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The effect of a personalized utility-value intervention on STEM students' interest in their study and identification with their study.

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Abstract

Since there is a shortage of highly educated STEM professionals in the Netherlands, it is important to increase the retention of STEM students in college so the number of technical professionals will grow. A concept that can be useful in this process, is professional identity. Professional identity is the perception of oneself in the occupational context and the extent to which individuals identify with that context. An instrument that is developed to help STEM professionals gain insights in their professional identity, is the Career Compass. It is important that individuals actively engage with the results of the Career Compass and one instrument that can possibly enhance this, is a utility-value intervention. The goal of this study was to investigate *to what extent a writing assignment connecting STEM students' personal values to the content of their study (i.e. a utility-value intervention) has a positive effect on STEM students' interest in their study and identification with their study.*

The research design included both a quantitative design and a qualitative design. 62 STEM students of the University of Twente and Hogeschool Saxion Enschede participated in filling in the Career Compass, the utility-value intervention (only the 30 participants in the experimental condition) and the questionnaire focused on STEM students interest in their study and identification with their study. Furthermore, the content of the written responses to the utility-value intervention was analysed in order to measure to what extent the depth of the written response has an influence on STEM students' interest in their study and identification with their study.

The results show that the writing assignment wherein STEM students connect personal values to the content of their study (i.e. the utility-value intervention) does not have an effect on STEM students' interest in their study and identification with their study. Furthermore, the depth of the written responses to the utility-value intervention does not have an effect on STEM students' interest in their study and identification with their study. This study thus adds value to existing research on the effect of a utility-value intervention on STEM students interest in their study and identification with their study.

Keywords: professional identity – utility-value intervention – Career Compass – STEM students

Content

Problem statement

In the Netherlands, around 14% of all graduates from higher education pursue technical studies (Berkhout, Bisschop, & Volkerink, 2013). Approximately 40% of the students entering Science, Technology, Engineering, and Mathematics (STEM) education do not pursue a career in the technical field and do not end up working in the technical labour market (Klebanov, Burstein, Harackiewicz, Priniski, & Mulholland, 2017). However, there is an increase in the numbers of technical vacancies available and new technical talent is needed. It is therefore important to increase the retention of STEM students in college so the number of technical professionals will grow (Cromley, Perez, & Kaplan, 2016).

A concept that can be useful in understanding why students leave the technical sector, is professional identity (van Hattum-Janssen, Endedijk, Quadrado, Bernardino, & Rocha, 2017). Professional identity is the perception of oneself in an occupational context and the extent to which individuals identify with that context (Beijaard, Meijer, & Verloop, 2004). Identification with one's study and future professional field is important because it stimulates commitment and satisfaction about career choices and work and fosters retention (Eliot & Turns, 2011; Nadelson et al., 2017).

In 2016, a feedback tool (Career Compass) was developed to help (future) technical professionals gain insights in their professional identity (van Veelen, Endedijk, Möwes, & van Hattum-Janssen, 2018). The Career Compass gives insights in an individuals' personality, interests, competencies, values and goals compared to a norm group of over 1000 technical professionals. It is important that STEM students actively engage with the results of the Career Compass so they will gain more knowledge and understanding about their identity in relation to their career and can identify with their future profession. One instrument that can possibly enhance active engagement, is a utility-value intervention. Through utility-value interventions, students discover connections between their own lives and their study which causes more motivation for that particular study (Harackiewicz & Priniski, 2018). However, no research has yet been conducted on the effect of the combination of a utility-value intervention and the Career Compass on the development of STEM students' professional identity.

The purpose of this current research is to investigate what the effect of a utility-value intervention in combination with the Career Compass is on the extent to which STEM students have

interest in their study and identify with their study. Through the Career Compass, students will gain insights in what values they find important in their lives. Through the utility-value intervention, students can connect those important values to their study. Through connecting these values to one's study, and thus to one's personal life, students' knowledge about their professional identity could possibly be positively enhanced.

Theoretical Framework

In the theoretical framework, the most important concepts of this research will be discussed. It will focus on professional identity, professional identity development and utility-value based interventions.

Professional identity

In the literature, there is a high variety in definitions for professional identity (Trede, Macklin, & Bridges, 2012). Combining the findings, professional identity can be described as the perception of oneself in an occupational context and it is an ongoing process of interpretation of experiences (Beijaard et al., 2004; Molinero & Pereira, 2013). Professional identity is defined by the attributes, skills, knowledge, beliefs, practices, and principles of professionals within a profession and it develops over time (Nadelson et al., 2017). An individual that has knowledge about one's professional identity, can connect his interests, values and goals to the (future) profession, and via this way feels related to the profession (Trede et al., 2012). It is thus about the extent to which an individual has internalized, developed and made sense of the different elements of a particular profession and can identify with the profession (Eliot & Turns, 2011).

Having knowledge about one's professional identity at an early age is important for several reasons. For example, individuals are hypothesized to assign higher value to choices that align with aspects of their identity (Perez, Cromley, & Kaplan, 2014) and a high identification with a profession stimulates commitment and satisfaction about career choices (Eliot & Turns, 2011). Developing a strong professional identity, thus enhances students' motivation to learn and their engagement in learning (Beijaard, Verloop, & Vermunt, 2000). Furthermore, the more students are aware of their professional identity, the more likely their persistence in that particular field because of the sense of belonging there (Hernandez et al., 2017). This can also apply to STEM students. For example, students with a stronger identification may persist longer in the face of difficulty and may be retained in the particular work field at a higher rate. Thus, the more STEM students develop their professional identity, the more likely their retention in the STEM field (Perez et al., 2014). It is therefore important that students get actively stimulated to develop their professional identity so they can identify with their study and their future profession.

Professional identity development

Individuals gain more understanding of their professional identity by going through different processes that have an influence on their commitments, the quality of their engagement and their well-being (Perez, Cromley & Kaplan, 2014). For students this means participation in the professional role and preparations for the role to gain insights into the professional ideology, motives and attitudes and the extent to which an individual can identify his interests, values and goals with the profession. According to Ibarra (2004) professional identity development and thus the process of identification with one's profession, consists out of three basic processes. Firstly, the engagement with professional activities is an important process. Through engaging in activities that are associated with a professional role, identification with the role is build. Secondly, social networks are developed. Through the development of social networks around the specific professional role, individuals have easy access to domain knowledge and furthermore they have role models. According to Ibarra (2004), the last process of the professional identity development process is sense-making. Sense-making consists out of individuals getting in term with the opportunities of the future professional role and the weighting of this against their own goals in life and especially values they find important in life. This process consists out of imposing meaning on situations, framing and reframing events and reflection (Danielak, Gupta, & Elby, 2014). Furthermore, it includes the writing and rewriting of personal narratives. According to Eliot and Turns (2011) especially this last process, thus sense-making, is important for gaining understanding of one's professional identity. Furthermore, important for this process, is active engagement from individuals. In their research, Eliot and Turns (2011) try to foster sense-making through constructing professional portfolios. Four weeks long participants attended a weekly workshop where they were guided in constructing a professional portfolio. During these workshops, participants gained knowledge about for example their own goals, background and skills. Participants built a personal narrative and found connections between their own professional values and their future profession. Participants found this sense-making intervention a valuable experience.

