professional identity (Savickas et al., 2009). Therefore, the current feedback tool was developed to gain insights into STEM students' professional identity. Insight in professional identity is an important step to make STEM students aware of their own professional identity and contributes to career choices that suits the student. Furthermore, according to Nadelson et al. (2017) STEM students with a more advanced professional identity are more adequate to engage in learning situations. Thus, STEM students with a strong professional identity will be more motivated for their study (Meijers et al., 2013). The developed feedback tool is complete and provides the information that is needed to gain insights into STEM students' professional identity. In general, students considered the feedback tool as informative and useful to gain insight into their professional identity.

Insights into professional identity contributes to self- knowledge of STEM students which can be used to make good career decisions (Olamide & Oluwaseun). For many students answering the question 'Who am I as a professional' is not enough to come to career decisions that suits them. For these students, the feedback tool provided an overview of next steps that could be taken to get a realistic view of themselves and to find out which career choices suits them. On the other hand, there were also students without a clear image of the first step. These students were only thinking about a future career during the focus group discussions. According to Adams, Hean, Sturgis, and Clark (2006) social interaction shaping the content of students' professional identity already takes place before entering a study. Thus, personality traits influence professional identity and therefore the first step to answer the question 'Who am I as a professional' should be taken to gain insights into career choices that suits the student. The profile texts provide a general representation of a future career direction, whereas the dimension texts focus on the personality traits and qualities of the student. The combination of these aspects offers STEM students insights into their professional identity and indicates a future career direction. The feedback tool does not provide a concrete answer for a career choice, but the feedback stimulates STEM students to become pro-active for their own career path, which is in line with research of Kuijpers and Meijers (2009) who indicated proactivity as the main objective of career guidance.

The feedback tool was developed for STEM students of the University of Twente and Saxion University of Applied Sciences. It was proven that STEM students are less competent than other

students in describing their qualities, wishes, and feelings (Guo, Parker, Marsch & Morin, 2015). The feedback tool is a helpful tool to support STEM students by providing information about their professional identity which includes information about their personality traits, values, goals, interests, and competences. The feedback tool maps the professional identity of STEM students, whereby the concrete qualities of the student will be described on paper which can be used by them when they need to present themselves. Providing feedback on professional identity will result in STEM students who can come up with their own values and make purposeful career choices instead of students that cannot describe their professional values and interests (Trede et al., 2012). The focus of the feedback tool is on the individual STEM student who stood in the center of the feedback. Research of Weaver (2006) has shown that feedback became more effective when it was presented in this way.

Limitations

Like any other study, this research had its limitations. To begin with, STEM students who participated in the focus group discussions were selected by the researcher based on a voluntary basis and depending on presence at the University of Twente or Saxion University of Applied Sciences at specific moments. As a consequence, students from more classical technical studies, such as Applied Physics were not included in the sample of STEM students for the sessions of the focus group discussions in the first phase of this research. Therefore, it will not be known for certain if the outcomes of the focus group discussions represented all STEM students or only STEM students of the more social technical studies.

For the evaluation, a workshop was conducted for eleven students of Applied Physics. This was a relatively small group of students from the same study which can influence the generalizability of the outcomes of the evaluation phase. Furthermore, the same group of STEM students from phase 1 was asked to evaluate the feedback tool by the use of a questionnaire. Consequently, the questionnaire was completed by a total of 16 students which was a relatively limited amount of students. Small sample studies could provide results quickly and could be used to design larger confirmatory studies (Hackshaw, 2008). Therefore, the results should be interpreted carefully. Unfortunately, we had no insight into the amount of students from Saxion University of Applied Sciences that participated in the evaluation phase, because there was no specific question about the educational institute in the questionnaire. As a consequence, there is a possibility that the evaluation phase provides a partial view that only represents the ideas of STEM students of the University of Twente.

Furthermore, not all design requirements reached high values for Cronbach's Alpha. This could be explained by the fact that this instrument was specifically designed for this study. The questionnaire was designed to measure whether the five design requirements were met in the feedback tool. If researchers would choose to use this questionnaire in a future study, they would need to adapt the instrument according to their own research goals. Therefore, the questionnaire could be further investigated and improved to use in future research for example by adding more questions to the instrument to measure the design requirements until all design requirements reach a high value for Cronbach's alpha (Tavakol & Dennick, 2011). An ongoing concern should be the length of the questionnaire, because the length will be decreased when items from scales need to be deleted to ensure the reliability (Moore & Benbasat, 1991). The questionnaire could be further investigated and improved by experts whereby changing the instrument would lead to a new instrument that could be used in future research.

