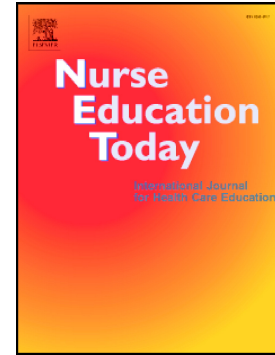


## Accepted Manuscript

Development and psychometric testing of the nursing student mentors' competence instrument (MCI): A cross-sectional study

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PII: S0260-6917(18)30228-4  
DOI: doi:[10.1016/j.nedt.2018.05.028](https://doi.org/10.1016/j.nedt.2018.05.028)  
Reference: YNEDT 3876  
To appear in: *Nurse Education Today*  
Received date: 4 December 2017  
Revised date: 29 March 2018  
Accepted date: 31 May 2018

Please cite this article as: Anna-Maria Tuomikoski, Heidi Ruotsalainen, Kristina Mikkonen, Jouko Miettunen, Maria Kääriäinen, Development and psychometric testing of the nursing student mentors' competence instrument (MCI): A cross-sectional study. *Ynedt* (2018), doi:[10.1016/j.nedt.2018.05.028](https://doi.org/10.1016/j.nedt.2018.05.028)

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DEVELOPMENT AND PSYCHOMETRIC TESTING OF THE NURSING STUDENT MENTORS' COMPETENCE  
INSTRUMENT (MCI): A CROSS-SECTIONAL STUDY

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Total number of pages: 17 pages, 2 tables

Word counts: Total: 3782 words / Abstract: 223 words

Source of support: This study was financially supported by a grant from the Finnish Research Foundation for Nursing Education, University of Oulu and University Hospital of Oulu.

No conflict of interest has been declared by the authors.

## **Development and psychometric testing of the nursing student mentors' competence instrument (MCI): A cross-sectional study**

### **ABSTRACT**

**Background:** Mentors require competence at a diverse array of skills to mentor students during clinical practice.

According to the latest evidence, competence at mentoring includes: knowledge, skills and attributes of individual students' learning objectives, core elements of nursing, learning processes, a reciprocal and trustful relationship, feedback, evaluation, cooperation with stakeholders, and the mentor's personal qualities.

**Objective:** The purpose of the study was to test psychometric properties of a mentor's competence instrument developed to self-evaluate mentors' competence at mentoring nursing students in clinical practice.

**Design:** A cross-sectional, descriptive, explorative study design was used.

**Settings:** Data were collected from mentors at five university hospitals in Finland in 2016.

**Participants:** A total of 576 mentors participated in this study.

**Methods:** The instrument was developed through systematic review, experts' evaluations, and pilot versions of the instrument tested in previous studies. The construct validity and reliability of the instrument were tested using exploratory factor analysis (EFA) with promax rotation and Cronbach's alpha.

**Results:** A 10-factor model showed that the instrument has acceptable construct validity. Cronbach's alpha values for the subscales observed ranged from 0.76 to 0.90.

**Conclusions:** The instrument exhibited acceptable psychometric properties, thereby proving itself a valuable tool for evaluating mentors' competence at mentoring students. Further assessments of its reliability, validity and generality for measuring mentor's competence for mentoring students in different contexts and cultures are recommended.

**Keywords:** mentoring, students, clinical practice, instrument development, psychometric testing, validation, nursing

## INTRODUCTION

The mentor plays a significant role in supporting nursing students' learning process in clinical practice (Courtney-Pratt *et al.* 2011, Jokelainen *et al.* 2013, Hilli *et al.* 2014, Ford *et al.* 2016). Although student mentorship has frequently been investigated in nursing science studies, the studies focus on students' perceptions; clinical learning is seldom studied (Hooven 2014, Vierula *et al.* 2016). Assessing the competence of nurses as student mentors is crucial for mentorship development and education, and assurance of high-quality mentorship for nursing students. However validated instruments for measuring the competence of nurses as mentors are still lacking. Such instruments would allow nurse mentors to self-evaluate their pedagogical competence at mentorship in clinical practice. This paper describes the development and initial psychometric testing of a mentorship competence instrument (MCI) that evaluates mentors of nursing students in clinical practice.

