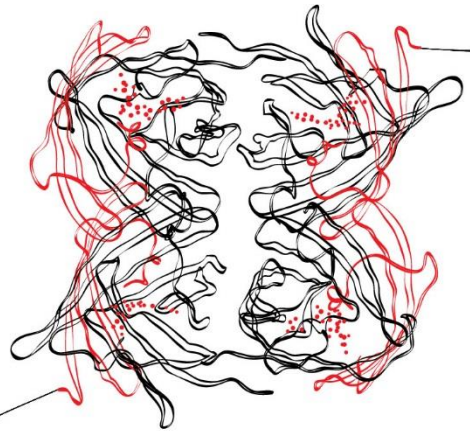
UNIVERSITY OF TWENTE

# THE RELATIONSHIP BETWEEN PSYCHOLOGICAL CAPITAL AND TWENTY FIRST CENTURY SKILLS IN AN EDUCATIONAL SETTING

*Author: Maschja Baas*



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First supervisor: Dr. Mariëlle Stel
Second supervisor: Dr.ir. Jean-Paul Fox

University of Twente
Department PCRS

UNIVERSITEIT TWENTE.

**Abstract (English version)**

In an ideal world, students are being prepared to succeed and excel in the global workplace of the future when they are adults. The modern society changes in a rapid ways and the knowledge, skills, and dispositions that students need in order to later succeed in this global workplace of the future are called 'twenty first century skills'. Since companies currently experience a lack of twenty first century skills and this lack also causes problems for the employees, it is highly important for students to optimally develop these skills in their education and it is urgent that options are evaluated to stimulate learning these essential skills. Literature suggests that psychological resources and build-in-strengths that could possibly assist in learning twenty first century skills are self-efficacy, hope, optimism and resilience, together forming the concept of 'psychological capital'. Hence, in this study we evaluated the relationship between psychological capital (and its components) and twenty first century skills (and its components) in an educational setting amongst high school students. Psychological capital and twenty first century skills were measured through the use of self-assessment amongst 1353 students in 11$^{th}$ grade, of 25 different high schools. The results indeed showed a significant relationship between psychological capital and twenty first century skills. This suggests that increasing people's psychological capital, will increase people's twenty first century skills. Implications and suggestions for future research are discussed in the paper.

**Abstract (Dutch version)**

In een ideale wereld worden studenten voorbereid om te slagen in de (wereldwijde) arbeidsmarkt van de toekomst, wanneer ze volwassen zijn. De moderne samenleving verandert snel en de kennis, vaardigheden en disposities die studenten nodig hebben om te slagen in de wereldwijde arbeidsmarkt worden '21e-eeuwse vaardigheden' genoemd. Aangezien bedrijven momenteel een gebrek aan personeel met de juiste 21e-eeuwse vaardigheden ervaren en dit gebrek ook problemen oplevert voor de werknemers zelf, is het van groot belang dat studenten deze vaardigheden optimaal ontwikkelen in hun opleiding. Het is daarom dringend noodzakelijk dat opties worden geëvalueerd om het aanleren van deze essentiële vaardigheden te stimuleren. De literatuur geeft aan dat 'geloof-in-eigen-kunnen', 'hoop', 'optimisme' en 'veerkracht', die samen het concept 'psychologisch kapitaal' vormen, mogelijk kunnen bijdragen aan het leren van 21e-eeuwse vaardigheden. Daarom hebben we in deze studie de relatie geëvalueerd tussen psychologisch kapitaal (en haar componenten) en 21e-eeuwse vaardigheden (en haar componenten). We onderzochten deze relatie in een educatieve setting onder middelbare scholieren in 5 VWO. Psychologisch kapitaal en 21e-eeuwse vaardigheden werden gemeten door middel van zelfevaluatie onder 1353 leerlingen van 25 verschillende middelbare scholen. Zoals verwacht werd lieten de resultaten inderdaad een significant verband zien tussen psychologisch kapitaal en 21e-eeuwse vaardigheden. Dit suggereert dat het vergroten van het psychologische kapitaal van mensen hun 21e-eeuwse vaardigheden kan vergroten. Implicaties en suggesties voor toekomstig onderzoek worden in het verslag besproken.

## Introduction

In an ideal world, students are being prepared to succeed and excel in the global workplace of the future when they are adults. The modern society changes in a rapid way with extensive technological developments where information is unlimited and always available (Thijs, Fisser & Van der Hoeven, 2014). In this workplace of the future, there is an increasing demand for jobs that require flexibility and problem-solving skills, which is part of the innovation economy. Generating new ideas through critical thinking, collaboration, creativity and communication is key (Trilling & Fadel, 2009; World Economic Forum, 2015). Furthermore, globalization plays an important role since we depend on developments far beyond national borders and thus when international collaboration is very important. These developments cause major economic and social changes and give rise to the question what knowledge and skills young people must learn in order to be prepared for the global workplace of the future (Thijs et al., 2014) and what kind of psychological resources and build-in-strengths can further stimulate effectiveness and success in this global workplace of the future (Luthans, Luthans & Jensen, 2012).

This question caused the discussion around ‘twenty first century skills’, which is an overarching term for the knowledge, skills and dispositions that students need in order to later succeed in this global workplace of the future (Germaine, Richards, Koeller & Schubert-Irastorza, 2016). Currently, students do not learn to master these skills enough in their education and thus do not attain these essential skills when they enter the global workplace (World Economic Forum, 2015; WRR, 2014). When young people will not learn to master these skills they will encounter problems in the labour market (Wagner, 2008). Just as the labor market who is already encountering problems. In 2014, global companies reported that more than a third (36%) of these companies had difficulties in filling their positions, due to a shortage of people with key twenty first century skills (Manpower Group, 2014). It is therefore highly

important for students to optimally develop these skills and urgent that options are evaluated to stimulate learning these essential skills.

Since companies currently experience a lack of employees with twenty first century skills and this lack also causes problems for the employees, it is highly important for students to optimally develop these skills in their education and urgent that options are evaluated to stimulate learning these essential skills. Literature suggests that psychological resources and build-in-strengths that could possibly assist in learning twenty first century skills are self-efficacy, hope, optimism and resilience, together forming the concept of 'psychological capital'. Psychological capital was originally founded by Luthans, Youssef & Avolio (2007) as a construct to measure Positive Organizational Behaviours. The definition of positive organizational behavior (POB) is "the study and application of positively oriented human resource strengths and psychological capacities that can be measured, developed and effectively managed for performance improvement in today's workplace" (Luthans, 2002, p.59). Companies too often overlook the positive psychological resources and build-in-strengths of employees, which is a pity since it can further improve an employee's effectiveness (Luthans et al., 2012). Research proved that the more psychological capital the employees has the better their workplace performance, attitudes and behaviors are (Avey, Luthans & Youssef, 2009; Avey, Reichard, Luthans & Mhatre, 2011; Larson & Luthans, 2006; Luthans, Avolio, Avey & Norman, 2007; Newman, Ucbasaran, Zhu & Hirst, 2014).

These studies prove that having more of these psychological resources can further enhance one's chances of success in the global workplace of the future, together with the development of the right skills. It is therefore of importance that future employees can make use of these resources and skills, in which education can play a key role. Organisations (who form the workplace of the future) could use psychological capital as measure to indicate the level of

positive psychological resources of employees in order to possibly stimulate this further within employees. Thereby, the organizations' goal to have a competitive advantages in performance, attitudes and behaviours of other companies can be reached (Luthans, Youssef et al., 2007). In the subsequent paragraphs, the concepts of psychological capital and twenty first century skills and how the two concepts may interact will be further explained.

## Psychological capital

Psychological capital is defined by Luthans, Youssef et al. (2007, p.3) as "an individual's positive psychological state of development" which is characterized by having 1) self-efficacy and 2) hope and by being 3) optimistic and 4) resilient.

### *Self-efficacy*

Self-efficacy refers to an individual's belief of how successful he or she is in his or her actions (Bandura, 1997). Within psychological capital, self-efficacy is defined as "having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks". When an individual has a high level of self-efficacy it can motivate someone to choose challenges and use strengths to meet this challenge. In that case, having high self-efficacy can help an individual to persist when obstacles are facing. It therefore also relates to hope, optimism, and resilience (Luthans, Youssef et al., 2007).

### *Hope*

Hope is a motivational state. When individuals have hope, they have the willpower to go after their success and obtain the ability to determine the steps that need to be taken to ensure success (Snyder, 2000). Within psychological capital, hope is defined as "persevering towards goals and, when necessary, redirecting paths to goals (hope) in order to succeed" (Luthans, Youssef et al., 2007, p3.).

### *Resilience*

Resilience refers to a set of skills that an individual needs to be able to create a good outcome, despite experiencing serious threats in one's development or adaptation (Masten, 2001). Within psychological capital, resilience is defined as "when beset by problems and adversity, sustaining and bouncing back and even beyond (resiliency) to attain success" (Luthans, Youssef et al., 2007, p3.).

### *Optimism*

Lastly, optimism is defined as an attribution style which "explains positive events through personal, permanent, and pervasive causes and negative events through external, temporary, and situation specific ones" (Seligman, 1998 in Luthans & Youssef, 2007, p31.). Within psychological capital, optimism is defined as "making a positive attribution (optimism) about succeeding now and in the future" (Luthans, Youssef et al., 2007, p3.).

### *Psychological capital research*

The construct of psychological capital was mainly used for the professional work environment. In the past, little attention was given to psychological capital amongst students (Luthans et al., 2012). Recently, researchers have started to research psychological capital amongst (starting) students. The results showed that psychological capital first of all contributes to and predicts student academic performance (Jafri, 2013; Luthans et al., 2012; Ortega-Maldonado & Salanova, 2018, Sheikhi & Shahmorady, 2015). Second of all, psychological capital predicts study / academic engagement (Datu & Valdez, 2016; Jafri, 2017; Siu, Bakker & Jiang, 2014) and predicts well-being (Datu & Valdez, 2016) and meaning-focused coping and satisfaction (Ortega-Maldonado & Salanova, 2018). Third of all, psychological capital influences academic motivation (Jafri, 2017; Siu et al., 2014) and helps university students in academic adjustment (Liran & Miller, 2019). Last of all, psychological capital positively relates

to mental health (Sevaraj, 2015), and copes with learning and adaptive stress (Wen & Lin, 2014).