The last limitation of this study was the provided feedback in the feedback tool. STEM students who were involved in the evaluation phase did not receive personalized feedback about their own professional identity. On the webpage, they received feedback that was conducted for a fictive student. The feedback did not concern themselves and they needed to judge the feedback as if it gains insights into their own professional identity which makes it more difficult to give an opinion about the feedback.

Practical implications

The feedback tool can be used by teachers and study counselors of Universities and Universities of Applied Sciences who want to stimulate STEM students in making well-considered career choices that suit them. The instrument will not be used to measure students' professional identity, but can be seen as a mapping tool to gain insights into the content of STEM students' professional identity. The feedback tool supports the need for an accessible tool to stimulate STEM students to think about their own professional identity, because most STEM students are not aware of their own professional identity and how to influence their own career path. It is advised to start a conversation about the outcomes in line with career guidance to make STEM students pro-active in their own learning and to meet the lack of the reflective nature of career guidance for STEM students (Kuijpers & Meijers, 2009). The role of study counselors will be to activate and stimulate STEM students to reflect on themselves and actively give substance to their professional identity and career development after receiving the feedback, because research showed that career development is a self-directed process (Meijers et al., 2013). The use of the feedback tool in combination with dialogues with counselors will contribute to the lack of personal attention and individual conversations in higher education institutions (Deursen & Jansen, 2006) and will increase students' career capabilities (Mittendorf et al., 2008). Furthermore, dialogues can contribute to the last step in the process of making a career choice that suits the individual student. This is the step to come from professional identity to a choice of profession. Students indicated in the evaluation phase that they needed support in this step. A dialogue ensures attention for support for individual STEM students in this step. In addition, students mentioned the utility of the feedback for making study-related choices, such as a minor or an internship. They argued that the feedback about their professional identity could help to raise awareness of themselves. Hence, the feedback tool can be used by STEM students as a tool to gain insights into their professional identity including all dimensions, thus evaluating who they are as a professional, what they find important, and what their competences are, which will support them in making career choices that suits them.

Further research

Further research can make a link between professional identity and career adaptability, because according to Hall and Mirvis (1995) two competencies should be developed for a successful career, namely identity growth and the ability to adapt. Research showed that students who score high on career adaptability make better choices for their future career (Hirschi, Niles and Akos, 2011). Further research can examine whether insight into STEM students' professional identity will influence their career adaptability, because in line with professional identity, career adaptability seems to be an important competency in someone's career to be successful (Zacher, 2014). Furthermore, research showed that a high score on career adaptability stimulates students to take control of their own career path and to seek reconciliation between dreams, abilities and ambitions and their work and career (Savickas, 2005), which matches the objective of the feedback tool.

Next, students indicated that examples of future occupations linked with a profile can have added value to gain insights into a career choice. Therefore, STEM students need to be followed for a longer period of time to gain insights into the career choices they make. It can be investigated which study directions and occupations students choose and in what kind of companies they will work. Next, it can be examined how this information can be provided to STEM students to make them pro-active in finding a career that suits them. The provided information could be linked to the current feedback on the web page. In this way, STEM students could receive the missing information they indicated in the evaluation phase.

Lastly, this study has been conducted with a small amount of respondents in the evaluation phase. Further research is necessary to confirm the design requirements and the essence of feedback about professional identity in a larger population of STEM students. The current study can be improved by collecting evaluative data from STEM students of different studies of the University of Twente and the University of Applied Sciences. Therefore, teachers of these educational institutes can be approached to ensure a high amount of respondents of both institutes.

Final conclusion

The Dutch economy currently deals with a shortage of technical employees. Many STEM students decide to leave the technical sector when they enter the labor market. The current research fills STEM students' need for a feedback tool that gains insights into their professional identity in order to support them in making well-considered career choices. The feedback tool reflects on students' personality, interests, values, goals, and competences. Gaining insight in STEM students' professional identity can contribute to the development of a strong professional identity. Research showed that a strong professional identity contributed to well-considered career choices (Meijers et al., 2013). The feedback tool can be used as a mapping tool of STEM students' professional identity and can provide the start of a dialogue between a STEM student and a teacher of study counselor about a future career. A feedback tool that provides insight in the content of STEM students' professional identity in higher education had not yet been developed. Findings of this research could contribute to filling the gap in the technical sector by focusing more on the future career that suits the STEM student.