Sense-making and active engagement can be qualified as important for the identification with one's (future) profession. However, in curricula of universities, sense-making is often not facilitated and therefore the process for students to develop their professional identity and to identify with their

future profession is not elusive enough (Eliot & Turns, 2011). It is thus important to help students to actively engage with their professional identities and to facilitate sense-making in order for them to more successfully identify with their professional identity and to foster STEM retention.

Interventions

One way to target specific educational problems, such as STEM retention, are targeted interventions (Harackiewicz & Priniski, 2018). A targeted intervention addresses specific motivational processes at crucial time points during the educational process. It can address basic psychological processes that have an influence on optimal academic functioning. Targeted interventions can focus on several problems, such as promoting motivation and engagement at university, and they can have powerful and long-term effects. There are three types of targeted interventions (Harackiewicz & Priniski, 2018). Task value interventions focus on how students perceive value in academic tasks and these interventions communicate the value or importance of an academic task. Framing interventions focus on changing the way students frame academic challenges and how to overcome these challenges. Lastly, personal value interventions focus on students' personal values and self-worth in the domain. Since a task value intervention focusses on students perceiving value in a task and discovering connections between oneself and an academic task, it could be a beneficial instrument in STEM retention, and more specifically in students gaining knowledge about their professional identity.

The task value intervention that is most successful in finding value in a task or topic, is a utility-value intervention (Harackiewicz & Priniski, 2018). Utility-value interventions are based on the expectancy-value theory (EVT), which provides a framework for educational and career choices based on skills, expectancies, task values and life goals (Wang & Degol, 2013). The expectancy-value framework emphasizes that value beliefs predict positive student outcomes and achievement choices, such as persistence and motivation for course taking and career choices (Gaspard et al., 2015; Hulleman, Kosovich, Barron, & Daniel, 2017; Wang & Degol, 2013). There are, according to the EVT two constructs that have a direct influence on student's task choice, persistence and motivation (Ball, Huang, Cotten, & Rikard, 2017). These two constructs are expectancies for success, which is about an individuals' belief to succeed at a given task, and subjective task values, which is about various

comprised values namely interest value, attainment value, utility value and costs for a particular task or activity. Utility-value interventions specifically focus on the perceived utility value in a task or course. Perceiving value in a task or course, has several positive effects on students. Namely their motivation increases, they work harder, develop more interests and their performances increase (Hulleman et al., 2017). Therefore, according to Harackiewicz and Priniski (2018) a utility-value based intervention can be an effective intervention for STEM retention.

Students perceive utility-value in a topic when they believe that it is useful and relevant for their current or future situation and for goals in their lives (Andersen & Ward, 2014). Through utility-value based interventions, students discover connections between their own lives and their study and this fosters sense-making (Hulleman, Godes, Hendricks, & Harackiewicz, 2010). For example, utility-value interventions connect one's future goals to a specific course or profession. Seeing such connections allows students to see relationships that they previously had not noticed. It allows students to view information from a different perspective and to develop a more in-depth integration of their knowledge (Hulleman et al., 2017). Perceiving a high utility-value thus has several benefits for students.

There are several techniques to create and conduct a utility-value intervention (Canning & Harackiewicz, 2015). The two most used techniques are a directly communicated utility-value intervention and a self-generated utility-value intervention. In a directly communicated utility-value intervention, information about the usefulness of a task is directly provided to the students. In a self-generated intervention students are asked to write about how the specific concept is useful to them in their own lives (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009). The self-generated intervention gives students an opportunity to personalize an intervention and it triggers reflection and sense-making, which in turn increases the effectiveness of the intervention. It helps students discover their own reasons for actively engaging in learning which works motivating. Both techniques are effective, however the self-generated utility-value intervention has been proven to be more effective for increasing interest, performance and utility. According to Gaspard et al. (2015) a combination of both techniques is even more effective. In their research it is proven that it sometimes can be difficult for students to write an assignment when they are not provided with some background information or

with an example. Therefore, by giving students a short example, and then let them individually write about the connection to their lives can be a useful approach for designing a utility-value intervention.

So far, several studies have focused on the effect of a utility-value based intervention on different dependent variables, such as motivation of students to attend college (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016), improving student performance (Canning et al., 2018), and promoting interest in STEM (Hulleman & Harackiewicz, 2009). For example, Hulleman et al. (2010) found in their study that through a utility-value intervention, which was a writing prompt given to high school students, students were more interested in STEM courses than students who did not participate in the writing intervention. Furthermore, Hulleman and Harackiewicz (2009) found in their study that whenever high school students connect their STEM course material to their own lives through a utility-value intervention, their motivation, interest and learning increased. In conclusion, several studies have focused on the effect of a utility-value intervention on different variables, but no study has yet focused on the combination of a utility-value based intervention and students' interest in their study and identification with their study. Since utility-value based interventions have an effect on sense-making and foster active engagement, it can be a useful instrument in identification. In the current research, there will thus be investigated to what extent a utility-value based intervention has a positive effect on STEM students' interest in their study and identification with their study.

So far, according to Akcaoglu, Rosenberg, Ranellucci, and Schwarz (2018), the majority of research towards utility-value interventions did not focus on the content of the written responses to utility-value interventions. However, research of Akcaoglu et al. (2018), proves that the content of the answers can be essential data to assess the effect of the utility-value intervention; the quality of the written responses can determine the impact of the intervention. For example, the length of the written response, the accuracy and the depth of the written response can all have an effect on the impact of the intervention (Daniels & Goegan, 2019). The extent to which a written response contains depth, has the biggest influence on the impact of a utility-value intervention. The more in-depth a written response is, the more a participant was invested in the assignment thus the bigger the impact of the utility-value intervention can be. Analysing the content of the written responses to the intervention can thus be

valuable in order to determine the effect of the intervention depending on how the intervention was made by participants.

No study has yet focused on the influence of a utility-value intervention on STEM students' identification with their study and STEM students' interest in their study. To enhance one's identification and interest, sense-making and active engagement are important. A utility-value intervention fosters both sense-making and active engagement. In this research, the utility-value intervention will be used as an instrument to let STEM students make a connection between values they find important in their lives and their study. Through the Career Compass designed by Möwes (2016), students discover knowledge about their personality, interests, competencies, values and goals. However, in this study, there is only focused on students' gaining knowledge about what values they find important in life since having knowledge about important values in life, plays a key role in the process of sense-making. In the utility-value intervention, STEM students will connect values they find important (derived from the Career Compass) to their study. This study will thus focus on the extent to which a utility-value based intervention combined with the Career Compass can contribute to STEM students' interest in their study and identification with their study. Furthermore, in this study, the content of the written responses to the intervention will be analysed. Via this way there can be determined to what extent the content of written responses, and most importantly the depth in the written responses, have an effect on the impact of the utility-value intervention on STEM students' interest in their study and identification with their study.

Research question

In order to guide this research, the following research question is posed:

To what extent does a writing assignment connecting STEM students' personal values to the content of their study (i.e., a utility-value intervention) has a positive effect on STEM students' interest in their study and identification with their study?