All in all, the theoretically based construct of psychological capital with its four components has great potential in measuring psychological capital in organizations, and since a few years, in student populations. Since the research amongst student populations is still relatively new, it is important to evaluate whether psychological capital and its components are indeed connected in school contexts as the theory suggests it does in organizations and schools. Therefore, it is researched whether the concept of psychological capital is indeed represented by the four subcomponents. It is expected that this is the case due to the results of previous studies.

**Hypothesis 1**: "*The concept of psychological capital is represented by four sub-components: self-efficacy, hope, resilience and optimism*".

As psychological capital with its components can be useful in learning and studying, it could positively influence twenty first century skills. Before investigating their relationship, the concept of twenty first century skills will be explained below.

**Twenty first century skills**

Twenty first century skills are defined as 'generic skills and related knowledge, insight and attitudes that are needed to function and contribute to the 21st century society' (Thijs et al., 2014, p.12). Even though a slight variation exist in which specific skills are part of twenty first century skills (Gutman & Schoon, 2013) and which skills are most important (Ledoux et al., 2013; Thijs et al., 2014), consensus amongst researchers exist regarding the key learning skills: 1) creativity and innovation, 2) critical thinking and problem-solving skills, 3) communication and 4) collaboration skills (Thijs et al., 2014). This matches the conclusion of the World Economic Forum (2015) who stated that it became the norm for employees to be able to

critically and creatively evaluate knowledge and work well in a team. In the subsequent paragraphs, the skills will be explained in more detail.

### *Creativity and innovation*

Creativity regards the "ability to imagine and devise innovative new ways of addressing problems, answering questions or expressing meaning through the application, synthesis or repurposing of knowledge" (World Economic Forum, 2015, Chapter 1). Creativity and innovation relate to each other since creativity asks to connect existing elements together, so that something new, innovative, is created (Tigchelaar, 2015).

### *Critical thinking and problem-solving skills*

Critical thinking means "to identify, analyse and evaluate situations, ideas and information in order to formulate responses to problems" (World Economic Forum, 2015, chapter 1). Critical thinkers can solve social, scientific and practical problems effectively by applying critical thinking (Snyder & Snyder, 2008). Therefore, critical thinking and problem-solving skills are intertwined. Critical thinkers needs to be open-minded to alternative views and be able to reflect on one's own learning process (Thijs et al., 2014).

### *Communication*

Communication means having the ability to express thoughts and ideas in a written, verbal and non-verbal way in varieties of contexts. Being able to communicate was already seen as a key life skill decades ago (Covey, 1989). Communication can be used for different reasons, such as to inform or persuade someone or to listen effectively to others (P21, 2019).

### *Collaboration*

Collaboration regards working effectively in different and diverse groups, to be willing to make compromises, value each members' contribution and share responsibility for the work (P21, 2019). Collaborators work more efficient and they solve problems and

innovate faster (Trilling & Fadel, 2009). In every profession or at every school nowadays you need to collaborate (Salmons, 2019), making it thus an important skill to learn.

All in all, creativity and innovation, critical thinking and problem-solving abilities, communication and collaboration are thus the essential skills amongst which researchers have made consensus, and which became the norm for employees to possess. Even though it is useful to make a distinction between the specific skills in theory, Germaine et al. (2016) states that in practice they are related and connected with each other. There are thus indications that the skills are connected and some research exist connecting one skill to another, but to the best of our knowledge no research has yet been conducted towards concept and the relationship between the four skills together. Therefore, the aim of the second hypothesis is to research if the concept of twenty first century skills is indeed represented by its four components, in which we expect this to be true based on Germaine et al. (2016).

**Hypothesis 2**: "*The concept of twenty first century skills is represented by four sub-components: creativity and innovation, critical thinking and problem-solving skills, communication and collaboration*".

**Relationship between "psychological capital" and "twenty first century skills"**

It has become clear that twenty first century skills are vital to possess in the workplace of the future, that students need to learn this in their education to apply it to the workplace. As psychological capital positively influences academic achievement, learning and motivation in education, this raises the question regarding the interconnectedness of psychological capital (and its subcomponents) and twenty first century skills (and its subcomponents). Already in 2012 it was concluded that psychological capital played a mediating role in predicting employee creativity (Rego, Sousa, Marques & Cunha, 2012a), providing an argument for further research amongst psychological capital, twenty first century skills and their indicators. Aside from a

study indicating that creative thinking can help predict resilience (Metzl, 2009), only studies were found regarding the influence of one of the psychological capital indicators on one of the twenty first century skills indicators. Therefore, the paragraphs below will focus on the four indicators of psychological capital and their influence on the twenty first century skills.

### *Self-efficacy and its relation towards twenty first century skills*

Self-efficacy is found to be related to the twenty first century skills creativity and innovation, critical thinking and problem-solving skills and collaboration. First of all, research showed that self-efficacy, just as hope, predict employees' level of creativity. The results showed that it is important for companies to focus on stimulating their employees self-efficacy and hope in order to keep a creative company (Rego, Sousa, Marques & Cunha, 2012b). One aspect of self-efficacy is the belief that people are able to be creative. This so-called creative self-efficacy leads students to be more involved in extra academic courses and these students had a stronger belief of their academic abilities (Beghetto, 2006).

Aside from the link with creativity, higher levels of self-efficacy are also related to more efficient problem-solving-skills, another twenty first century skill (Hoffman & Spatariu, 2008; Li, Eschenauer & Yang, 2013). When a student does not have the belief that he or she can learn critical thinking skills (low level of self-efficacy), the chance that the student will learn the skills will thus be a lot slimmer. Therefore it comes as no surprise that it is therefore highly important to focus on improving students self-efficacy in order to further develop their critical thinking ability (Fahim & Nasrollahi-Mouziraji, 2013).

Lastly, self-efficacy also stimulates collaboration, another twenty first century skill, on different levels. In a school for instance, teachers had significantly higher levels of self-efficacy when their supervisor (principal) used a collaborative leadership style (Arbabi & Mehdinezhad,

2015). Also, on student levels it was found that self-efficacy was positively influenced by cooperative education (eg. working together on projects or jobs) (Raelin et al., 2011).

### *Hope and its relation towards twenty first century skills*

Another component of psychological capital, hope, is also related to the twenty first century skills creativity, critical thinking and problem-solving abilities and communication. First of all, high levels of hope, just as self-efficacy, can predict creativity, so it is important for companies to focus on stimulating their employees self-efficacy and hope in order to keep a creative company (Rego et al., 2012b). Another study provided similar results and claimed that a hopeful person shows creativity in the workplace, and also mediates the relationship of having a supervisor with an authentic leadership style and showing creativity in one's job (Anwar, Abid & Waqas, 2020).

Second of all, hope also stimulates problem-solving abilities, which is part of the critical thinking skill. Students with higher levels of hope had more problem-solving skills than students who had low levels of hope. The same study presents that hope is an important predictor in academic and life satisfaction (Chang, 1998). It is therefore of high importance to focus on hope when developing essential skills in education. Following the definition of hope by Luthans, Youssef et al. (2007), eventually when you have the willpower and the pathways, hope can lead you towards accomplishing goals successfully.

Third of all, hope is also connected to the twenty first century skill communication. It was found that interventions stimulating hope, could enhance communication apprehension, which is associated with a perceived lack of communication competence (Umphrey, & Sherblom, 2014). Creating more hope can thus further stimulate ones communication skills.

### *Optimism and its relation towards twenty first century skills*

The psychological capital component optimism is related to twenty first century skill creativity and innovation in organizations. Research found that the level of optimism predicts creativity amongst employees (Rego et al., 2012a). Optimism as component is harder to influence or develop than the other psychological capital components since it is a character trait (Luthans, Youssef et al., 2007). Of the four indicators of psychological capital, the least research has been conducted towards the influence of optimism towards twenty first century skills.

### *Resilience and its relation towards twenty first century skills*

Next to the other three psychological capital components, resilience is also connected to the twenty first century skills components: creativity and innovation, critical thinking and problem solving skills and collaboration. Resilience positively influences creativity in an organization (researched in medium-sized firms). Therefore, managers should realize they should invest in creating resilience amongst employees in order to be or stay a creative organization (Richtnér & Löfsten, 2014). Next to creativity, the psychological capital component resilience was also found to be a predictor and mediator on problem-solving-skills (Li et al., 2013). Lastly, Luthans, Youssef et al. (2007) researched resilience in organizations and found that employees who have high resilience skills will bounce back to a positive state sooner when something negative occurs, like having a conflict with colleagues or delivering a bad performance in collaboration, linking it to the fourth twenty first century skill collaboration as well.

## Current research

Since studies proved that psychological capital components are related to twenty first century components, it is expected that the higher the level of psychological capital of an individual, the higher the level of twenty first century skills of that individual. No research has yet been conducted towards the connection between psychological capital and twenty first

century skills at their main level, making this research innovative. Hence, in this study we will research the relationship between psychological capital and twenty first century skills in an educational setting amongst high school students. An educational setting is chosen since students should primarily develop their essential skills at school and thus can best be influenced in that context in order to be prepared for the workplace of the future.

Hypothesis 3: ***"****There is a positive relationship between psychological capital and twenty first century skills"*.