## BACKGROUND

In the European Union, it typically takes at least three years to attain a bachelor's degree in nursing, and about half of this duration involves clinical practice. Nursing students are mentored by professional nurses in their placement during these clinical practice periods (EU directive 2013/55/EU). No generally-accepted definition of 'mentor' can be found in the literature. The term refers to multiple concepts, including: 'supervisor' (Saarikoski & Leino-Kilpi 2002), 'supervising nurse' (Courtney-Pratt *et al.* 2011, Ford *et al.* 2016), 'preceptor' (Hilli *et al.* 2014), 'clinical mentor' (Dobrowolska *et al.* 2016) and 'mentor' (Jokelainen *et al.* 2013). The term 'clinical facilitator' commonly refers to a registered nurse (RN) who mentors between 8 and 12 students simultaneously (Courtney-Pratt *et al.* 2011, Ford *et al.* 2016). Also, the mentorship structure and mentors' backgrounds, experiences, qualifications, and employment requirements vary by country. In many cases, student mentorship is offered by higher education institutions where mentors do not usually mentor students during clinical practice outside of organizing student clinical placement and introducing them to a new learning environment. In several countries, healthcare providers such as registered nurses, whose primary roles involve caring for patients, offer student mentorship regardless of the added clinical teaching responsibility (Dobrowolska *et al.* 2016). In this study, the term 'mentor' refers to a registered nurse working in a hospital for whom mentoring nursing students is a secondary assignment. A 'mentor' is responsible for mentoring students' clinical practice.

In this study the concept of competence at mentoring nursing students is based on a systematic literature review (Authors names blinded). Mentors must be competent at mentoring nursing students in clinical practice. In this study, 'competence' includes the mentor's skills, knowledge, performance, and values when acting as a mentor in the clinical field (Cowan *et al.* 2007). A mentor must be aware of mentoring practices (Meretoja *et al.* 2006), collaborate with education organizations, and possess qualities like trustworthiness, patience, reliability, and respectfulness towards students (Courtney-Pratt *et al.* 2011, Jokelainen *et al.* 2013, Hilli *et al.* 2014). The mentor plays an important role in supporting students' learning processes during clinical practice. The mentor-student relationship is the main factor in a student's clinical practice experience, and should be trustful and reciprocal; the student should feel accepted, secure, and welcome in the clinical practice (Courtney-Pratt *et al.* 2011, Jokelainen *et al.* 2013, Hilli *et al.* 2014, Ford *et al.* 2016). The mentor must assist the student in setting realistic and achievable learning goals according to the student's identified level of competence (Jokelainen *et al.* 2013), and must support the student's professional development (Hilli *et al.* 2014). The mentor must be pedagogically competent, which enables them to give meaningful feedback and evaluation, and focus on concrete performance, progression, and the professional knowledge of the student (Jokelainen *et al.* 2013). In fact, students from a very recent study (Names blinded, 2018) believed the mentoring relationship enhanced their learning when the mentors had frequent unscheduled discussions with them and planned their learning outcomes, and when the mentors were appointed and were not frequently replaced. Finally, the mentor should organize opportunities for students to develop competence and build confidence (Ford *et al.* 2016) and should support the student during the learning process in clinical practice (Jokelainen *et al.* 2013, Hilli *et al.* 2014).

The Clinical Teaching Competence Inventory for Nursing Preceptors, developed in Taiwan, measures the following four factors: 1) student evaluation, 2) goal setting and individual teaching, 3) teaching strategies, and 4) demonstration of organized knowledge (Hsu *et al.* 2014). Another instrument, the Support Instrument for Nurses Facilitating the Learning of Others (SINFLO), measures registered nurses' perceptions of the support they receive for fulfilling their role in supporting the learning of others. SINFLO includes five core elements: workload, communication, teamwork, preparation, and acknowledgement (Henderson *et al.* 2012). Hallin and Danielson (2009) developed an instrument for measuring a mentor's actions, and personal and clinical characteristics: preparation; support from teachers; and support from colleagues, chief nurses and registered nurses. Another tool, the Clinical Nursing Faculty Competence Inventory (CNFCI), was designed to evaluate clinical faculty members' core competence in China. Competence areas of the CNFCI include: leadership ability, problem-solving ability, educational intelligence, general teaching ability, and professional competence (Hou *et al.* 2011). These existing instruments were developed to assess mentors' competence

at nursing student mentorship in clinical practice. However, none of these tools specifically assess extensive competence at mentoring nursing students in clinical practice.'