H1: The writing assignment connecting STEM students' personal values to the content of their study (i.e. a utility-value intervention) will have a positive effect on STEM students' interest in their study.

H2: The writing assignment connecting STEM students' personal values to the content of their study (i.e. a utility-value intervention) will have a positive effect on STEM students' identification with their study.

H3: In-depth responses to the utility-value intervention will have a positive effect on the impact of the utility-value intervention on STEM students' interest in their study and identification with their study.

Method

In this chapter, the research design with corresponding methodological information will be explained. 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.

Research design

The aim of this study was to investigate to what extent a personalized utility-value intervention has an effect on STEM students' interest in their study and STEM students' identification with their study. In this research an experimental design was applied. The condition participants were randomly assigned to was defined as the independent variable and participants' interest in their STEM study and identification with their STEM study were defined as the dependent variables. The independent variable consisted of two conditions, namely the experimental condition in which respondents were asked to complete a writing exercise (utility-value intervention) and the control condition in which participants did not complete an exercise. Furthermore, within the experimental condition it is analysed to what extent the length, correctness and depth of the answers had an influence on the impact of the utility-value intervention on STEM students' interest in their study and identification with their study.

Respondents

The aim was that at least 60 STEM students (both applied sciences and university students) participated in this study. In order to have a representative study, it was necessary that both the experimental group and the control group existed out of a minimum of 30 participants (Babbie, 2016). A total of 174 students started with the study. However, 112 students were deleted from the dataset since they did not fully complete the questionnaire. Most students that were deleted from the dataset, quit the questionnaire either before filling in the Career Compass (51 students) or before the utility-value intervention (27 students), which are both essential components of the study. Furthermore, 23 students indicated that they did not receive an email with the results of the Career Compass and they could therefore not further participate in the study. One student was deleted from the dataset since they were not a STEM student and one student was deleted from the dataset because their response to the

utility-value intervention was blank. The manipulation check gave no further reasons to eliminate participants (elaborated explanation in the Data analysis). The final sample therefore included 62 STEM students. The final sample of 62 participants contained 7 students of Saxion Hogeschool Enschede and 55 students of the University of Twente, of which 29 were males and 33 were females, aged from 18 to 35 years old (M = 21.65 years, SD = 2.71). Participants were informed about the nature of the research, the possibility to withdraw and the privacy of the data. Participants were randomly assigned to one of two conditions, namely the experimental condition or the control condition. 30 students participated in the utility-value intervention (experimental group) and 32 students did not participate in the utility-value intervention (control group).

Instrumentation

A variety of instruments were used to investigate to what extent a utility-value intervention contributed to STEM students' identification with their study and interest in their study.

Career Compass. The Career Compass is an online tool developed by Möwes (2016) to measure STEM students' personality, interests, competencies, values and goals. It helps students to get insights in who they are as a STEM professional. This helps them develop their professional identity and it makes career choices easier. Each of the five dimensions (personality, interest, competencies, values and goals) is measured with multiple factors and the factors are measured with several items. For each item, participants indicate to what extent a statement applies to them, all on a 7-point Likert scale (1 = Not at all, 7 = Very much). For this study, there was only focused on the dimension 'values' since having knowledge about what values one finds important in life, is most important in the process of sense-making. Therefore, the dimensions personality, interest, competencies and goals were deleted from the Career Compass. The dimension 'values' was measured with 32 items, reflecting nine values (Appendix A). Examples of items are 'I find good health important' and 'I find curiosity important'. Participants were asked to fill in their email address and via this email address participants received a link to the outcome of the Career Compass. The outcome showed participants' score on each of the nine values and the importance of those values to the participant. The nine different values are tradition, family, hedonism, benevolence, intellectual stimulation, health, security, power and comfort. Lastly, participants were asked to remember the two values that were most

important to them. Appendix B shows an overview of the values participants indicated were most important to them.

Utility-value intervention. The goal of the utility-value intervention used in this study was focused on enhancing active engagement and sense-making since theory has proven this could be beneficial for developing one's professional identity (Eliot & Turns, 2011). According to Gaspard et al. (2015) a combination of a self-generated and directly communicated utility-value intervention is most successful. Therefore, this method was applied to the utility-value intervention by providing participants with guidelines in the intervention but on the other hand, giving them the freedom to choose their own topic to write about.

After comparing several utility-value interventions created for studies with different purposes, the utility-value intervention created by Hulleman and Harackiewicz (2009) was used as a basis for the utility-value intervention in this study. This utility-value intervention was chosen since it focused on enhancing interest in a STEM related subject (biology) and proved to have a positive effect. Furthermore, the intervention is a combination of a self-generated and directly communicated utility-value intervention, which is according to Gaspard et al. (2015) the most effective technique for a utility-value intervention. Since the utility-value intervention developed by Hulleman and Harackiewicz (2009) was distributed among high school biology students, and in this study the utility-value intervention was distributed among STEM students, several changes have been made to the intervention to adapt it to this study (see Appendix C for an overview of the personalized utility-value intervention in Dutch and in English). Originally, biology students were asked to apply a topic or concept that was covered during their biology classes to their life or the life of a family member/friend. In Part A of the utility-value intervention, students had to summarize a topic or concept that was covered during their biology classes. In Part B of the utility-value intervention, students had to describe how the information of that subject was useful to them and how learning about the topic applied to achieving future plans. In the adapted utility-value intervention used in this study, participants were asked to pick a topic or concept that was covered during one of their classes and summarize this topic or concept (around 50 words) in Part A of the utility-value intervention. In Part B of the utility-value intervention, participants were asked to connect the two for them important

values of the Career Compass (prior to the utility-value intervention participants were asked to indicate which two values of the Career Compass were most important to them), to the summarized concept or topic in Part A. Participants were asked how the specific topic or concept can be relevant to the two values and how learning about the specific topic or concept contributes to achieving the two values in life. Participants were asked to describe this in at least five sentences.

In order to test how the adapted version of the utility-value intervention was received by the target group, prior to the data collection the adapted utility-value intervention was tested by three students. Based on their feedback, a few small changes were made in the wording of some sentences.

Questionnaire. The questionnaire measured several concepts, namely background information of the participants and the two dependent variables, namely STEM students' interest in their study and STEM students' identification with their study (Appendix D). The questionnaire was published in both Dutch and in English. The background questions in the questionnaire focused on participants' gender, age, level of education, study and the year of the study of which participants followed the most classes. The items for interest in one's study were based on Harackiewicz et al. (2016). Interest was measured by five items (Cronbach's $\alpha = .87$). Participants could answer on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree. To adapt the items on this study, the word 'biology' in the questions was changed to 'my study'. Examples of items are "I'm looking forward to learn more about my study" and "I find my study interesting". The items for identification with one's study, were based on Chemers, Zurbriggen, Syed, Goza, and Bearman (2011). Identification with one's study was initially measured with six items (Cronbach's $\alpha = .79$), however after conducting a factor analysis (Appendix E), one item was deleted (Cronbach's $\alpha = .78$) (see Preliminary data analysis for a detailed explanation). Participants could answer on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). To adapt the items on this study and to make it personal for the participants, the word 'science' in the questions was changed. This word was customized for every participant. For example, if a participant indicated that they studied Business & IT, the word 'science student' was changed to 'Business & IT student'. Examples of items are "I have a strong sense of belonging in the community of … students" and "Being a … student is an important part of my self-image".