## Methods

### Participants

For this research, 11th grade students following the 'VWO' track on twenty-five high schools in the region of Twente (the Netherlands) participated. These students are preparing for their academic studies and/or working life. Students below the age of 16 needed permission from their parents. Students above the age of 16 could choose for themselves whether or not they wanted to participate in the study. In total, 1521 students were offered the questionnaire, of which 72 students did not want to participate or had no permission (rejection rate 4,73%). Eventually, 1449 students started the questionnaire and 1353 students finished it (dropout rate 6,63%). Since data could only be used if the questionnaire was filled in entirely, only students who finished the questionnaire are seen as participants, so N=1353. Of the participants (N=1353), 54,2% were female, 44,8% were male and 1% defined themselves as 'other'. Participants were aged around 16 years (*M=16.48, SD=0.80*).

### Procedure

The ethical committee of the University of Twente granted permission for this research. Questionnaires were spread amongst the participants by the participants teachers of the participating schools during classes. Students could fill in the online questionnaire via the

provided link to Qualtrics on their laptops, mobile phones or tablets. For students who did not have access to a laptop, mobile phone or tablet with internet, a hard copy version of the questionnaire was provided, which was used once but not finished so this was not included in the research.

Students who were below the age of 16 had to grant permission from their parents beforehand via a hard copy informed consent form. Next to that, all students (also below the age of 16) had to grant permission themselves to participate by the informed consent form, which was the first part of the online questionnaire. The informed consent mentioned that students were allowed to quit the research at any time if they wanted to and that all data was handled anonymously. This research was part of a larger longitudinal study on twenty first century skills. Students were debriefed after the entire study was finished regarding the goal and the results. Lastly, the participants had the possibility to contact the researcher with questions if they wanted to.

## Measurements

In order to estimate student scores in psychological capital and twenty first century skills, two different questionnaires were filled out at once, starting with some questions regarding demographics (age, gender).

### *Psychological Capital*

Psychological capital was measured through a validated questionnaire (translated in Dutch), created by Luthans et al. (2012). This questionnaire was on his turn an adapted questionnaire focusing on education, based on the originally developed questionnaire by Luthans, Youssef et al. (2007). The questionnaire consisted out of 24 statements, six for each scale, using a six-point likert scale in which students could score their level of agreeableness

from 1 (strongly disagree) to 6 (strongly agree). In total, 3 of the 24 statements were reversed by Luthans et al. (2012) with the aim to prevent random completion of the questionnaire.

Self-efficacy was measured with six statements, for example 'I feel confident setting targets/goals on my overall life'. Reliability analysis showed a Cronbach's Alpha of .81, indicating good internal consistency (George & Mallery, 2003). Hope was measured with six statements, for example 'At the present time, I am energetically pursuing my overall life goals'. Reliability analysis showed a Cronbach's Alpha of .81, indicating good internal consistency (George & Mallery, 2003). Resilience was also measured with six statements, for example 'I usually manage difficulties one way or another concerning my overall life'. Reliability analysis showed a Cronbach's Alpha of .58, indicating poor internal consistency (George & Mallery, 2003). Optimism was measured with six statements, for example 'I approach my overall life as if every cloud has a silver lining'. Reliability analysis showed a Cronbach's Alpha of .74, indicating acceptable internal consistency (George & Mallery, 2003). Lastly, reliability analysis showed a Cronbach's Alpha of .89 for the entire construct of psychological capital, indicating good internal consistency (George & Mallery, 2003). This is similar to the Cronbach's alpha of .90 which was originally found by Luthans et al. (2012).

***Twenty first century skills***

Since no validated questionnaire existed which assesses twenty first century skills, and it was practically impossible to ask teachers to assess this, a self-assessment questionnaire was developed. Using student self-assessment questionnaires is a well-established method of measuring twenty first century skills (Child Trends 2014, as mentioned in Lamb, Jackson & Rumberger, 2015). The questionnaire was developed based on the 'twenty first century skills Standard Rubric' for teachers to assess whether their students met the standards of the skills or not (CTE – Washington, 2019). This rubric uses the official P21 definitions, which is the commonly used model for the four twenty first century skills (P21, 2019). For the current

research, a questionnaire was developed with 48 different statements divided over three parts, based on the P21 goals, using a six-point Likert scale from strongly disagree (1) to strongly agree (6). In total, 6 of the 48 statements were reversed with the aim to prevent random completion of the questionnaire.

Creativity and innovation was measured with 17 statements, for example 'I regularly come up with innovative ideas that are not obvious (are out of the box)'. Reliability analysis showed a Cronbach's Alpha of .82, indicating good internal consistency (George & Mallery, 2003). Critical thinking and problem solving was measured with 16 statements, for example 'I find it useful to critically examine perspectives that are different from my own'. Reliability analysis showed a Cronbach's Alpha of .81, indicating good internal consistency (George & Mallery, 2003). Collaboration was measured with 7 statements, for example 'I work better in a group than I work alone'. Reliability analysis showed a Cronbach's Alpha of .66, indicating questionable internal consistency (George & Mallery, 2003). Communication was measured with 8 statements, for example 'I can communicate effectively to motivate and convince others'. Reliability analysis showed a Cronbach's Alpha of .77, indicating acceptable internal consistency (George & Mallery, 2003). All 48 statements (in Dutch) can be found in appendix A. Reliability analysis showed a Cronbach's Alpha of . 90 for the entire 48-items long questionnaire, indicating excellent internal consistency (George & Mallery, 2003).

## Results

### Descriptive statistics

Based on the SPSS descriptive analysis of the gathered ordinal data the following results are presented: The minimum scores on the scales ranged from an average of 1.00 to 2.33. The maximum scores on the scales ranged from an average of 5.65 to 6.00. The average scale scores are ranging from 3.94 up to 4.51 (see Table 1 below). Furthermore, looking on item level the distribution of the individual statement scores show a 25% quartile around 3-4 and 75% quartile

around 5. This means that the distribution of the observed scores (or the quartiles) per statement shows that more than 75% of the students agreed with the individual statements. It is remarkable that the reversed scored items show most diversity in the scoring. Descriptive statistics on item level including the quartiles can be found in appendix B.

**Table 1**

*Descriptive Statistics for latent factors of 'psychological capital' and 'twenty first century skills'*

| Subject | Latent factor (scale) | *M* | *SD* | Min. | Max. |
|---|---|---|---|---|---|
| Psychological | Self-efficacy | 4.33 | 0.77 | 1.00 | 6.00 |
| Capital | Hope | 4.22 | 0.78 | 1.00 | 6.00 |
| | Resilience | 4.28 | 0.63 | 1.83 | 6.00 |
| | Optimism | 3.94 | 0.77 | 1.00 | 6.00 |
| Twenty First | Creativity and innovation | 4.03 | 0.56 | 1.29 | 5.65 |
| Century Skills | Critical thinking | 4.11 | 0.53 | 1.00 | 5.88 |
| | Collaboration | 4.51 | 0.62 | 2.33 | 6.00 |
| | Communication | 4.25 | 0.66 | 1.00 | 5.88 |

**Statistical evaluation of relationship between constructs**

Structural equation modelling was applied to measure and evaluate the constructs. Three different confirmatory factor analyses were conducted to be able to explain the relationships between the latent variables and their indicators, namely the statements. The R code, used to analyse the three different models, can be found in Appendix C. Every model of the three models resembles the research of one of the three hypothesis. The models were fitted in R version 3.6.2 (R Core Team, 2019) with the use of the lavaan package, version 0.6-5 (Rosseel, 2012). The lavaan package standardly uses the identification rule that restricts the first item loading of each latent variable to 1, which is of standard use in all confirmatory factor analyses. We have chosen not to restrict the loadings of the reversed statements, if this was the first item of the scale, since their scores possibly contain response bias. Since ordinal data was analysed, lavaan automatically used the WLSMV estimation method. This means that it uses diagonally weighted least squares (DWLS) to estimate the model parameters (Rosseel, 2012).

For each of the three models the number of iterations the model needed to converge will be presented. Thereafter, fit indices are discussed who evaluate model fit for the data being examined. The most widely-used incremental or relative fit indices are comparative fit index (CFI), normed fit index (NFI), and the root mean square error of approximation (RMSEA) (Smith & McMillan, 2001). The NFI was improved and called the Nonnormed Fit Index (NFI) (Bentler & Bonnet, 1980) which is based on the Tucker-Lewis index (TLI). These three fit indices (CFI, TLI and RMSEA) are also the fit indices as examined in the SEM model in Lavaan (Rosseel, 2012). In order to evaluate the model fit of the models presented below, the following rules are applied: For CFI, a value larger than .9 indicates an acceptable level of fit (Smith & McMillan, 2001). For TLI, a value at or above .9 is considered to indicate a good to excellent fit (Bentler & Bonnet, 1980). For RMSEA, the lower the RMSEA value the better is the fit of

the model (Byrne, 1998). After the model fit, the estimated factor loadings and correlations are presented.

### *Evaluating 'psychological capital' and 'twenty first century skills' as constructs*

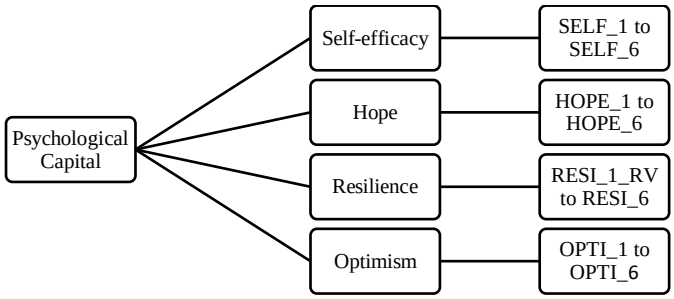
Below, the first two models are tested, representing the first two hypotheses. The aim of these models is to check whether the main constructs psychological capital and twenty first century skills are represented by their indicators.

### *Model 1: Psychological capital and its subscales*

To test whether psychological capital indeed is measured through four different components, a four-subfactor-model was tested where the four subscales represent latent variables with 6 items per subscale (see Figure 1 below).