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Appendices

Appendix A – Focus group guide

1.1 Introduction (±2.5 min.)

General overview		
Introduction – explanation of the project		
Step	Action	To say
1	Researcher welcomes everyone and introduces the topic and context of this focus group.	<p>Bedankt allemaal dat jullie aanwezig willen zijn bij deze focusgroep. Jullie zijn gevraagd om deel te nemen aan een onderzoek onder technische studenten van de UT en Saxion die gericht zijn op het ontvangen van feedback over je wie je bent als professional.</p> <p>Het doel van dit onderzoek is om erachter te komen welke informatie technische studenten van belang vinden om te krijgen over wie zij zijn als professional. Daarnaast onderzoeken we hoe deze informatie het beste gepresenteerd kan worden om m.b.v. dit inzicht een passende carrièrekeuze te kunnen maken. Wie ben jij in je professionele rol en welke functie binnen het werkveld past hierdoor bij jou?</p> <p>Hierover zou ik graag jullie mening horen.</p>

1.2 Directions (±5 min.)

General overview		
Introduction –direction of the focus group		
Step	Action	To say
1	Researcher explains the content of the focus group, how it will flow (time-management), need for tape recording & asks if anyone minds being taped.	<p>Er zal gedurende de focusgroep een geluidsopname gemaakt worden. Dit is nodig voor het onderzoek. Alleen de onderzoekers die betrokken zijn bij dit project zullen toegang hebben tot de geluidsopname. Namen noch persoonlijke gegevens zullen gebruikt worden in de rapportage; de deelname zal anoniem verwerkt worden. Ik nodig jullie uit om actief deel te nemen aan de discussie, omdat we alleen op deze manier zo dicht mogelijk komen bij het achterhalen van informatie die jullie belangrijk vinden. De focusgroep zal 60-75 minuten duren.</p> <p>Is alles wat betreft de gang van zaken rond deze focusgroep duidelijk?</p>
2	Researcher explains what 'professional identity' is.	<p>Centraal staat de interpretatie van een persoon over zichzelf in de professionele rol. Hiervoor is zelfkennis nodig over wie je bent en wat je wil bereiken. Bijv. in hoeverre ben je een technisch bedrijfskundige en voel je je een technisch bedrijfskundige.</p> <p>Het onderzoeken wie je bent als professional is een continu en levenslang proces die aangepast wordt door nieuwe ervaringen en persoonlijke interpretaties. Veel studenten zijn zich niet bewust van hun professionele rol. In hoeverre weet je wat een technisch bedrijfskundige inhoudt en hoe hij zich gedraagt en past dit bij jezelf.</p>

		Onderzoek toont aan dat een sterk beeld van wie je bent als professional de motivatie voor een studie verhoogt en zorgt voor stabiele carrièrekeuzes. Ook is wetenschappelijk bewezen dat dit sterke beeld wisselingen van baan verlaagt.
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1.3 Introduce yourself (± 5 min.)

General overview		
Getting to know each other		
Step	Action	To say
1	The researcher makes sure all students tell something about themselves.	Indien de groep elkaar niet kent even kort een voorstelronde. Wie ben je en in welke fase van de studie zit je op dit moment?
2	The researcher starts a group discussion.	Introductievraag: Welke vakken in jouw opleiding vind je leuk om te volgen? Waarom? Wat maakt deze vakken interessant?

1.4 Professional identity (± 10 min)

General overview		
Talk about STEM students' professional identity		
Step	Action	To say
1	Researcher explains this part and starts a group discussion.	Heb jij een beeld van jezelf wie jij bent als professional? Wat je zou willen? Kunnen? In hoeverre voel jij jezelf een typische technische medewerker? Heb jij een beeld van een mogelijk toekomstige beroep dat je zou willen uitoefenen en waar je terecht zou kunnen komen? Hoe is dit beeld gevormd? Vind je het belangrijk om dit te weten?