Procedure

In order to ensure the quality of this study, approval from the Ethics committee of the University of Twente was obtained prior to conducting the data. STEM students were invited to participate in the research via a link to the questionnaire. Flyers with a QR code that directed students to the questionnaire were spread at the University of Twente and Saxion Hogeschool Enschede. The flyers were distributed in study rooms that belong to STEM study associations and in study rooms that are specifically for STEM students. Furthermore, snowball sampling was used in order to gain more participants. The utility-value intervention and the questionnaire were conducted via Qualtrics, an online survey tool for smartphone, tablet and notebook. Firstly, participants were partly informed about the research and participants gave permission to participate in this study by means of online informed consent. Secondly participants filled in background information. Thirdly, within Qualtrics participants were directed to the Career Compass with a link. After participants had filled in the Career Compass, they received an email with a link to the outcome of the Career Compass. Participants were instructed to read the outcome of the Career Compass, to remember the two values that were most important to them and participants were instructed to return to the questionnaire in Qualtrics. For the experimental group the utility-value intervention followed in Qualtrics and they had to made use of the two for them most important values they had to remember from the Career Compass. Followed, participants in both the experimental group and the control group were asked to fill in questions about their interest in their study and their identification with their study. Lastly participants were fully informed about the goal of the research and the existence of the two conditions was explained. This was purposefully shared in the end of the questionnaire to avoid socially desirable answers. The completion time was approximately 15 to 20 minutes.

Pre-liminary data analysis

Quantitative data

Quantitative data was collected using the questionnaire that measured background information, interest in STEM and identification with STEM. To investigate whether the questions in the questionnaire addressed the relevant variables, a factor analysis was run in SPSS. The factor analysis revealed two components with Eigenvalues over Kaiser's criterion of 1, and in combination

the components explained 59.69% of the variance. However, the factor analysis showed that one item that measures identification, namely 'Being a … student is an important part of my self-image' belonged to the factor interest instead of the factor identification. Therefore, the factor analysis suggests that this item is not reliable when it comes to measuring identification with one's study. This can thus have a negative impact on the further analysis, and therefore there was chosen to not include this item in the further analysis. A second factor analysis was done, excluding the item 'Being a … student is an important part of my self-image'. The factor analysis revealed two components with Eigenvalues over Kaiser's criterion of 1, and in combination the components explained 62.34% of the variance (Appendix E).

Furthermore, a manipulation check was conducted in order to investigate to what extent participants were aware of what assignments they have carried out during the research. Participants were asked what they have done during this research, namely filling in the Career Compass or filling in the Career Compass and a short writing assignment (i.e., utility-value intervention). Results show that 61 participants indicated the right condition that they were in, namely the experimental condition or the control condition. Only one participant indicated that they did not do the writing assignment while they did do the writing assignment. The data of that specific participant was inspected and this showed that they filled in the utility-value intervention seriously. This gave no further reason to eliminate the data from this person.

Assumptions for an ANOVA were investigated in order to analyse if an ANOVA could be carried out to measure the effect of the utility-value intervention on interest in one's study and identification with one's study. Results show that the observations were independent and that the dependent variables were measured on an interval scale, Furthermore, the assumption for normal distribution was checked using the Shapiro-Wilk test for small ($n<200$) samples. The assumption for normality was met for STEM students' interest in their study ($p < .05$). The assumption for normality was not met for STEM students' identification with their study ($p = .26$). However, when group sizes are equal, an F-statistic can be quite robust to violation of normality (Field, 2009). Therefore, to investigate whether the utility-value intervention had a significant effect on STEM students' interest in their study and identification with their study, an ANOVA was carried out. To assess whether one

group had more interest in their study and identified with their study than the other group, the mean scores of variables were compared between the participants from both conditions.

Qualitative data

Qualitative data was collected with the utility-value intervention *(N=30).* In the intervention, participants were asked to summarize a concept or topic of their study (Part A) and to connect this concept or topic to values they find important in their lives (Part B). According to Akcaoglu et al. (2018) and Daniels and Goegan (2019) important for the analysis of responses to utility-value interventions, are the length, correctness and especially the depth of the responses. Therefore, the focus during analysing the responses to the utility-value intervention was on the length, correctness and depth of the responses. The analysis was done by the use of a codebook which can be found in Appendix F.

To address the issue of consistency of the implementation of the codebook, the interrater reliability was measured. Both coders coded 12 written responses to both Part A and Part B of the utility-value intervention and during coding, there was focussed on the length and correctness of the response to Part A of the intervention and the length, correctness and depth of the responses to Part B of the intervention. Therefore, 40% of the written responses was coded by two coders. This resulted in an interrater reliability of 93.33%, which states the percentage of agreement between the two coders on the 12 written responses.

The initial codebook existed out of 12 codes; four codes for Part A and seven codes for Part B. For Part A of the intervention there were two codes for the length of the response namely less than the guidelines (a response below 50 words) and according to the guidelines (a response with 50 words or more). There was chosen to code this in order to determine to what extent writing a response with a length according to the guidelines had a positive influence on STEM students' interest in their study and identification with their study. There were two codes for the correctness of the response, namely incorrect (topic or concept was vaguely described) and correct (topic or concept was clearly described). There was chosen for two options since the assignment in Part A of the intervention was quite easy and could therefore only be made correct or incorrect. For Part B of the intervention there were three codes for the length of the response, namely less than the guidelines (written response is

below 70 words), according to the guidelines (written response is between 70 and 130 words) and more than the guidelines (written response consists out of 130 words or more). There were two codes for the correctness of the response, namely incorrect (in the written response is not described how values are related to the topic or concept and how learning about the topic or concept contributes to achieves the values) and correct (in the written response was described how values are related to the topic or concept and how learning about the topic or concept contributes to achieving values). There was chosen for two codes since it was important to see the effect of writing a correct response to the utility-value intervention on STEM students' interest in their study and identification with their study. Lastly, there were three codes for the depth of the written response, namely little depth (both values are described vaguely and are hardly connected to one's personal life), medium depth (one value is connected to one's personal life, respondent gives one example about how this topic or concept contributes to achieving the values) and a lot depth (both values are connected to one's personal, respondent gives multiple examples about how this topic or concept contributes to achieving the values).

However, since one code of the length of the response to Part B consisted of only one participant, and one code of the depth of the response to Part B consisted of only seven participants, codes were merged within their subcategory (see Table 3 for the frequencies per code). Therefore, the codes *according to the guidelines* and *more than the guidelines*, were merged into the code *according to the guidelines* (the written response consists of 70 or more words). Furthermore, the codes *medium depth* and *a lot depth* were merged into *a lot depth* (one or both values are connected to one's personal life, respondent gives an example about how this topic or concept contributes to achieving the values). Therefore, the final codebook existed out of 10 codes (Appendix F).