**Figure 1**

*Psychological capital model as tested in lavaan*




Parameter estimates were obtained after 39 iterations using all 1353 observations. The CFI equalled .959. and the TLI .954. The RMSEA was estimated to be .087, with a 90% confidence interval from .085 to .090., where the .087 RMSEA indicates mediocre fit (Byrne, 1998). The main indicators of the four subfactors all had significant positive factor loadings, with standardized coefficients ranging from .89 to 1.22. The same confirmatory factor analysis provided the factor loadings on item level to estimate to what extent an item contributes towards

one of the four different psychological capital subscales, see the factor loadings table in Appendix D.

**Table 2**

*Factor loadings 'psychological capital' on scale level (with main latent variable)*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|
| Psychological Capital | Self-efficacy | 1.00 | | | .77 | .00* |
| | Hope | 1.22 | 0.04 | 28.51 | .93 | .00* |
| | Resilience | 1.06 | 0.04 | 24.47 | .81 | .00* |
| | Optimism | 0.89 | 0.04 | 23.58 | .75 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed).

Next to significant positive factor loadings, the correlations among the four latent factors were also significantly positive. Between self-efficacy and optimism, hope and resilience and resilience and optimism a moderate positive relationship was found (Hinkle, Wiersma, & Jurs, 2003), indicating that students scoring high on resilience are more likely to score high on hope and optimism. The same indication can be made between self-efficacy and optimism. Between self-efficacy and hope, self-efficacy and resilience and hope and optimism, a strong positive relationship was found (Hinkle et al., 2003). These results indicate that students scoring high on self-efficacy, were very much more likely to score high on hope and resilience. The same indication can be made between hope and optimism (see Table 3). The estimated latent variable

correlations were obtained by fitting the model without the higher-level latent variable psychological capital. In that model 12 of the 24 item factor loadings differed by one thousandth (11 out of 12) or two thousandth (1 out of 12) before rounding when comparing them to the model with the latent variable psychological capital.

**Table 3**

*Latent Factor Correlations 'Psychological capital'*

| Latent factors | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Self-efficacy | - | .77* | .71* | .61* |
| 2. Hope | .77* | - | .63* | .71* |
| 3. Resilience | .71* | .63* | - | .60* |
| 4. Optimism | .61* | .71* | .60* | - |

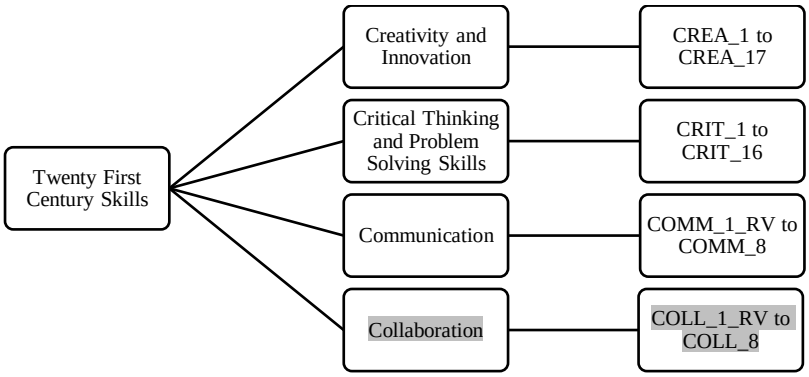
*= Correlation is significant at the 0.05 level (2-tailed)

***Model 2: Twenty first century skills and its subscales***

To test whether twenty first century skills indeed is measured through four different components, a four-subfactor-model was tested where the four subscales represent latent variables with 7 to 17 items per subscale (see Figure 2 below).

**Figure 2**

*Twenty first century skills as a four-factor-model as tested in lavaan*




Based on the analysis of the four-subfactor-model it became clear that the collaboration subscale could not measure the construct of 'collaboration' on individual student level well enough well enough as part of twenty first century skills, since the model could not converge normally with the collaboration scale included and the factor variance was zero. This provided unreliable results and showed that the scale could not discriminate students on levels of collaboration. Therefore, it was decided to run the model without the collaboration scale. In the discussion section the implications of this choice will be discussed.

After the collaboration scale was removed from the model 'twenty first century skills', it was tested as a three-subfactor-model where the three remaining subscales represent latent variables with 8 to 17 items per subscale (see Figure 2 above, in which "collaboration" is marked grey since it is not included).

Parameter estimates were obtained after 48 iterations using all 1353 observations. The CFI equalled .908 and the TLI .903. The RMSEA was estimated to be .089, with a 90% confidence interval from .088 to .091., where the .089 RMSEA indicates mediocre fit (Byrne, 1998). The main indicators of the three subfactors all showed significant positive factor loadings, with standardized coefficients ranging from 0.89 to 1.24. The same confirmatory

factor analysis provided the factor loadings on item level to estimate to what extent an item contributes towards one of the three different twenty first century subscales, see the factor loadings table in Appendix D.

**Table 4**

*Factor loadings 'twenty first century skills' on scale level (with main latent variable)*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|
| Twenty first century skills | Creativity and innovation | 1.00 | | | .84 | .00* |
| | Critical thinking and problem solving skills | 1.24 | 0.08 | 15.14 | .89 | .00* |
| | Communication | 0.89 | 0.06 | 14.92 | .71 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed).

Next to significant positive factor loadings, the correlations among the three latent factors were also significantly positive (see Table 5). Between creativity-and-innovation and communication, and between critical-thinking-and-problem-solving-skills and communication, a moderate positive relationship was found (Hinkle et al., 2003). Between creativity and innovation and critical thinking and problem-solving skills, a strong positive relationship was found (Hinkle et al., 2003). This indicates that students who scored high on of the twenty first century skills scales were more likely to score high on the other scales as well (see Table 5).

The estimated latent variable correlations were obtained by fitting the model without the higher-level latent variable twenty first century skills. In that model 1 of the 41 item factor loadings differed by one thousandth before rounding when comparing them to the model with the latent variable twenty first century skills.

**Table 5**

*Latent Factor Correlations 'twenty first century skills'*

| Latent factors | 1 | 2 | 3 |
|---|---|---|---|
| Creativity | - | .75* | .60* |
| Critical Thinking | .75* | - | .63* |
| Communication | .60* | .63* | - |

*= Correlation is significant at the 0.05 level (2-tailed)

***Evaluation of the relationship between 'psychological capital' and 'twenty first century skills'***

Below, the results of the third model are presented which provide an answer to the most important question in this research, namely if a positive relationship exists between psychological capital and twenty first century skills. Not only will this section show the relationship at their main level, the relationships amongst the respectively four and three indicators of the main constructs are evaluated as well.

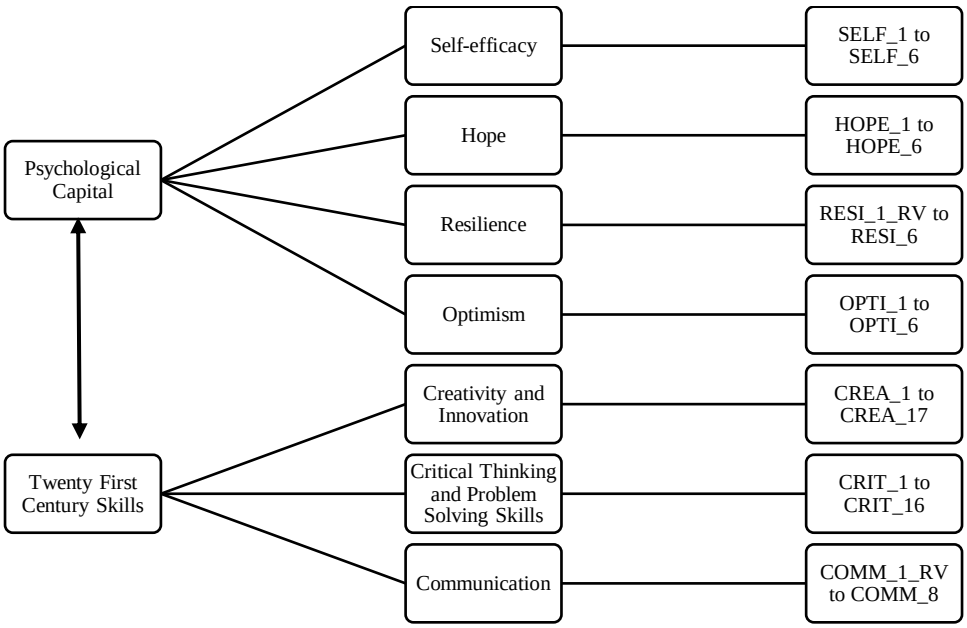
***Model 3: Relationship between 'psychological capital' and 'twenty first century skills'***

To evaluate the relationship between psychological capital, twenty first century skills and their subscales, a two-factor-model was tested including the main factors 'psychological capital' (measured by its four subscales representing latent variables and their matching items)

and ‘twenty first century skills’ (measured by its three subscales representing latent variables and their matching items), see Figure 3 below.

**Figure 3**

*Two-factor-model of ‘psychological capital’ and ‘twenty first century skills’ as tested in lavaan*




Parameter estimates were obtained after 77 iterations using all 1353 observations. The CFI equalled .917 and the TLI .914. The RMSEA was estimated to be .080, with a 90% confidence interval from .079 to .082., where the .080 RMSEA indicates fair / mediocre fit (Byrne, 1998). The main indicators of the four (psychological capital) and three (twenty first century skills) subscale factors all showed significant positive factor loadings, with standardized coefficients ranging respectively from .57 to 1.00. and from 1.00 to 1.24 (see Table 6).

The same confirmatory factor analysis provided the factor loadings on item level to estimate to what extent an item contributes towards one of the four different psychological

capital subscales or one of the three different twenty first century subscales, see the factor loadings table in Appendix D.