1.5 Content of professional identity (± 20 min.)

General overview		
Discussion - content of professional identity		
Step	Action	To say
1	Researcher introduces this part of the session and starts a group discussion.	Jullie hebben het carrièrekompas ingevuld. Dit is een feedbacktool om in kaart te brengen wie je bent als professional. Hoe denk je over het krijgen van feedback over jezelf n.a.v. het invullen van het carrièrekompas? Zijn er situaties waarin je deze kennis zou kunnen gebruiken?
2	Table 1 in the PowerPoint is displayed on the laptop. Researcher explains it and starts a group discussion.	In het carrièrekompas is aandacht voor vijf onderdelen van professionele identiteit (interesses, waarden, doelen, persoonlijkheid, competenties). Hierover kan feedback gegeven worden per onderdeel of voor deze 5 onderdelen in het geheel. Daarnaast hebben de onderzoekers van dit project ook profielen samengesteld op basis van alle antwoorden van respondenten. Bij deze profielen staan beschrijvingen per onderdeel van professionele identiteit die kenmerkend zijn bij het profiel. Welke informatie zou je, na het invullen van het carrièrekompas,

		<p>als feedback over jezelf als professional willen krijgen?</p> <p>Hoe moet de feedback eruit zien om bewuster te worden van wie je bent en met welke professional jij je identificeert?</p> <p>Welke informatie zou je over de 5 onderdelen willen krijgen?</p> <p>Welke informatie zou je over de 5 profielen willen krijgen?</p> <p>Het is ook mogelijk om zowel over de 5 onderdelen als over de profielen feedback te ontvangen, dus een combinatie te maken. Hoe denk je hierover?</p> <p>Zijn er nog punten die jullie missen? Waarover je meer zou willen weten?</p> <p>Als we deze profielen een naam zouden moeten geven, welke namen vinden jullie dan bij de profielen passen? Waarom?</p>
3	Table 2 in the PowerPoint is displayed on the laptop. Researcher explains it and starts a group discussion.	<p>Dit zijn de namen die als eerste opzet bedacht zijn bij de profielen. Wat roept dit in je op?</p> <p>Zou je het fijn vinden om zo genoemd te worden?</p> <p>Zou het je tot denken aanzetten?</p>

1.6 Presenting feedback about professional identity (± 20 min.)

General overview		
<p>Discussion - presentation of professional identity</p> <p>The idea is to use 6 examples and discuss these examples with the participants.</p>		
Step	Action	To say
1	Researcher introduces this part of the session and starts a group discussion.	<p>We hebben het net gehad over de inhoud. Nu zou ik de focus graag leggen op de manier van presenteren; dus hoe moet de feedback eruit zien.</p> <p>Heb je al een idee over hoe de feedback, over wie jij bent als een professional, eruit zou moeten zien?</p> <p>Ik heb enkele voorbeelden over manieren hoe de feedback over professionele identiteit gepresenteerd kan worden. Ik ben benieuwd hoe jullie over deze voorbeelden denken. Het idee is om alle voorbeelden langs te lopen en vervolgens in discussie te gaan over goede en minder goede punten van deze voorbeelden.</p>
2	Example 1 and 2 in the PowerPoint are displayed on the laptop. Researcher explains them.	<p>Je ziet nu voorbeelden hoe de feedback gepresenteerd kan worden.</p> <p>Wat vind je van deze feedback?</p> <p>Wat is een sterk punt van deze manier van feedback geven?</p> <p>Wat is een zwak punt van deze manier van feedback geven?</p> <p>Hoe zou deze feedback geoptimaliseerd kunnen worden?</p>

3	Example 3 and 4 in the PowerPoint are displayed on the laptop. Researcher explains them.	<p>Je ziet nu voorbeelden hoe de feedback gepresenteerd kan worden.</p> <p>Wat vind je van deze feedback?</p> <p>Wat is een sterk punt van deze manier van feedback geven?</p> <p>Wat is een zwak punt van deze manier van feedback geven?</p> <p>Hoe zou deze feedback geoptimaliseerd kunnen worden?</p>
6	Example 5 and 6 in the PowerPoint are displayed on the laptop. Researcher explains them.	<p>Je ziet nu voorbeelden hoe de feedback gepresenteerd kan worden.</p> <p>Wat vind je van deze feedback?</p> <p>Wat is een sterk punt van deze manier van feedback geven?</p> <p>Wat is een zwak punt van deze manier van feedback geven?</p> <p>Hoe zou deze feedback geoptimaliseerd kunnen worden?</p>
7	Examples are all shown on one PowerPoint slide. Researcher explains it and starts the group discussion.	<p>Alle voorbeelden staan in dit overzicht. Hoe zou je de feedback, over wie jij bent als een professional, nu het liefst willen ontvangen? Hoe zou de ideale feedback er voor jou uitzien?</p> <p>Zou je over alle profielen iets willen weten?</p> <p>Zou je jouw antwoorden willen kunnen vergelijken met anderen?</p>