## THE STUDY

### *Aim*

The purpose of the study was to test psychometric properties of a mentor's competence instrument (MCI) developed to self-evaluate mentors' competence at mentoring nursing students in clinical practice.

### *Design*

A cross-sectional survey design, involving a self-administered electronic version of the instrument, was used.

### *Participants*

Mentors at all five university hospitals in Finland were surveyed. A sample of 25% of the total RN population ( $N = 13,342$ ) was selected by stratified random sampling (Grove, Burns, & Gray, 2013). Electronic questionnaires were sent to 3,355 registered nurses who mentor students in the university hospitals; participants were randomly chosen. Samples drawn from the strata were proportional to the number of nurses in the university hospitals, and the following inclusion criteria were set: the respondent must be a registered nurse, be a hospital employee, and have experience mentoring students.

### *Data collection*

Data were collected via the Webropol program during the spring of 2016. Registered nurses from 5 hospitals were invited to participate in the survey via email. Two reminder emails were sent, at 2-week intervals following the initial survey, to registered nurses from three hospitals. One reminder email was sent to registered nurses at the remaining two hospitals. The number of emails received by each hospital was dictated by organizational practices: two hospitals allowed only one reminder email, while three hospitals allowed two reminder emails. A total of 576 registered nurses responded to the survey.

### *Instrument*

The instrument was developed in three phases (see figure 1): 1) construction of the conceptual framework and item generation by systematic literature review (Authors names blinded); 2) judgment quantification using an expert panel (Authors names blinded); and 3) pilot testing prior to main data collection to test construct validity and reliability of the

instrument (Authors names blinded). Instrument development followed the recommendations of Streiner and Norman (2014b).

The first phase of instrument development included construction of the theoretical framework using systematic literature review. After content analysis of the systematic review, 179 items were developed under eight main sub-dimensions. The second phase was completed by a panel of six experts from university hospital staff and clinical mentors. The content validation index was tested by reducing the number of items to 177. The third phase included pilot tests of the instrument using principal component analysis (PCA). PCA produced 13 factors and 85 items. This paper reports the main data collection and psychometric testing of the instrument conducted during the third phase.

The self-assessment instrument used in this cross-sectional study comprised a Mentors' Competence Instrument (MCI) (68 items) with background information. The survey was conducted in Finnish. Items were formulated to be measured on a four-point Likert rating scale (1 = totally disagree, 2 = disagree to some extent, 3 = agree to some extent, and 4 = totally agree), and no items were reverse-scored.

### ***Ethical considerations***

The study was conducted according to guidelines of ethical research conduct (RCR 2012). Research permissions were obtained from all five university hospitals according to each hospital's research approval protocol. Formal ethics committee approval was not required for this cross-sectional study (Medical Research Act 2010/794) since participants were not exposed to any psychologically and/or physically harmful influences. All participants received an informative email about the study with guaranteed voluntary and anonymous participation (Stang, 2015).

### ***Data analysis***

The International Business Machines Corporation Statistical Package for Social Sciences (IBM SPSS V23.0) was used to analyze the data. Data was analyzed using descriptive statistics including frequencies, percentages, means, medians, standard deviations, and ranges for the mentors' background variables. Responses to instrument items were calculated before applying association tests between variables (Pett et al. 2003, Munro 2005). Construct validity of the instrument was evaluated using exploratory factor analysis (EFA) with oblique rotation (Promax) and principal axis factoring. The promax rotation was used since sub-dimensions correlated above 0.2 score (Pett et al 2003).