**Table 6**

*Factor loadings 'psychological capital and twenty first century skills' on scale level (with main latent variable)*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|
| Psychological capital | Self-efficacy | 1.00 | | | .92 | .00* |
| | Hope | 0.87 | 0.03 | 31.44 | .83 | .00* |
| | Resilience | 0.78 | 0.03 | 23.94 | .84 | .00* |
| | Optimism | 0.57 | 0.03 | 19.92 | .64 | .00* |
| Twenty first century skills | Creativity and innovation | 1.00 | | | .80 | .00* |
| | Critical thinking and problem solving skills | 1.24 | 0.09 | 14.43 | .84 | .00* |
| | Communication | 1.12 | 0.08 | 14.52 | .83 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed)

Next to significant positive factor loadings, the correlations among the seven latent factors (four for psychological capital, three for twenty first century skills) were also

significantly positive (see Table 7). This indicates that students who scored high on of the seven subscales were more likely to score high on the other subscales as well (see Table 7). The estimated latent variable correlations were obtained by fitting the model without the higher-level latent variables psychological capital and twenty first century skills. Just a few factor loadings, standardized coefficients and standard errors differed, mostly by one thousandth before rounding when comparing them to the model with the latent variables psychological capital and twenty first century skills.

Last of all, the correlation between psychological capital and twenty first century skills as higher level variables was significantly positive at .78. This indicates that students who scored high on psychological capital were much more likely to score high on twenty first century skills.

**Table 7**

*Latent Factor Correlations 'psychological capital subscales on twenty first century skills subscales'*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Self-efficacy | - | .71* | .65* | .56* | .57* | .64* | .74* |
| Hope | .71* | - | .72* | .72* | .49* | .49* | .56* |
| Resilience | .65* | .72* | - | .57* | .52* | .58* | .61* |
| Optimism | .56* | .72* | .57* | - | .33* | .29* | .44* |
| Creativity and innovation | .57* | .49* | .52* | .33* | - | .75* | .60* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Critical thinking | .64* | .49* | .58* | .29* | .75* | - | .64* |
| Communication | .74* | .56* | .61* | .44* | .60* | .64* | - |

*= Correlation is significant at the 0.05 level (2-tailed)

## Discussion

### Overview of results

In this study the relationship between psychological capital and twenty first century skills was evaluated in an educational setting. Hypothesis one and two regarded whether the main constructs, respectively psychological capital and twenty first century skills, were indeed predicted by their sub-constructs. The first hypothesis stated that "the concept of psychological capital is represented by four sub-components: self-efficacy, hope, resilience and optimism". This hypothesis is confirmed as the model of psychological capital with its four components fitted well. The results showed that all four components significantly contributed to psychological capital and to each other. This means that students who score high on one of the four psychological capital components, are more likely to score high on the other components. Also, the four psychological capital constructs contributed approximately equally.

The second hypothesis stated that "the concept of twenty first century skills is represented by four sub-components: creativity and innovation, critical thinking and problem-solving skills, collaboration and communication". This hypothesis is partly confirmed, since one of the components was excluded since it was not possible to measure this construct. Therefore, only three of the four components were incorporated in the analysis. The model with the remaining three components of twenty first century skills fitted well. The results showed that all three components significantly contributed to twenty first century skills and to each

other. This means that students who score high on one of the three skills, are more likely to score high on the other skills.

### *Results regarding relationships of (sub)components 'psychological capital' and 'twenty first century skills'*

The third and most important hypothesis claimed that "**"**there is a positive relationship between psychological capital and twenty first century skills*"*. This hypothesis was confirmed. The tested model with psychological capital and twenty century skills (consisting of three out of four components) fitted well. The results showed that psychological capital and twenty first century skills significantly contributed to each other, just as all seven subcomponents did as well. This means that students who score high on psychological capital, are more likely to score high on the twenty first century skills. Some relationships appeared to be stronger than others. Self-efficacy and hope and creativity-and-innovation and critical-thinking-and-problem-solving-skills appeared to show a strong relationship (Hinkle et al., 2003), whereas optimism appeared to show a somewhat lower, but still positive, relationship with both creativity-and-innovation and critical-thinking-and-problem-solving-skills (Hinkle et al., 2003).

## Discussion of results

### *'Psychological capital' and 'twenty first century skills' as constructs*

Our study found that all four psychological capital components significantly contributed to psychological capital and to each other. These results are in line with previous research indicating that the four subconstructs self-efficacy, hope, optimism, and resilience together form the concept of psychological capital (Luthans, Youssef et al., 2007). These results implicate that the instrument measures what it is supposed to measure and therefore can also be used in future research and other research fields.

Regarding twenty first century skills, only three of the four components were included in the research. This is therefore only partly in line with the research of Germaine et al. (2016), who indicates that all four twenty first century skills components were intertwined. The component "collaboration" was excluded in our study when it became clear that the collaboration subscale could not measure the component of 'collaboration' on individual student level well enough as part of twenty first century skills. Almost no dispersion was visible between the provided answers by students. The twenty first century skills model including collaboration therefore provided no reliable results. The lack of dispersion could be due to the fact that in current education, project based learning is highly implemented and thus students need to work so much together they might already be able to collaborate and therefore all score in the same range of collaboration (Lee, Huh & Reigeluth, 2015). Therefore, this could be a reason that students showed few variation amongst their answers.

The results do not imply, however, that collaboration should be excluded as a component of twenty first century skills. In confirmatory factor analyses even more so than other kinds of statistical modelling, the theory behind your model is crucial to deciding whether or not a model is any good (Understanding Data, 2017). Based on the literature discussed in the introduction one can only conclude that collaboration is an incremental part of twenty first century skills in order to function in the global society of the future (Thijs et al., 2014). The overall conclusion that can be drawn from these points is that, for this specific questionnaire, collaboration as construct and as part of TFCS could not be measured. The three remaining twenty first century components (creativity and innovation; critical thinking and problem-solving skills; and communication) significantly contributed to twenty first century and to each other.

Twenty first century skills could not be assessed yet due to a lack of good comparable indicators, even though the need for such an instrument is high (World Economic Forum, 2015). A strong point of this study is that, in this study, we developed a self-assessment scale for students based on existing observation tools for teachers (CTE – Washington, 2019) and tested this instrument in the same research with over 1300 participants. Three of the four components positively related to each other and reliability analysis showed excellent internal consistency for the entire questionnaire, indicating that we made a good start in developing the questionnaire. Future research should be focused on further developing an instrument in which collaboration can be measured as individual component together with the other three components in order to test if collaboration is part of twenty first century skills just as the other three components.

***Relationships psychological capital and twenty first century skills***

Our main founding was that psychological capital and twenty first century skills were strongly related (Hinkle et al., 2003) such that students who scored high on psychological capital were more likely to score high on twenty first century skills. Even though a causal connection could not yet been determined, it is expected that psychological capital influences twenty first century skills more than the other way around. This is expected because several studies claim usefulness of stimulating psychological capital in order to increase twenty first century skills (for example: Fahim & Nasrollahi-Mouziraji, 2013; Rego et al., 2012b, Richtnér & Löfsten, 2014). Future research should focus on examining the direction of the relationship.

A strong point of this research regarded the generalizability. Since students of twenty different schools participated in the research, it can be stated that the results of this research are representable for the Netherlands as a country, and for surrounding countries with a similar culture and curriculum.

Societal implications of these results lie on the level of improving the learning of the essential twenty first century skills by increasing psychological capital. It is possible to develop (enhance) psychological capital since it is state-like in nature, which means that one's psychological capital can be developed (enhanced) trough interventions (O'Reilly, 2016). Since psychological capital on itself is important regarding its connection with academic achievement, motivations and well-being and it can also increase twenty first century skills, intervening on psychological capital catches two birds with one stone. A successful intervention was already conducted to enhance psychological capital in a student population of 24 students (O'Reilly, 2016).

The intervention was based on the guidelines of the original intervention of Luthans, Avey, Avolio & Peterson (2010) and is described in O'Reilly (p53-P61). It entails multiple exercises, both individual and in a group, with the specific goal of increasing (on of) the indicators of psychological capital. For example, students had to participate in an "Individual Goal Setting Exercise - SMART Goals, Sub-Goals, Pathways Identification and Obstacles" (O'Reilly, p53-61). The intervention showed significant positive results and demonstrated the further growing potential for psychological capital development in students (O'Reilly, 2016). Suggestions for future research would therefore be to conduct a research with a psychological capital intervention and to measure psychological capital and twenty first century skills before, during and after the intervention. This in order to find out how psychological capital exactly influences twenty first century skills

Last of all, limitations of this study regarded the data collection (the downside of using self-assessment) and the quality of the data. The mean item scores were quite high and in most cases more than 75% of the students agreed with the statements. This could indicate that the questionnaires were not discriminating enough. Also, students might not have been that

concentrated or motivated to fill out the questionnaire, the results of the reversed items suggest this for at least part of the group, a clear response bias was visible. These points should be taken into account when the questionnaire will be improved in further research. Due to validity reasons, it was decided not to delete 'bad performing items' since the whole skill would then not have been measured as it was defined by Luthans et al. (2012) and P21 (2019). Even though it was a limitation of this study, literature suggested that self-assessment is a good way to assess the twenty first century skills (Child Trends 2014, as mentioned in Lamb, Jackson & Rumberger, 2015) and the tested subscales provided a good fit within both the constructs psychological capital and twenty first century skills.

## Conclusion

The goal of this study was to examine the relationship between psychological capital and twenty first century skills. The results showed that a strong relationship exists between psychological capital and twenty first century skills (Hinkle et al., 2003), indicating that they do influence each other. Suggestions for future research lie on improving the measurement instruments and the development and use of a psychological capital intervention. This in order to further stimulate psychological capital growth amongst students and assist students in learning their essential skills and therefore better be prepared for their relevant role in the global workplace of the future.