After coding the qualitative data, the data was placed in an SPSS file. A descriptive analysis was conducted in order to analyse the overall quality of the written responses to the utility-value intervention.

To investigate whether the amount of depth embedded in the written response had a significant effect on STEM students' interest in their study and identification with their study, an ANOVA for both dependent variables was carried out. To assess whether one group had more interest in their study and identified more with their study than the other group, the mean scores of variables were compared between the participants who had few depth in their answer and those who had a lot of depth in their answer.

Results

Descriptive statistics

The variables of this study were STEM students' interest in their study, STEM students identification with their study, the condition of the study and the demographic variables age, gender, level of education, study and the year of the study of which participants followed the most classes . A Spearman correlation showed that age and gender were correlated (r_s = .33; p = .01), gender and educational level were correlated (r_s = .28; p = .05) and interest and identification were correlated (r_s = .52; p = .01). Since there are no significant correlations between the dependent variables and the demographic variables, the demographic variables were not included in further analysis. Results show that there were no significant correlations between the condition participants were in and gender, age and educational level. This thus means that the participants were evenly distributed among both conditions. Table 1 shows the means, standard deviations and correlations between the variables.

Table 1. *Correlations and descriptive statistics; demographic variables and independent variables (N = 62)*

			Correlations					
	Mean	SD	1	2	3	4	5	6
1. Gender[a]	1.53	.50	--					
2. Age	21.64	2.71	.33**	--				
3. Educational level[b]	1.89	.32	.28*	-.21	--			
4. Condition[c]	1.48	.50	-.06	.08	-.06	--		
5. Interest[d]	4.17	.60	.06	.02	.09	-.10	--	
6. Identification[d]	3.64	.62	.05	-.24	.13	-.04	.52**	--

Notes. [a]Gender: 1 = male, 2 = female. [b] Educational level: 1 = Applied Sciences, 2 = University. [c]Condition: 1 = control condition, 2 = experimental condition. [d]Measured at a five point scale. *Correlation is significant at .05 α level. **Correlation is significant at .01 α level.

Difference between experimental condition and the control condition

Table 2 shows the means, standard deviations and minimum and maximum scores for the dependent variables per condition. An ANOVA was conducted to compare STEM students' interest in their study between the control condition and the experimental condition. Results showed a non-significant difference F(60)=0.47, p=0.49 (p>0.05) (Table 2). Hence, no significant difference in

interest in one's study among the two groups was found. Therefore, Hypothesis 1 (the writing assignment connecting STEM students' personal values to the content of their study will have a positive effect on STEM students' interest in their study) can be rejected.

To compare STEM students' identification with their study between the control condition and the experimental condition, an ANOVA was conducted. Results showed a non-significant difference $F(60)=0.01$, $p=0.92$ ($p>0.05$) (Table 2). Hence, no significant difference in identification with one's study among the two groups was found. Therefore, Hypothesis 2 (the writing assignment connecting STEM students' personal values to the content of their study will have a positive effect on STEM students' identification with their study) can be rejected.

Table 2. *Mean scores and standard deviations on interest with one's study and identification with one's study for the control condition and experimental condition.*

	Control condition				Experimental condition			
	M	SD	Minimum score	Maximum score	M	SD	Minimum score	Maximum score
Outcomes interest	4.22	0.62	2.20	5	4.11	0.58	2.60	5
Outcomes identification	3.65	0.59	2.20	4.80	3.63	0.69	2.20	4.80

The written responses

In total 30 participants participated in the experimental condition and thus made the utility-value intervention. During the analysis there was investigated how the intervention was made by the participants. There was focused on the length of Part A (the section wherein participants had to summarize a topic or concept of their study) and Part B (the section wherein participants had to connect two important values to the previous summarized concept or topic), the correctness of Part A and Part B and the depth of Part B. Table 3 shows the frequencies of each variable.

Table 3. *Frequencies of the variables of the written responses (N=30).*

		Frequency	Percent
Length Part A	Less than the guidelines	16	53.3
	According to the guidelines	14	46.7
Correctness Part A	Incorrect	3	10.0
	Correct	27	90.0
Length Part B	Less than the guidelines	16	53.3
	According to the guidelines	14	46.7
Correctness Part B	Incorrect	19	63.3
	Correct	11	36.6
Depth	A little	12	40.0
	A lot	18	60.0

Striking in the results, is that 27 participants did the assignment of Part A correctly but only 11 participants did the assignment of Part B correctly. Most participants that did not follow the guidelines, only described one value instead of two values (10 participants). 5 participants indicated that they were unable to connect the values to their study, an example of a response is: *'In no way warmth can be connected to my two values health and hedonism'*. Furthermore, it was striking that one participant explained how his study had a negative impact on achieving his two most important values instead of describing how his study has a positive effect on achieving the two values. Therefore, the assignment wasn't done correctly.

Furthermore, the results show that 18 participants had many depth in their written response to Part B of the intervention. Those participants were able to give a detailed explanation and one or multiple examples of how their study contributed to achieving their two most important values in their life. Participants who hardly showed depth in their written response, mostly described the values vaguely and did not describe how the values were personally connected to their study and how their study helped by achieving those values. An example of this is: '*Comfort would link to this as the point of the course was to make products as easy to use'*.

Correlations

A Spearman correlation was conducted in order to see to what extent there were correlations between the codes of the codebook and the dependent variables. The results show that the length of Part B and correctness of Part B were correlated (r_s = .40; p = .05), correctness of Part A and depth were correlated (r_s = .41; p = .05), length of Part B and depth were correlated (r_s = .49; p = .01) and correctness of Part B and depth were correlated (r_s = .62; p = .01). Table 4 shows the means, standard deviations and correlations between the variables.

Table 4. *Correlations and descriptive statistics; written responses and independent variables (N = 30)*

			Correlations						
	Mean	SD	1	2	3	4	5	6	7
1. Interest	4.17	.60	--						
2. Identification	3.64	.62	.52**	--					
3. Length Part A	1.47	.51	-.11	-.06	--				
4. Correctness Part A	1.90	.31	-.15	-.21	.31	--			
5. Length Part B	1.47	.51	.14	.10	.06	.31	--		
6. Correctness Part B	1.37	.49	.19	.09	-.16	.25	.40*	--	
7. Depth	1.60	.50	.01	.15	.08	.41*	.49**	.62**	--

Notes. *Correlation is significant at .05 α level. **Correlation is significant at .01 α level.

Relationship between the written responses and the dependent variables

Table 5 shows the means, standard deviations and minimum and maximum scores for interest in one's study and identification with one's study per depth in the written response. An ANOVA was conducted in order to the investigate the influence of the depth of the written responses, on STEM students' interest in their study. Results revealed a non-significant difference, $F(28) = 0.05$, $p = 0.82$ ($p>0.05$) (Table 5). Hence, no significant difference in interest in one's study among the two groups was found.

Furthermore, an ANOVA was conducted in order to the investigate the influence of the depth of the written responses, on STEM students' identification with their study. Results revealed a non-significant difference, $F(28) = 0.49$, $p = 0.49$ ($p>0.05$) (Table 5). Hence, no significant difference in identification with one's study among the two groups was found. Therefore, Hypothesis 3 (in-depth

responses to the utility-value intervention will have a positive effect on the impact of the utility-value intervention on STEM students' interest in their study and identification with their study) can be rejected.