1.7 Closing section (±2,5 min.)

Step	Action	To say
1	In the closing section all individual judgments are aggregated into group judgments, and feedback is provided on the consistency in judgments.	<p><u>Afsluiting:</u> We zijn nu aangekomen bij het einde van deze sessie. Tijd om alles samen te vatten. Deze punten zijn aangedragen als belangrijk: Is er nog iets wat jullie graag nog toe zouden willen voegen? Iets waarvan jullie denken dat ook belangrijk is om mee te nemen, dat wij over het hoofd hebben gezien?</p> <p>Ontzettend bedankt voor jullie input!</p> <p>Bij vragen en/ of opmerkingen kunnen jullie contact opnemen via de mail: m.devos@student.utwente.nl.</p>

Appendix B – Questionnaire

Feedback Carrière Kompas

Bij het invullen van deze vragenlijst neem je deel aan een onderzoek onder technische studenten van de UT en Saxion waarbij het doel is om feedback krijgen over wie je bent als professional.

In een eerder stadium van het onderzoek is onderzocht welke informatie studenten, n.a.v het invullen van het Carrière Kompas (CC), van belang vinden om te krijgen over wie zij zijn als professional en welke visuele weergave zij hierbij graag willen zien. Op basis van deze informatie is de huidige feedback ontworpen.

De huidige website bevat veel informatie in deze test-fase. De bedoeling is dat studenten na het invullen van het Carrière Kompas toegespitste feedback ontvangen: een top 3 van profielen die het meest overeenkomen. Hierdoor hoeven zij niet alle profielen te lezen.

Graag willen we van jou weten of de teksten en afbeeldingen op de huidige website duidelijk, aantrekkelijk en informatief zijn en of je door deze informatie een goed beeld krijgt van jezelf als professional.

Deelname is vrijwillig en antwoorden zullen anoniem verwerkt worden; namen noch persoonlijke gegevens zullen gebruikt worden in de reportage. Alleen de onderzoekers die betrokken zijn bij dit onderzoek zullen toegang hebben tot deze vragenlijst en jouw ingevulde antwoorden.

Door op onderstaande knop te klikken stem je geheel vrijwillig in met deelname aan dit onderzoek. Hierbij behoud je het recht om op elk moment zonder opgaaf van redenen je deelname aan dit onderzoek te beëindigen.

De begintekst

Tijdens het invullen van deze digitale enquête heb je de volgende website nodig:

<http://feedbackcc.jouwweb.nl/>. Alle vragen zijn gericht op teksten en afbeeldingen die op deze website te vinden zijn. Je kunt onderaan de pagina verder klikken naar de volgende pagina. Wanneer je op de website komt lees je meteen bij 'home' een tekst die uitleg geeft over de website en de feedback die op de website te bekijken en lezen is.

Onderstaande stellingen gaan over de tekst op deze pagina van de website.

Ik vind....

	Informative	Clear	Goal-oriented	Concise and to the point	Use of multimedia principles
Stellingen en de gemeten design requirements					
De begintekst duidelijk beschrijven wat het doel is van de informatie op de website			X		
De begintekst inzicht bieden in de informatie die je kunt lezen op de website			X		
De begintekst informatief	X				
De opbouw van de begintekst duidelijk		X			
De begintekst kort en krachtig geschreven				X	
De begintekst prettig geschreven					X
De begintekst te uitgebreid				X	

Open vragen begintekst:

Welke informatie uit de begintekst zou je lezen?

Welke informatie uit de begintekst zou je niet lezen?

Wat zou je verder nog willen veranderen aan de informatie in de begintekst?

Welke informatie mis je nog in de begintekst?