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# Appendix

## Appendix A: Self-assessment questionnaire for twenty first century skills (in Dutch)

Hieronder staan een aantal beweringen. Het is de bedoeling dat je je inleeft in de bewering en je aangeeft in hoeverre de bewering van toepassing is op jou. De beweringen gaan over hoe jij de dingen ziet en ervaart in je leven, dus niet specifiek alleen over je schoolwerk/schoolleven. Het is de bedoeling dat je het eerste antwoord wat in je opkomt aanklikt. Je kunt de beweringen een score geven van helemaal mee oneens tot en met helemaal mee eens. Er is geen goed of fout antwoord, het gaat erom welke bewering het beste bij jou past.

### *Creativity and Innovation*

1. Ik gebruik verschillende creatieve technieken (zoals brainstormen) om tot nieuwe ideeën te komen
2. Ik ben goed in het verbeteren van bestaande concepten
3. Ik kom regelmatig met vernieuwende ideeën die niet voor de hand liggen (out of the box zijn)
4. Ik bedenk graag nieuwe ideeën en zoek daarvoor ook naar nieuwe kennis en bronnen
5. Ik analyseer en evalueer regelmatig mijn eigen ideeën
6. Ik slaag erin om mijn ideeën te verbeteren door ze te verfijnen en evalueren
7. REVERSED Ik vind het lastig om een nieuwe idee concreet te maken en gedetailleerd te beschrijven
8. REVERSED Het lukt me vaak niet om een nieuw idee praktisch tot uitvoering te brengen
9. Ik kan mijn ideeën goed aan anderen uitleggen
10. Ik vraag graag naar de ideeën van anderen om een probleem op te lossen
11. Ik verwerk de input van anderen graag in mijn ideeën en de uitwerking daarvan

12. Het lukt me om een idee (wat misschien abstract is) om te zetten naar een haalbare uitwerking
13. Mijn ideeën en de uitwerkingen daarvan bevatten vaak originele elementen
14. Ik probeer zo min mogelijk fouten te maken
15. Ik accepteer alle fouten die ik maak want die gebruik ik om mijn werk te verbeteren
16. Ik vind dat het een proces is van vallen en opstaan als ik nieuwe ideeën ontwikkel, toepas en uitwerk
17. Als ik een creatief idee heb zorg ik dat dat het in de praktijk uitgevoerd wordt

***Critical Thinking and Problem Solving***

18. Ik ben in staat om uit verschillende waarnemingen en gegevens een logische conclusie te trekken
19. Ik kan algemene kennis toepassen om in specifieke situaties een oplossing te verzinnen
20. Ik probeer een probleem of vraagstuk altijd te zien als een onderdeel van een groter geheel
21. Complexe vraagstukken breek ik op in eenvoudigere deelproblemen
22. Ik kan goed beslissingen nemen
23. REVERSED Ik vind het moeilijk om ergens een genuanceerd oordeel over te vellen
24. Ik ben in staat om bewijzen, argumenten, beweringen en overtuigingen kritisch te analyseren
25. Ik analyseer en evalueer graag perspectieven die heel anders zijn dan dat van mijzelf
26. Ik vind het nuttig om perspectieven die anders zijn dan mijn eigen perspectief kritisch te bekijken
27. Ik kan informatie en argumenten met elkaar in verband brengen om een standpunt te onderbouwen

28. REVERSED Ik vind het moeilijk om complexe informatie te analyseren en interpreteren en daar conclusies uit trekken
29. Ik reflecteer op leerervaringen en leerprocessen
30. Ik kan een probleem dat ik nog niet eerder ben tegengekomen oplossen door gebruik te maken van kennis en/of middelen die ik al heb
31. Ik kan een probleem dat ik nog niet eerder ben tegengekomen oplossen op een vernieuwende manier
32. Ik kan kritische vragen stellen om tot een betere oplossing van een probleem te komen
33. Ik kan kritische vragen stellen om verschillende perspectieven beter te begrijpen

***Communication***

34. REVERSED Ik vind het moeilijk in een gesprek mijn ideeën over te brengen
35. Ik ben altijd goed in staat om mijn ideeën schriftelijk over te brengen
36. Ik kan goed actief luisteren en haal er vaak meer informatie dan alleen wat wordt gezegd
37. Ik kan effectief communiceren om anderen te informeren en instrueren
38. Ik kan effectief communiceren om anderen te motiveren en overtuigen
39. Ik kan voor elke situatie goed bedenken op welke manier (bijvoorbeeld schriftelijk, mondeling of digitaal) ik mijn boodschap zo goed mogelijk over kan brengen
40. Ik kan bepalen wat de meest effectieve manier is om een boodschap digitaal over te brengen
41. Ik kan altijd goed verbaal en non-verbaal communiceren met anderen, in verschillende omgevingen (denk aan school, sport, bijbaantje)

***Collaboration***

42. REVERSED Ik werk liever alleen dan in een groep
43. Ik werk beter in een groep dan alleen

44. Ik kan goed en respectvol samenwerken, ook als de verschillen in onze groep groot zijn
45. In een groep ben ik bereid om een compromis te sluiten om een gemeenschappelijk doel te bereiken, ook als die oplossing niet mijn eerste voorkeur heeft
46. In groepswerk voel ik mij medeverantwoordelijk voor het eindproduct
47. Ik vind dat bij groepswerk de hele groep verantwoordelijk is voor het volledige eindproduct
48. Als ik in een groep werk waardeer ik de (individuele) bijdrage van anderen

**Appendix B: Descriptive statistics tables on item level**

***Psychological capital***

**Table 1**

*Descriptive Statistics for Observed Variables 'psychological capital'*

| Latent factor (scale) | Variable | Mean | SD | Min | Max | 25% | 50% | 75% |
|---|---|---|---|---|---|---|---|---|
| Self-efficacy | SELF_1 | 4.10 | 0.98 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | SELF_2 | 4.33 | 1.05 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | SELF_3 | 4.41 | 1.06 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | SELF_4 | 4.69 | 1.00 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | SELF_5 | 4.06 | 1.23 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | SELF_6 | 4.41 | 1.08 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| Hope | HOPE_1 | 4.10 | 1.03 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | HOPE_2 | 4.24 | 1.20 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | HOPE_3 | 4.53 | 0.91 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | HOPE_4 | 3.95 | 1.24 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | HOPE_5 | 4.33 | 0.96 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | HOPE_6 | 4.16 | 1.12 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Resilience | RESI_1_RV | 3.81 | 1.25 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | RESI_2 | 4.40 | 0.98 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | RESI_3 | 5.06 | 0.92 | 1.00 | 6.00 | 5.00 | 5.00 | 6.00 |
| | RESI_4 | 4.18 | 1.06 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | RESI_5 | 3.97 | 1.31 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | RESI_6 | 4.25 | 1.07 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| Optimism | OPTI_1 | 3.70 | 1.17 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | OPTI_2_RV | 3.72 | 1.14 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | OPTI_3 | 3.81 | 1.23 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | OPTI_4 | 4.33 | 1.13 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | OPTI_5_RV | 3.99 | 1.15 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | OPTI_6 | 4.09 | 1.18 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |

***Twenty first century skills***

**Table 2**

*Descriptive Statistics for observed variables 'twenty first century skills'*

| Latent factor (scale) | Variable | Mean | SD | Min | Max | 25% | 50% | 75% |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Creativity and innovation | CREA_1 | 3.65 | 1.27 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_2 | 3.87 | 1.04 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_3 | 3.75 | 1.17 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_4 | 3.80 | 1.20 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_5 | 3.75 | 1.21 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_6 | 3.86 | 1.10 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_7_RV | 3.63 | 1.20 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_8_RV | 3.76 | 1.18 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_9 | 4.44 | 1.06 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CREA_10 | 4.37 | 1.09 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CREA_11 | 4.28 | 1.02 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | CREA_12 | 3.89 | 0.98 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_13 | 3.94 | 1.01 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CREA_14 | 5.14 | 0.96 | 1.00 | 6.00 | 5.00 | 5.00 | 6.00 |
| | CREA_15 | 4.25 | 1.17 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | CREA_16 | 4.44 | 1.03 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CREA_17 | 3.60 | 1.10 | 1.00 | 6.00 | 3.00 | 4.00 | 4.00 |
| | CRIT_1 | 4.59 | 0.88 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Critical thinking and problem solving skills | CRIT_2 | 4.58 | 0.88 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CRIT_3 | 3.80 | 1.10 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_4 | 3.80 | 1.12 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_5 | 4.08 | 1.32 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_6_RV | 3.69 | 1.18 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_7 | 4.40 | 0.96 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CRIT_8 | 3.90 | 1.22 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_9 | 4.27 | 1.04 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | CRIT_10 | 4.54 | 0.87 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | CRIT_11_RV | 3.65 | 1.13 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_12 | 3.96 | 1.08 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | CRIT_13 | 4.34 | 0.85 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | CRIT_14 | 3.88 | 0.96 | 1.00 | 6.00 | 3.00 | 4.00 | 4.00 |
| | CRIT_15 | 4.15 | 1.01 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | CRIT_16 | 4.20 | 1.00 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| Communication | COMM_1_RV | 4.23 | 1.26 | 1.00 | 6.00 | 3.00 | 5.00 | 5.00 |
| | COMM_2 | 4.11 | 1.12 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | COMM_3 | 4.13 | 1.08 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | COMM_4 | 4.35 | 1.00 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | COMM_5 | 4.40 | 1.01 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | COMM_6 | 4.16 | 1.01 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | COMM_7 | 4.13 | 0.99 | 1.00 | 6.00 | 4.00 | 4.00 | 5.00 |
| | COMM_8 | 4.53 | 1.10 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| Collaboration | COLL_1_RV | 3.49 | 1.42 | 1.00 | 6.00 | 2.00 | 3.00 | 5.00 |
| | COLL_2 | 3.64 | 1.23 | 1.00 | 6.00 | 3.00 | 4.00 | 5.00 |
| | COLL_3 | 4.78 | 0.94 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | COLL_4 | 4.67 | 0.94 | 1.00 | 6.00 | 4.00 | 5.00 | 5.00 |
| | COLL_5 | 5.29 | 0.85 | 1.00 | 6.00 | 5.00 | 5.00 | 6.00 |
| | COLL_6 | 5.31 | 0.91 | 1.00 | 6.00 | 5.00 | 6.00 | 6.00 |
| | COLL_7 | 5.14 | 0.81 | 1.00 | 6.00 | 5.00 | 5.00 | 6.00 |