Table 5. *Mean scores and standard deviations on interest in one's study and identification with one's study for a little depth and a lot of depth.*

	A little depth				A lot of depth			
	M	SD	Minimum score	Maximum score	M	SD	Minimum score	Maximum score
Outcomes interest	4.08	0.58	2.60	4.80	4.13	0.60	2.80	5.00
Outcomes identification	3.52	0.73	2.40	4.80	3.70	0.67	2.60	4.80

Discussion

The current research aimed to examine to what extent a writing assignment connecting STEM students' personal values to the content of their study (i.e. a utility value intervention), had a positive effect on STEM students' interest in their study and identification with their study. Additionally, this study focused on the effect of the content of the written response on the impact of the utility-value intervention on STEM students' interest in their study and identification with their study. In this chapter the outcomes of the study will be discussed. Furthermore, theoretical and practical implications that derive from this research will be discussed and limitations that can be considered when interpreting the results are explained. Suggestions for further research will be offered and subsequently, final conclusions about the current research will be drawn.

The effect of the writing assignment on STEM students' interest in their study and identification with their study

First, this study investigated the effect of a utility-value intervention on STEM students' interest in their study and identification with their study. According to the literature, active engagement and sense-making are necessary in order to enhance one's professional identity (Eliot & Turns, 2011; Hulleman et al., 2010). Both were present in the utility-value intervention in this study since students had to actively engage with the results of the Career Compass by connecting their personal values to their study, which in turn fosters sense-making about one's professional identity. It was thus expected that the writing assignment connecting STEM students' personal values to the content of their study (i.e., a utility-value intervention), would have a positive effect on STEM students' interest in their study and identification with their study. However, results of this study revealed that the utility-value intervention did not have a significant effect on STEM students' interest in their study and identification with their study. Results show that interest in one's study and identification with one's study are highly correlated, which means that whenever students are more interested in their study, they can also identify more with their study. On average STEM students are interested in their study and identify with their study, however results show that the utility-value

intervention did not have a significant effect on this. This finding is not in line with the previous literature about the effect of a utility-value intervention.

Furthermore, it was hypothesized that the more depth participants showed in their written response to the utility-value intervention, the more the utility-value intervention would have had an impact on STEM students (e.g. more interest in one's study and more identification with one's study). However, the findings are not in line with this hypothesis. Results show that participants who showed more depth in their written response, were on average more interested in their study and could identify more with their study, however these results were not significant.

One possible explanation for the fact that the utility-value intervention did not have the hypothesized effect, is the setting wherein participants participated in the research. Studies which focused on the effects of a utility-value intervention mostly took place in classroom settings (Daniels & Goegan, 2019; Harackiewicz et al., 2016; Hulleman & Harackiewicz, 2009). In classroom settings, there is more control over participants when they participate in the intervention, which can cause more motivation for participants to actively engage in an assignment. The fact that during this study participants had the freedom when writing their response to the utility-value intervention, could have caused that participants took the writing assignment in the utility-value intervention less seriously. For example, results show that the majority of the participants did not do the writing assignment of Part B according to the guidelines. Not all participants described how their two important values are related to their study and how their study can contribute to achieving the two important values in life, some participants connected only one value to their study and some participants didn't connect a value to their study at all. Therefore, it is possible that participants did not actively engage enough during the intervention and that there was less sense-making than hypothesized. This could have caused that there was no significant difference between the experimental condition and the control condition, and thus that the utility-value intervention did not have the hypothesized positive effect on STEM students' interest in their study and identification with their study.

Another possible explanation for the fact that the utility-value intervention did not have the hypothesized effect, is the absence of repetitiveness of the utility-value intervention in this research. Repetitiveness is not specifically necessary for the utility-value intervention to have an impact

(Harackiewicz & Priniski, 2018), however several studies proved that repeating a utility-value intervention can foster STEM students' interest in for example mathematics and biology (Gaspard et al., 2015; Harackiewicz et al., 2016). Therefore, the fact that this study had an absence of repetitiveness of the utility-value intervention could have caused that the utility-value intervention did not have the hypothesized positive effect on STEM students' interest in their study and identification with their study.

Theoretical implications

This study investigated the effect of a utility-value intervention on STEM students' interest in their study and identification with their study. Although the utility-value intervention did not have the hypothesized positive effect on STEM students' interest in their study and identification with their study, the results might serve upcoming studies.

The majority of studies on the topic of utility-value interventions focused on other variables than identification with one's study. Previous research has focused on the effect of a utility-value intervention on variables more distant from professional identity, for example motivation for students to attend college (Harackiewicz et al., 2016) and improving student performance (Canning et al., 2018). This study thus adds to existing theories as it provides new knowledge about the impact of a utility-value intervention on STEM students' identification with their study and interest in their study which eventually contributes to STEM students' knowledge about their professional identity. Even though within this study the personalized utility-value intervention did not have an effect on STEM students' interest in their study and identification with their study, it is an important and relevant topic to look at since a utility-value intervention can be an effective instrument in enhancing STEM students' knowledge about their professional identity since it fosters sense-making and active engagement. It is thus important that future research focusses on the effect of a personalized utility-value intervention, under different circumstances, on STEM students' interest in their study and identification with their study.

In addition, this research was the first to combine participants personal values (arising from participants completing the Career Compass) with a utility-value intervention. Previous research

focused on personalizing utility-value intervention upon a certain extent. Within this study, the utility-value intervention is made personal on a deeper level since participants had to think about connecting important values in their life (derived from the Career Compass) to a concept or topic of their study. In contrast, other utility-value interventions focussed on students making a connection between a topic or concept of one's study and the usefulness of this topic or concept to one's daily life. This is broader and more general which can cause less active engagement and sense-making. This study revealed more knowledge about the impact of combining a utility-value intervention with STEM students' personal values on the interest in their study and identification with their study. However, more research is needed in order to further analyse the impact of the personalized utility-value intervention.

Practical implications

This study showed that a writing assignment connecting STEM students' personal values to the content of their study (i.e., a utility-value intervention) did not have an effect on STEM students' interest in their study and identification with their study. However, it is hypothesized that practical implications derive from this study when several changes are made to the personalized utility-value intervention. For example, there is hypothesized that when repetitiveness is applied in the utility-value intervention, active engagement and sense-making have a higher chance to occur, which both play an important role in (future) professionals gaining knowledge about their professional identity. The personalized utility-value intervention can thus be used by organizations that want to increase STEM students' interest in their study and identification with their study so the knowledge about their professional identity increases.