Profielen

Via het kopje 'Feedback' kom je bij twee afbeeldingen: de top 3 en de radar chart. Met behulp van deze afbeeldingen kun je zien welke profielen overeenkomen met de antwoorden die jij gegeven hebt in het Carrière Kompas. Hieronder zal de beschrijving komen van het profiel waarmee jij het meest overeenkomt. Op dit moment kun je op de namen van de vijf profielen klikken om de informatie over elk profiel te lezen.

Onderstaande stellingen gaan over de afbeeldingen 'top 3' en 'de radarchart' en de teksten over de profielen: 'nerd', 'einzelfänger', 'security seeker', 'allrounder' en 'status seeker'.

Ik vind....

	Informative	Clear	Goal-oriented	Concise and to the point	Use of multimedia principles
Stellingen en de gemeten design requirements					
Het podium met de top 3 duidelijk weergeven met welk profiel ik het meest overeen kom					X
Het podium met de top 3 interessant om te bekijken					X
De radar chart duidelijk weergeven met welk profiel ik het meest overeen kom					X
De radar chart uitnodigend om te bekijken					X
De combinatie van de afbeeldingen (top 3 en radar chart) en tekst over de profielen prettig					X
De afbeeldingen (top 3 en radar chart) en tekst over de profielen bij elkaar passen					X
De teksten over de profielen informatief	X				
De teksten over de profielen een goed beeld geven van mijzelf als professional			X		
De teksten over de profielen nuttig voor toekomstige keuzemomenten binnen en na de studie. Denk aan minor, stage, bachelor opdracht, master scriptie etc.			X		
De teksten over de profielen kort en krachtig geschreven				X	
De teksten over de profielen prettig geschreven					X
De opbouw van de teksten over de profielen duidelijk		X			
De teksten over de profielen te uitgebreid				X	
Het prettig dat ik zelf controle heb over hoeveel profielen ik lees					X
De profielnamen passend bij de teksten					
De profielnamen duidelijk					
De profielnamen prettig om te lezen					

Open vragen:

Welke informatie zou je lezen over de profielen?

Welke informatie zou je niet lezen over de profielen?

Wat zou je verder nog willen veranderen aan de informatie over de profielen?

Welke informatie mis je nog bij de profielen?

Dimensies

Via het kopje 'dimensies' kom je terecht bij de afbeelding van het Carrière Kompas (CC).

Onder dimensies vind je informatie over alle vijf dimensies: persoonlijkheid, interesses, waarden, doelen en competenties. Bij elke dimensie zie je naast de tekst een grafiek waarin jouw gegeven antwoorden staan en waarbij de lijn het gemiddelde antwoord van alle studenten laat zien. Deze grafiek wordt groter wanneer je er op klikt.

Onderstaande stellingen gaan over de afbeeldingen: 'het Carrière Kompas' en de 'grafieken' en over de teksten: 'persoonlijkheid', 'interesses', 'waarden & doelen' en 'competenties'.

Ik vind....

	Informative	Clear	Goal-oriented	Concise and to the point	Use of multimedia principles
Stellingen en de gemeten design requirements					
Het kompas uitnodigend om te bekijken					X
Het kompas duidelijk weergeven welke dimensies er zijn					X
Het kompas duidelijk weergeven over welke dimensie de informatie beschreven is					X
De grafiek uitnodigend om te bekijken					X
De grafiek duidelijk weergeven in welke mate een eigenschap bij mij past					X
Dat ik de informatie duidelijk uit de grafiek kan halen					X
De combinatie van afbeeldingen en tekst over de profielen prettig					X
Het kompas en de tekst over de dimensies bij elkaar passen					X
De grafiek en de tekst over de dimensies bij elkaar passen					X
De teksten over de dimensies informatief	X				
De teksten over de dimensies een goed beeld geven van mijzelf als professional			X		
De teksten over de dimensies nuttig voor toekomstige keuzemomenten binnen en na de studie. Denk aan minor, stage, bachelor opdracht, master scriptie etc.			X		
De opbouw van de teksten over de dimensies duidelijk		X			
De teksten over de dimensies kort en krachtig geschreven				X	
De teksten over de dimensies prettig geschreven					X
Het prettig dat alle onderdelen per dimensie toegelicht zijn					
De teksten over de dimensies te uitgebreid				X	
Het prettig dat ik zelf controle heb over hoeveel dimensies ik lees					X
De combinatie van informatie over profielen en dimensies interessant					
De combinatie van informatie over profielen en dimensies een goed beeld geven van mijzelf als professional					

Open vragen:

Welke informatie zou je lezen over de dimensies?