**Appendix C: R codes**

***R code for CFA analysis psychological capital model***

```
# specificy psycap.model met hoofd latente variabele psycap

psycap.model <-

  'self_efficacy =~ SELF_1 + SELF_2 + SELF_3 + SELF_4 + SELF_5 + SELF_6

hope =~ HOPE_1 + HOPE_2 + HOPE_3 + HOPE_4 + HOPE_5 + HOPE_6

resilience =~   RESI_2 + RESI_1_RV + RESI_3 + RESI_4 + RESI_5 + RESI_6

optimism =~ OPTI_1 + OPTI_2_RV + OPTI_3 + OPTI_4 + OPTI_5_RV + OPTI_6

psycap =~ self_efficacy + hope + resilience + optimism'

#fit psycap.model with categorical variables met hoofd latente variabele psycao

fit_psycap.model <- cfa(psycap.model, data = df_psy_data, ordered = c ("SELF_1", "SELF_2",
"SELF_3", "SELF_4", "SELF_5", "SELF_6", "HOPE_1", "HOPE_2", "HOPE_3", "HOPE_4",
"HOPE_5", "HOPE_6", "RESI_2", "RESI_1_RV", "RESI_3", "RESI_4", "RESI_5",
"RESI_6", "OPTI_1", "OPTI_2_RV", "OPTI_3", "OPTI_4",
"OPTI_5_RV", "OPTI_6"))

#display summary output psycap model met hoofd latente variabele psycap

summary(fit_psycap.model, fit.measures= TRUE, standardized=TRUE)
```

***R code for CFA analysis twenty first century skills model***

```
#specify tfcs.model met hoofd latente variabale tfcs

tfcs.model <-
```

```
'creativity =~ CREA_1 + CREA_2 + CREA_3 + CREA_4 + CREA_5 + CREA_6 + CREA_7_RV + CREA_8_RV + CREA_9 + CREA_10 + CREA_11 + CREA_12 + CREA_13 + CREA_14 + CREA_15 + CREA_16 + CREA_17

critical_thinking =~ CRIT_1 + CRIT_2 + CRIT_3 + CRIT_4 + CRIT _5 + CRIT_6_RV + CRIT_7 + CRIT_8 + CRIT_9 + CRIT_10 + CRIT_11_RV + CRIT_12 + CRIT_13 + CRIT_14 + CRIT_15 + CRIT_16

communication =~ COMM_2 + COMM_1_RV + COMM_3 + COMM_4 + COMM_5 + COMM_6 + COMM_7 + COMM_8

tfcs =~ creativity + critical_thinking + communication'

#fit tfcs.model with categorical variables met hoofd latente variabale tfcs

fit_tfcs.model <- cfa(tfcs.model, data = df_psy_data, ordered = c ("CREA_1", "CREA_2", "CREA_3", "CREA_4", "CREA_5", "CREA_6", "CREA_7_RV", "CREA_8_RV", "CREA_9", "CREA_10", "CREA_11", "CREA_12", "CREA_13", "CREA_14", "CREA_15", "CREA_16", "CREA_17", "CRIT_1", "CRIT_2", "CRIT_3", "CRIT_4", "CRIT_5", "CRIT_6_RV", "CRIT_7", "CRIT_8", "CRIT_9", "CRIT_10", "CRIT_11_RV", "CRIT_12", "CRIT_13", "CRIT_14", "CRIT_15", "CRIT_16", "COMM_1_RV", "COMM_2", "COMM_3", "COMM_4", "COMM_5", "COMM_6", "COMM_7", "COMM_8"))

#display summary output tfcs met hoofd latente variabale tfcs

summary(fit_tfcs.model, fit.measures= TRUE, standardized=TRUE)
```

***R code for CFA analysis psychological capital and twenty first century skills model***

```
# specificy psycap_tfcs.model with head level correlation

psycap_tfcs.model <- '

self_efficacy =~ SELF_1 + SELF_2 + SELF_3 + SELF_4 + SELF_5 + SELF_6

hope =~ HOPE_1 + HOPE_2 + HOPE_3 + HOPE_4 + HOPE_5 + HOPE_6

resilience =~   RESI_2 + RESI_1_RV + RESI_3 + RESI_4 + RESI_5 + RESI_6

optimism =~ OPTI_1 + OPTI_2_RV + OPTI_3 + OPTI_4 + OPTI_5_RV + OPTI_6

creativity =~ CREA_1 + CREA_2 + CREA_3 + CREA_4 + CREA_5 + CREA_6 +
CREA_7_RV + CREA_8_RV + CREA_9 + CREA_10 + CREA_11 + CREA_12 + CREA_13
+ CREA_14 + CREA_15 + CREA_16 + CREA_17

critical_thinking =~ CRIT_1 + CRIT_2 + CRIT_3 + CRIT_4 + CRIT _5 + CRIT_6_RV +
CRIT_7 + CRIT_8 + CRIT_9 + CRIT_10 + CRIT_11_RV + CRIT_12 + CRIT_13 + CRIT_14
+ CRIT_15 + CRIT_16

communication =~ COMM_2 + COMM_1_RV + COMM_3 + COMM_4 + COMM_5 +
COMM_6 + COMM_7 + COMM_8

psycap =~ self_efficacy + hope + resilience + optimism

tfcs =~ creativity + critical_thinking + communication

psycap ~~ tfcs'

#fit psycap_tfcs.model with categorical variables with head level correlation

fit_psycap_tfcs.model <- cfa(psycap_tfcs.model, data = df_psy_data, ordered = c ("SELF_1",
"SELF_2", "SELF_3", "SELF_4", "SELF_5", "SELF_6", "HOPE_1", "HOPE_2", "HOPE_3",
```

"HOPE_4", "HOPE_5", "HOPE_6", "RESI_2", "RESI_1_RV", "RESI_3", "RESI_4", "RESI_5", "RESI_6", "OPTI_1", "OPTI_2_RV", "OPTI_3", "OPTI_4", "OPTI_5_RV", "OPTI_6", "CREA_1", "CREA_2", "CREA_3", "CREA_4", "CREA_5", "CREA_6", "CREA_7_RV", "CREA_8_RV", "CREA_9", "CREA_10", "CREA_11", "CREA_12", "CREA_13", "CREA_14", "CREA_15", "CREA_16", "CREA_17", "CRIT_1", "CRIT_2", "CRIT_3", "CRIT_4", "CRIT_5", "CRIT_6_RV", "CRIT_7", "CRIT_8", "CRIT_9", "CRIT_10", "CRIT_11_RV", "CRIT_12", "CRIT_13", "CRIT_14", "CRIT_15", "CRIT_16", "COMM_1_RV", "COMM_2", "COMM_3", "COMM_4", "COMM_5", "COMM_6", "COMM_7", "COMM_8"))

*#display summary output psycap_tfcs with head level correlation*

summary(fit_psycap_tfcs.model, fit.measures= TRUE, standardized=TRUE)

## Appendix D: Factor loadings on item level

### *Factor loadings psychological capital on item level*

**Table 1**

*Factor loadings psychological capital subscales on item level (with main latent variable)*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|
| Self-efficacy | SELF_1 | 1.00 | | | .70 | .00* |
| | SELF_2 | 1.04 | 0.03 | 34.30 | .73 | .00* |
| | SELF_3 | 1.01 | 0.03 | 32.94 | .71 | .00* |
| | SELF_4 | 1.06 | 0.03 | 32.96 | .75 | .00* |
| | SELF_5 | 0.92 | 0.03 | 26.63 | .64 | .00* |
| | SELF_6 | 0.99 | 0.03 | 30.73 | .70 | .00* |
| Hope | HOPE_1 | 1.00 | | | .71 | .00* |
| | HOPE_2 | 1.00 | 0.03 | 35.68 | .71 | .00* |
| | HOPE_3 | 0.94 | 0.03 | 33.37 | .66 | .00* |
| | HOPE_4 | 0.95 | 0.03 | 33.24 | .68 | .00* |
| | HOPE_5 | 1.03 | 0.03 | 37.14 | .73 | .00* |
| | HOPE_6 | 0.97 | 0.03 | 31.85 | .69 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| Resilience | RESI_2 | 1.00 | | | .71 | .00* |
| | RESI_1_RV | 0.65 | 0.04 | 16.81 | .46 | .00* |
| | RESI_3 | 0.63 | 0.04 | 15.64 | .45 | .00* |
| | RESI_4 | 0.57 | 0.04 | 14.64 | .40 | .00* |
| | RESI_5 | 0.29 | 0.04 | 7.19 | .21 | .00* |
| | RESI_6 | 0.98 | 0.04 | 26.62 | .70 | .00* |
| Optimism | OPTI_1 | 1.00 | | | .64 | .00* |
| | OPTI_2_RV | 0.58 | 0.05 | 12.45 | .37 | .00* |
| | OPTI_3 | 1.19 | 0.04 | 31.03 | .76 | .00* |
| | OPTI_4 | 1.26 | 0.04 | 31.14 | .81 | .00* |
| | OPTI_5_RV | 0.63 | 0.05 | 13.33 | .40 | .00* |
| | OPTI_6 | 1.12 | 0.04 | 28.82 | .72 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed)