Limitations and future research

A potential shortcoming of this study might be the setting wherein STEM students participated in the research. The lack of social control by a researcher and other students when participants participated in the research might have reduced active engagement and participants' ability to make sense of the assignment. This could thus have influenced the impact of the utility-value intervention on STEM students' interest in their study and identification with their study. Whenever students

participated in this research in a classroom setting, it would have been more likely that the process of sense-making (e.g. connecting personal values to one's study) was more extensive. Individuals are more likely to make sense of a situation or assignment when it is tied to practice and individuals are placed in a specific role (Danielak et al., 2014). In this study, the assignment in the utility-value intervention was tied to practice, but the process of placing students into a specific role could have been more elaborated. In a classroom setting, participants would have been more likely to feel specifically placed in the role of a STEM student which could have made it easier for participants to make sense of the assignment. This thus could have been beneficial for the sense-making process and eventually have a positive effect on STEM students' interest in their study and identification with their study. Therefore, it is important that future research focusses on the extent to which this personalized utility-value intervention (i.e. participants connect important values derived from the Career Compass to their study) can have an effect on STEM students' interest in their study and identification with their study when the utility-value intervention takes place in a classroom setting.

A second potential shortcoming of this research is the number of participants who dropped out during the research. An analysis of the preliminary data showed that a total of 112 STEM students were deleted from the sample since they quit the questionnaire halfway. Whenever the final sample would have consisted out of more respondents, a better representation of the target group was reached. This would have been especially beneficial for the analysis of the written responses to the utility-value intervention since these analysis' were conducted over 30 respondents. Since there are only a few studies that focused on the content of the written responses, there is only few evidence about the effect of the content of the written response on the impact of a utility-value intervention. It is thus important for future research to conduct a bigger sample in order to investigate the effect of the personalized utility-value intervention on STEM students' interest in their study and identification with their study.

In the present study, participants received the personalized utility-value intervention one time. However, previous research, focused on different dependent variables, revealed that repetitiveness of an utility-value intervention can be beneficial for the impact of the intervention (Gaspard et al., 2015; Harackiewicz et al., 2016). Therefore, future research can try to confirm this by replicating the current utility-value intervention and extending it by repeating the intervention several times.

Another recommendation for future research, is integrating another condition in the study. By adding a standard utility-value intervention to the study, there can be analysed to what extent there is a difference between the impact of a standard utility-value intervention and the personalized utility-value intervention on STEM students' interest in their study and identification with their study. Via this way the value of the personalized utility-value intervention can be determined.

A last recommendation for future research, is adding a pre-test to the research design. By adding a pre-test there can be determined to what extent the utility-value intervention works better for some groups than others. It is possible that the dependent variables, thus STEM students' interest in their study and identification with their study, might influence the impact of the utility-value intervention. For example; the utility-value intervention might work better for participants who have a low interest in their study. It is important that future research confirms or rejects this possibility.

Final conclusion

In conclusion, in contrast to the expectations, a personalized utility-value intervention combined with the Career Compass does not have an effect on STEM students' interest in their study and identification with their study. These findings suggest that the widely proven effects of utility-value interventions do not persist in all circumstances. Moreover, the quality of the written responses to the utility-value intervention in this study seems to be too inefficient to have a significant effect on STEM students' interest in their study and identification with their study.

The current study was the first to combine the Career Compass with a utility-value intervention focused on both STEM students' interest in their study and identification with their study. Therefore, it adds new value to the existing research on the effect of a utility-value intervention on STEM students' professional identity, more specifically on STEM students' interest in their study and identification with their study. Furthermore, this study was one of the first to analyse the content of the written responses to the utility-value intervention and therefore it adds new knowledge about the impact of the content of the written response on STEM students' interest in their study and identification with their study. Results of this research can be used to further investigate the impact of a utility-value intervention on STEM students' gaining knowledge about their professional identity.

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Appendix A – Components Career Compass

Factor tradition ZF_V_TRAD

Order	*ENG*	*NL*	
34	Respect for tradition	Respect voor traditie	V_trad1
18	Politeness	Beleefdheid	V_trad2
36	Honoring elders	Respect voor ouderen	V_trad3

Factor family ZF_V_FAM

Order	*ENG*	*NL*	
4	A harmonious relationship with my parents and siblings	Een harmonieuze relatie met mijn ouders, broers en zussen	V_fam1
27	Strong family ties	Een sterke familieband	V_fam2
24	A family life	Een gezinsleven	V_fam3
29	A satisfying marriage or relationship	Een goed huwelijk of relatie	V_fam4

Factor hedonism ZF_V_HED

Order	*ENG*	*NL*	
20	Enjoying life	Genieten van het leven	V_hed1
30	Having fun	Leuke dingen doen	V_hed2
31	Having a good time	Plezier maken	V_hed3

Factor benevolence/universalism ZF_V_BENE

Order	*ENG*	*NL*	
32	Protecting the environment	Milieubewustzijn	V_bene1
37	Making a contribution to society	Bijdragen aan de maatschappij	V_bene2
33	Ethical responsibility	Ethische verantwoordelijkheid	V_bene3
14	A just world	Een rechtvaardige wereld	V_bene5

Factor Intellectual stimulation ZF_V_STIM

Order	*ENG*	*NL*	
1	Curiosity	Nieuwsgierigheid	V_stim1
21	Lifelong learning	Een leven lang leren	V_stim2
22	Intellectual stimulation	Intellectuele uitdaging	V_stim4

Factor health ZF_V_HEAL

Order	*ENG*	*NL*	
3	Good health	Een goede gezondheid	V_health1
23	Exercise	Sporten/bewegen	V_health2
12	A good physical condition	Een goede lichamelijke conditie	V_health3

Factor security ZF_V_SEC

Order	*ENG*	*NL*	
35	Routine and structure	Routine & structuur	V_sec2
38	Certainty and safety	Zekerheid en veiligheid	V_sec3
6	Stability	Stabiliteit	V_sec4

Factor comfort ZF_V_COM

Order	*ENG*	*NL*	
17	Avoiding hard work	Niet te hard werken	V_comf1
5	An easy life	Een makkelijk leven	V_comf2
7	A carefree life	Een zorgeloos leven	V_comf3
8	A comfortable life	Een comfortabel leven	V_comf4

Factor Power & Status - ZF_V_POW

Order	*ENG*	*NL*	
9	A prestigious jo	Een prestigeuze baan	V_pow1
28	Success	Succes	V_pow3
13	Influence	Invloed	V_pow4
25	Power and status	Macht en status	V_pow5
15	Having authority	Autoriteit hebben	V_pow6

Appendix B – Values of the Career Compass participants indicated as most important

Value	Amount it was picked by participants
Benevolence	14
Comfort	5
Family	15
Health	21
Hedonism	34
Intellectual stimulation	21
Power	3
Security	7
Tradition	4

Notes All participants chose two values that were most important to them (*N*=30)

Appendix C – Utility-value intervention

Nederlandse versie

Opdracht

We willen je nu vragen om te reflecteren op de inhoud van je studie en hoe deze aansluit bij de voor jou belangrijke waarden in je leven. Dit doen we door middel van een korte schrijftopdracht waarin we je vragen de voor jou belangrijke waarden te koppelen aan een bepaald onderwerp of concept uit je studie. Deze opdracht bestaat uit onderdeel A en onderdeel B.

Onderdeel A

Kies een bepaald onderwerp of concept dat tijdens je studie is behandeld. Denk bijvoorbeeld aan een onderwerp of concept waar je deze module college over krijgt. Schrijf een samenvatting van ongeveer 50 woorden over dit onderwerp.