Welke informatie zou je niet lezen over de dimensies?

Wat zou je verder nog willen veranderen aan de informatie over de dimensies?

Welke informatie mis je nog bij de dimensies?

Hoe nu verder?

De tekst 'Hoe nu verder' op de laatste pagina van de website beschrijft vervolgstappen die genomen kunnen worden naar aanleiding van de feedback.

Onderstaande stellingen gaan over de tekst op de pagina 'Hoe nu verder'.

Ik vind...

	Informative	Clear	Goal-oriented	Concise and to the point	Use of multimedia principles
Stellingen en de gemeten design requirements					
De 'hoe nu verder' tekst duidelijk beschrijven wat je met de feedback zou kunnen doen			X		
De 'hoe nu verder' tekst informatief	X				
De opbouw van de 'hoe nu verder' tekst duidelijk		X			
De 'hoe nu verder' tekst kort en krachtig beschreven				X	
De 'hoe nu verder' tekst prettig geschreven					X
De 'hoe nu verder' tekst te uitgebreid				X	

Open vragen:

Welke informatie uit de 'hoe nu verder' tekst zou je lezen?

Welke informatie uit de 'hoe nu verder' tekst zou je niet lezen?

Wat zou je verder nog willen veranderen aan de informatie in de 'hoe nu verder' tekst?

Welke informatie mis je nog bij de 'hoe nu verder' tekst?

Overige vragen

1. Als je van de hele website zelf zou mogen kiezen welke afbeeldingen je zou bekijken, welke afbeeldingen zouden dit dan zijn?
2. Als je van de hele website zelf zou mogen kiezen welke teksten je zou lezen, welke teksten zouden dit dan zijn?

Appendix C –Codebook Focus groups

Categorie	Subcategorie	Subcode	Description	Example
1. Professionele identiteit	1.a Kijk op professionele identiteit	1.a.1 Mening student over PI	Uitspreken hoe je over professionele identiteit denkt.	'Belangrijk, want je denkt dat je jezelf kent.'
		1.a.2. Vergelijking PI met uitkomst andere testen	Professionele identiteit vergelijken met een test/vragenlijst.	'Dat is hetzelfde als een persoonlijke test. Dat geeft een indicatie van hoe jij kan zijn....'
	1.b Beeld eigen professionele identiteit (Wie ben ik?)	1.b.1 Inzicht in eigen competenties	Een beeld hebben waar je zelf goed in bent	'Pro-actief denken en veel kunnen analyseren.'
		1.b.2 Inzicht in eigen waarden	Een beeld hebben van wat jij belangrijk vindt	'Ik vind het heel fijn om controle te hebben.'
		1.b.3 Inzicht in eigen doelen	Een beeld hebben van welke doelen je hebt	'Ik wil graag software ontwikkelen.'
		1.b.4 Inzicht in eigen interesses	Een beeld hebben wat je interessant vindt	ik vind het heel leuk om mij in één onderwerp te verdiepen.'
		1.b.5 Inzicht in eigen persoonlijkheid	Een beeld hebben van de rol die je vaak aan neemt binnen het samenwerken.	'Ik ben vaak voorzitter.'
	1.c Nut inzicht in je eigen professionele identiteit (Wat wil ik?) (Hoe kom ik daar?)	1.c.1 Inzicht in jezelf	Wat wil je bereiken	'Ik zoek iets in de security richting voor het research project, omdat ik dat ook graag als master wil gaan doen.'
		1.c.2.	Reflectie op jezelf	'Ik zou wel graag willen weten hoe ik als professional zou zijn, omdat je daar dan gebruik van kunt maken.'
		1.c.3 Betere keuzes maken	Passende keuzes tijdens studie	'Mijn studie is een goede keuze geweest, maar het is nog steeds heel breed.'
		1.c.4	Persoonlijke ontwikkeling	'Het kan je wel helpen met kijken van wat zijn je goede skills, wat zijn je negatieve skills waar je aan kan werken.'
2. Feedback professionele identiteit	2.a Dimensies	2.a.1 Indruk van studenten over feedback m.b.t. de vijf dimensies	Mening over feedback krijgen m.b.t. de vijf dimensies (waarden, doelen, persoonlijkheid, competenties en	'Ik zou liever informatie over de vijf dimensies krijgen. Dan krijg je toch iets meer informatie over jezelf.'