***Factor loadings twenty first century skills on item level***

**Table 2**

*Factor loadings TFCS subscales on item level (with main latent variable)*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Creativity and innovation | CREA_1 | 1.00 | | | .51 | .00* |
| | CREA_2 | 1.33 | 0.06 | 22.40 | .67 | .00* |
| | CREA_3 | 1.18 | 0.06 | 21.00 | .60 | .00* |
| | CREA_4 | 1.32 | 0.06 | 21.52 | .67 | .00* |
| | CREA_5 | 1.23 | 0.06 | 20.42 | .63 | .00* |
| | CREA_6 | 1.31 | 0.06 | 21.12 | .67 | .00* |
| | CREA_7_RV | 0.56 | 0.06 | 9.74 | .29 | .00* |
| | CREA_8_RV | 0.60 | 0.06 | 10.01 | .31 | .00* |
| | CREA_9 | 0.97 | 0.06 | 15.59 | .50 | .00* |
| | CREA_10 | 0.76 | 0.05 | 14.56 | .39 | .00* |
| | CREA_11 | 0.93 | 0.06 | 16.88 | .47 | .00* |
| | CREA_12 | 1.21 | 0.06 | 19.86 | .62 | .00* |
| | CREA_13 | 1.20 | 0.06 | 19.57 | .61 | .00* |
| | CREA_14 | 0.68 | 0.06 | 11.08 | .35 | .00* |
| | CREA_15 | 0.68 | 0.06 | 11.89 | .35 | .00* |
| | CREA_16 | 0.99 | 0.06 | 16.89 | .50 | .00* |
| | CREA_17 | 1.02 | 0.05 | 18.84 | .52 | .00* |
| | CRIT_1 | 1.00 | | | .59 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| Critical thinking and problem solving skills | CRIT_2 | 1.02 | 0.04 | 27.63 | .60 | .00* |
| | CRIT_3 | 0.92 | 0.04 | 23.24 | .54 | .00* |
| | CRIT_4 | 0.81 | 0.04 | 20.71 | .48 | .00* |
| | CRIT_5 | 0.57 | 0.04 | 13.04 | .34 | .00* |
| | CRIT_6_RV | 0.28 | 0.05 | 6.23 | .17 | .00* |
| | CRIT_7 | 1.04 | 0.04 | 25.54 | .62 | .00* |
| | CRIT_8 | 0.94 | 0.04 | 22.32 | .56 | .00* |
| | CRIT_9 | 0.88 | 0.04 | 20.99 | .52 | .00* |
| | CRIT_10 | 1.09 | 0.05 | 23.63 | .65 | .00* |
| | CRIT_11_RV | 0.46 | 0.04 | 10.42 | .27 | .00* |
| | CRIT_12 | 0.78 | 0.04 | 17.95 | .46 | .00* |
| | CRIT_13 | 1.02 | 0.05 | 22.35 | .60 | .00* |
| | CRIT_14 | 0.92 | 0.05 | 20.31 | .54 | .00* |
| | CRIT_15 | 1.21 | 0.05 | 26.77 | .71 | .00* |
| | CRIT_16 | 1.17 | 0.05 | 25.82 | .69 | .00* |
| Communication | COMM_2 | 1.00 | | | .54 | .00* |
| | COMM_1_RV | 0.66 | 0.06 | 10.48 | .36 | .00* |
| | COMM_3 | 1.00 | 0.06 | 16.45 | .54 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | COMM_4 | 1.38 | 0.07 | 20.60 | .74 | .00* |
| | COMM_5 | 1.37 | 0.07 | 20.02 | .73 | .00* |
| | COMM_6 | 1.30 | 0.06 | 21.30 | .70 | .00* |
| | COMM_7 | 1.15 | 0.06 | 18.49 | .62 | .00* |
| | COMM_8 | 1.08 | 0.06 | 17.63 | .58 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed)

***Factor loadings psychological capital and twenty first century skills taken together on item level***

**Table 3**

*Factor loadings psychological capital and twenty first century skills subscales on item level*

| Latent factor (scale) | Indicator | B (factor loading) | SE (standard error) | Z | Beta coefficient (standardized) | Sig P(>\|z\|) |
|---|---|---|---|---|---|---|
| Self-efficacy | SELF_1 | 1.00 | | | .76 | .00* |
| | SELF_2 | 0.97 | 0.03 | 37.74 | .74 | .00* |
| | SELF_3 | 0.93 | 0.03 | 33.86 | .71 | .00* |
| | SELF_4 | 0.94 | 0.03 | 33.60 | .72 | .00* |
| | SELF_5 | 0.81 | 0.03 | 27.29 | .62 | .00* |
| | SELF_6 | 0.87 | 0.03 | 30.21 | .66 | .00* |
| Hope | HOPE_1 | 1.00 | | | .74 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | HOPE_2 | 0.97 | 0.03 | 31.22 | .71 | .00* |
| | HOPE_3 | 0.92 | 0.03 | 29.78 | .67 | .00* |
| | HOPE_4 | 0.86 | 0.03 | 28.10 | .63 | .00* |
| | HOPE_5 | 1.01 | 0.03 | 33.72 | .74 | .00* |
| | HOPE_6 | 0.93 | 0.03 | 28.20 | .70 | .00* |
| Resilience | RESI_2 | 1.00 | | | .66 | .00* |
| | RESI_1_RV | 0.55 | 0.05 | 12.10 | .36 | .00* |
| | RESI_3 | 0.77 | 0.05 | 16.89 | .51 | .00* |
| | RESI_4 | 0.80 | 0.04 | 18.16 | .53 | .00* |
| | RESI_5 | 0.41 | 0.05 | 8.62 | .27 | .00* |
| | RESI_6 | 1.06 | 0.05 | 23.38 | .70 | .00* |
| Optimism | OPTI_1 | 1.00 | | | .63 | .00* |
| | OPTI_2_RV | 0.58 | 0.06 | 10.06 | .37 | .00* |
| | OPTI_3 | 1.20 | 0.05 | 25.03 | .76 | .00* |
| | OPTI_4 | 1.29 | 0.05 | 24.40 | .82 | .00* |
| | OPTI_5_RV | 0.63 | 0.06 | 10.71 | .40 | .00* |
| | OPTI_6 | 1.14 | 0.05 | 23.45 | .72 | .00* |
| | CREA_1 | 1.00 | | | .49 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| Creativity and innovation | CREA_2 | 1.37 | 0.07 | 19.96 | .67 | .00* |
| | CREA_3 | 1.22 | 0.06 | 19.36 | .60 | .00* |
| | CREA_4 | 1.30 | 0.07 | 19.79 | .64 | .00* |
| | CREA_5 | 1.16 | 0.07 | 17.82 | .57 | .00* |
| | CREA_6 | 1.29 | 0.07 | 18.84 | .63 | .00* |
| | CREA_7_RV | 0.66 | 0.07 | 10.26 | .33 | .00* |
| | CREA_8_RV | 0.69 | 0.07 | 10.16 | .34 | .00* |
| | CREA_9 | 1.11 | 0.07 | 15.19 | .55 | .00* |
| | CREA_10 | 0.73 | 0.06 | 12.68 | .36 | .00* |
| | CREA_11 | 0.89 | 0.06 | 14.56 | .44 | .00* |
| | CREA_12 | 1.29 | 0.07 | 18.60 | .63 | .00* |
| | CREA_13 | 1.19 | 0.07 | 17.36 | .59 | .00* |
| | CREA_14 | 0.67 | 0.07 | 9.92 | .33 | .00* |
| | CREA_15 | 0.85 | 0.07 | 12.83 | .42 | .00* |
| | CREA_16 | 1.12 | 0.07 | 16.53 | .55 | .00* |
| | CREA_17 | 1.07 | 0.06 | 17.59 | .53 | .00* |
| Critical thinking and | CRIT_1 | 1.00 | | | .58 | .00* |
| | CRIT_2 | 1.01 | 0.04 | 25.33 | .59 | .00* |

| | | | | | | |
|---|---|---|---|---|---|---|
| problem | CRIT_3 | 0.90 | 0.04 | 21.28 | .53 | .00* |
| solving skills | CRIT_4 | 0.79 | 0.04 | 18.62 | .46 | .00* |
| | CRIT_5 | 0.79 | 0.05 | 15.78 | .46 | .00* |
| | CRIT_6_RV | 0.33 | 0.05 | 6.89 | .19 | .00* |
| | CRIT_7 | 1.06 | 0.05 | 22.66 | .62 | .00* |
| | CRIT_8 | 0.87 | 0.05 | 19.18 | .51 | .00* |
| | CRIT_9 | 0.81 | 0.05 | 17.78 | .47 | .00* |
| | CRIT_10 | 1.13 | 0.05 | 22.18 | .66 | .00* |
| | CRIT_11_RV | 0.51 | 0.05 | 10.87 | .30 | .00* |
| | CRIT_12 | 0.78 | 0.05 | 16.21 | .45 | .00* |
| | CRIT_13 | 1.09 | 0.05 | 21.71 | .63 | .00* |
| | CRIT_14 | 0.98 | 0.05 | 19.54 | .57 | .00* |
| | CRIT_15 | 1.22 | 0.05 | 23.81 | .71 | .00* |
| | CRIT_16 | 1.15 | 0.05 | 22.80 | .67 | .00* |
| Communication | COMM_2 | 1.00 | | | .53 | .00* |
| | COMM_1_RV | 0.78 | 0.07 | 11.48 | .41 | .00* |
| | COMM_3 | 0.98 | 0.06 | 16.14 | .51 | .00* |
| | COMM_4 | 1.39 | 0.07 | 19.90 | .73 | .00* |

| | | | | | |
|---|---|---|---|---|---|
| | COMM_5 | 1.40 | 0.07 | 19.85 | .74 | .00* |
| | COMM_6 | 1.28 | 0.06 | 20.91 | .67 | .00* |
| | COMM_7 | 1.13 | 0.06 | 18.10 | .59 | .00* |
| | COMM_8 | 1.20 | 0.06 | 18.53 | .63 | .00* |

*= Factor loading is significant at the 0.05 level (2-tailed)