Onderdeel B

Pas het onderwerp of concept dat je in onderdeel A hebt beschreven toe op je eigen leven. Focus hiervoor vooral op de twee waarden die voor jou belangrijk zijn.

De voor jou belangrijke waarden zijn:

Hoe is het beschreven onderwerp of concept in onderdeel A gerelateerd aan je belangrijke waarden? Hoe draagt het leren over dit onderwerp of concept bij aan het bereiken van de belangrijke waarden in jouw leven? Schrijf hierover ongeveer 5 zinnen.

Voorbeeld; stel je studeert voeding en diëtetiek en je hebt als onderwerp gekozen hoe voeding verteerd in de maag. Nadat je hebt beschreven hoe voeding wordt opgenomen en wordt verteerd door de mond, maag en darmen om energie op te wekken, ga je schrijven over hoe dit proces bijdraagt om de voor jou belangrijke waarden in je leven te bereiken. Stel één van de voor jou belangrijke waarden is 'Health': weten hoe voedsel verteerd wordt, kan bijdragen aan een gezonde levensstijl bereiken. Gezond voedsel eten, helpt je lichaam de benodigde energie te produceren zodat je je optimaal fit met je dagelijkse werkzaamheden bezig kan houden.

English version

Assignment

In this assignment we will ask you to reflect on your study and how this connects to the two most important values in your life. In a short writing assignment you will connect the two most important values to a specific concept or topic in your study. This assignment consists of Part A and Part B.

Part A

Pick a concept or topic that was covered during one of your classes. For example a concept or topic that was covered in the previous module. Briefly summarize this concept or topic in about 50 words.

Part B

Apply the concept you have summarized in Part A to your own life. For this assignment, focus on the two values that are most important to you.

The two most important values to you are:

How might the information of the specific topic or concept be relevant to your two most important values? How does learning about this topic or concept contribute to achieving these values in your life? Write at least 5 sentences about this.

For example, if you were studying nutrition, you could have chosen a topic such as how food is digested. After you have briefly summarized the digestive process: how foods are broken down in the mouth, stomach, and intestines to make energy, you will write about how this applies to your own life and how this contributes to achieving two values that are important to you. For example, if an important value of you is ‘Health’; knowing how food is digested, can contribute by achieving a healthy lifestyle. Eating healthy foods helps your body produce energy to play your favorite sport or study for exams.

Appendix D – Items questionnaire

Dimension	Item	Statement/question	
		Dutch	English
Demographic questions	1.	Wat is je geslacht?	What is your gender?
	2.	Wat is je leeftijd?	What is your age?
	3.	Wat is je huidige studieniveau?	What is your current level of education?
	4.	Welke opleiding doe je?	What do you study?
	5.	Van welk jaar van je studie volg je de meeste vakken?	From which year of your study do you follow the most courses?
Interest in one's study	12.	Ik kijk ernaar uit om meer te leren over onderwerpen binnen mijn studie	I'm looking forward to learn more about my study
	13.	Ik vind mijn studie boeiend	My study fascinates me
	14.	Ik vind mijn studie interessant	I think my study is interesting
	15.	Ik word enthousiast van mijn studie	I'm excited about my study
	16.	Ik vind mijn studie niet interessant	I don't find my study interesting
Identification with one's study	18.	Een … student zijn is een belangrijk onderdeel van mijn zelfbeeld	Being … student is an important part of my self-image
	19.	Ik voel me sterk thuis in de gemeenschap van … studenten	I have a strong sense of belonging in the community of … students
	20.	Een … student zijn is een belangrijke weerspiegeling van wie ik ben	Being a … student is an important reflection of who I am
	21.	Ik zie mezelf als … student	I have come to think of myself as … student
	22.	Ik voel me thuis bij mijn studie	I feel at home in my study
	23.	Ik ben een … student	I am a … student

Appendix E – Factor loadings

Item	Rotated factor loading	
	Interest in one's study	Identification with one's study
I.m looking forward to learn more about my study	.79	
My study fascinates me	.80	
I think my study is interesting	.82	
I'm excited about my study	.80	
I don't find my study interesting (Recoded)	.74	
I have a strong sense of belonging in the community of … students		.68
Being a … student is an important reflection of who I am		.49
I have come to think of myself as a … student		.84
I feel at home in my study		.80
I am a … student		.62
Eigenvalues	4.74	1.50
% of variance	47.35	14.99
Crohmbach's α	.87	.79

Appendix F – Codebook

Part	Category	Subcode	Description	Example
Part A	Length	Less than the guidelines	The response is below 40 words	Tissue engineering, growth of artificial cartilage in the lab by stem cells.
		According to the guidelines	The response is 40 words or above	Human computer interaction, how to make products that are intuitive to the user and how to test and observe the user interacting with the product so that you know what you need to improve to make the product even better.
	Correctness	Incorrect	Instructions in the assignment were followed incorrectly: there was a vague explanation of the topic or concept	Creep in a stern tube seal.
		Correct	Instructions in the assignment were followed correctly: the topic or concept was clearly described	Course called circulation and ventilation in which we learned more about patients in shock; what types of shock exist and how to detect these and what steps to take to treat this patient.
Part B	Length	Less than the guidelines	The written response is below 70 words	Comfort would link to this as the point of the course was to make products as easy and comfortable to use as possible. Products don't need to be unnecessarily complicated as that would benefit no one and only make your and the users life more difficult. I don't really know how to link family to this topic.
		According to the guidelines	The written response consists of 70 or more words	I think it is very important to be able to enjoy life as the Hedonism states. The patients we are currently helping, have a terrible disease that let them live with uncertainty every day. This restricts them in

				being able to enjoy everything that life has to offer and therefore, I feel a strong urge to try and help these people by inventing a system to enjoy life a bit more.
	Correctness	Incorrect	Instructions in the assignment were followed incorrectly: there is not described how values are related to the topic or concept and how learning about the topic or concept contributes to achieving values	I choose this topic because it is new, few people have experience with it so I can challenge myself to come up with new applications. My second main motivation was because I thought it was fun, especially for its applications in entertainment media.
		Correct	Instructions in the assignment were followed correctly: there was described how values are related to the topic or concept and how learning about the topic or concept contributes to achieving values	It was a challenging course and therefore gave me (sufficient) intellectual stimulation. Furthermore, the course is related to health care and knowledge about the human body. Therefore, it is related to my own healt in some way as well. However, it will (hopefully) be more related to my work later which concerns healt of other patients. If it would concern myself, who is the patient in shock. Knowing about what happens to me could be useful, but knowing how to treat myself in the critical situation is 'useless', since I would be unconscious or at least not able to treat myself.
	Depth	A little	Both values are described vaguely and are hardly connected to one's personal life	This has nothing to do with the two values.
		A lot	One or both values are connected to one's personal life, respondent gives an	I think it is very important to be able to enjoy life as the Hedonism states. The patients we are currently helping, have

			example about how this topic or concept contributes to achieving the values	a terrible disease that let them live with uncertainty every day. This restricts them in being able to enjoy everything that life has to offer and therefore, I feel a strong urge to try and help these people by inventing a system to enjoy life a bit more