			interesses)	
		2.a.2 Suggesties over de feedback m.b.t. de vijf dimensies	Studenten beschrijven hoe de feedback over de vijf dimensies er inhoudelijk uit moet zien	'Goals vind ik wel heel erg uitgebreid... Ik weet niet of dat logisch klinkt om short term en long term te doen?'
	2.b Profielen	2.b.1 Indruk van studenten over feedback m.b.t. de vijf profielen	Mening over feedback krijgen m.b.t. de vijf profielen	'Een profiel is een beetje.. ik weet niet.. sterrenbeeld-achtig.'
		2.b.2 Suggesties over de feedback m.b.t. de vijf profielen	Studenten beschrijven hoe de feedback over de vijf profielen er inhoudelijk uit moet zien	'Liefst in een percentage uitgedrukt dat je zegt van 60% is dat je daar wat van weg hebt.'
	2.c Profielfnamen	2.c.1 Indruk van de studenten over de huidige namen van de profielen	Mening van studenten over de huidige profielfnamen	'Als je dit allemaal bij elkaar ziet dan wil iedereen de allrounder zijn denk ik. Die klinkt het beste.'
		2.c.2 Ideeën van studenten over namen die passen bij de profielen	Namen die de studenten bedacht hebben passend bij de profielen	'Op de basisschool zou je dat een nerd noemen inderdaad.'
3 Presentatie feedback professionele identiteit	3.a Suggesties	3.a.1 Suggesties over de presentatie van de feedback over PI	Studenten beschrijven hoe de presentatie van de feedback over PI er uit moet komen te zien	'Je kunt misschien een soort van persona opstellen. Dat je er een foto bij krijgt van iemand die een beetje past bij dat profiel.'
	3.b Afraders	3.b.1 Ideeën die studenten hebben die zij niet in de presentatie van de feedback over PI willen zien	Beschrijving van afraders m.b.t. de presentatie van feedback over PI	'Niet te veel kleuren gebruiken.'
	3.c Multimedia principle	3.c.1 Students learn better from words and pictures than from words alone.	Visuele ondersteuning bij de feedback over PI	'Een korte beschrijving en sowieso dat eerste plaatje (met de 4 kleuren) waarbij alles visueel te zien is met een stukje tekst.'
	3.d Temporal Contiguity principle	3.d.1 Students learn better when corresponding words and pictures are presented	Presenteer tekst en plaatjes die bij elkaar horen tegelijkertijd.	'Als je dit [grafiek] er alleen neer zet dan wordt het niks maar als je een verhaaltje erbij zet dan kan je het wel interpreteren.'

		simultaneously rather than successively.		
	3.e Signaling Principle	3.e.1 Students learn better when cues that highlight the organization of the essential material are added.	Highlight datgene waar de student naar moet kijken.	‘Misschien vooral het meest en het minst dat dat iets duidelijker is aangegeven; dat dat opvalt’
	3.f Segmenting principle	3.f.1 Students learn better from a multimedia lesson when it is presented in user-paced segments rather than as a continuous unit.	Biedt de feedback deel voor deel aan en niet de gehele feedback in één keer.	‘Pas als je ergens op drukt, dat je dan meer informatie krijgt.’
	3.g Feedback	3.g.1 Vergelijken met andere studenten	Mening over de vergelijking van de feedback over PI met andere studenten	‘Het zou wel leuk zijn om te kunnen vergelijken met anderen, maar wat maakt het eigenlijk uit. Het gaat toch om mij.’
		3.g.2 Vergelijking met werknemers	Mening over de vergelijking van de feedback over PI met mensen uit het werkveld	‘Het lijkt mij dan wel interessant om juist te weten in wat voor beroep mensen uiteindelijk zijn gekomen met een dergelijk profiel.’
Reacties op voorbeelden qua presentatie	4 reacties	Reacties op visuele voorbeelden	Mening/reactie over powerpoint presentatie en bijbehorende visuele voorbeelden	‘Rechter sowieso. Die is sowieso wel iets blijer.’