EFA was based on Pearson's correlation coefficients of associations between items. Bartlett's test of sphericity (BTS) was used to determine the degree of interrelationship between variables for use in EFA ( $p < 0.001$ ). The Kaiser-Meyer-

Olkin (KMO) test ( $p > 0.60$ ) was used to determine sample adequacy. During EFA analysis, factors that had eigenvalues  $> 1.0$  were retained, thus explaining 5% of the variance in the aspects of interest. Alternatively, factors that were important according to Cattell's scree test were retained (Burns & Grove 2005). The cut-off for adding items to the EFA model was  $> 0.30$  (DeVellis 2012). A requirement of more than five times the number of participants to items was set to determine a sample size that would yield reliable correlation estimates among variables (Pett *et al.* 2003). Cronbach's alpha coefficient was used as an estimate of the instrument's internal consistency (Cronbach 1951), which indicates how well the instrument's items fit together conceptually.

## RESULTS

### Participants

A total of 576 mentors responded to the survey (17% response rate). Table 1 shows the mentors' demographic characteristics. Mentors were mostly female (87%), aged 22-66 years (mean age 41.67 years), and their work experience ranged from 0 to 42 years (mean 15.86 years). Most mentors had no education in mentoring (61%).

### Exploratory factor analysis

The KMO and BTS values for the MCI were 0.954 and 21090.665 (d.f. = 1,953;  $P < 0.001$ ), indicating sampling adequacy. Three items were removed from the instrument based on Pearson's two-tailed correlation between items, and two items were also removed based on factor's cross-loading on variables ( $> 0.30$ ), leaving 63 items in the MCI. EFA yielded an 11-factor model with the eigenvalue set to  $> 1$ . One factor loaded only 3 items. Promax rotation was used with 10-factor model loadings. The cumulative percentage of the total variance explained by these factors was 61%. The first factor, student-centered evaluation, explained 32.1% of the total variance; the second, goal-oriented mentoring, 5.6%; the third, mentoring practice in the workplace, 4.9%; the fourth, reflection during mentoring, 3.8%; the fifth, the mentor's characteristics, 3.3%; the sixth, supporting the student's learning process, 2.9%; the seventh, the mentor's motivation, 2.5%; the eighth, identifying the student's level of competence, 2.3%; the ninth, constructive feedback, 2.1%; and the tenth, mentoring practice between student and mentor, 1.9%. The factors' eigenvalues ranged from 1.179 to 20.192, factor loadings ranged from 0.340 to 0.895, and communalities ranged from 0.301 to 0.726.

### Internal consistency of the instrument



The MCI (with 63 items) was created to measure mentors' competence at mentoring nursing students. The MCI is a self-assessment instrument with a four-point Likert rating scale that includes 10 dimensions: student-centered evaluation (10 items); goal-oriented mentoring (9 items); mentoring practices in the workplace (6 items); reflection during mentoring (6 items); the mentor's characteristics (7 items); supporting the student's learning process (8 items); the mentor's motivation (5 items); identifying the student's level of competence (4 items); constructive feedback (4 items); and mentoring practices between student and mentor (4 items). Cronbach's alpha values varied between 0.76 and 0.90.

## DISCUSSION

The purpose of this study was to develop and test the psychometric properties of the MCI. The creation of a validated instrument for assessing competence at mentoring nursing students during clinical practice could have important implications for mentoring practices in Finland and other countries. Levels of competence at mentorship should be observed and education in mentorship should be developed accordingly. Mentors' increased competence at mentoring nursing students would improve the quality of mentorship and student learning during clinical practice.

It is challenging to define and operationalize mentorship competence to develop an evaluation instrument. Here, a thorough systematic review was the basis for operationalization of the theoretical framework of mentorship competence (Authors names blinded). The review also identified key aspects of competence at mentoring students and items to measure it.

The MCI presented good estimates of construct validity and internal consistency. Construct validity was evaluated by EFA with promax rotation. EFA was conducted for all MCI items which represent different theoretical aspects of registered nurse mentors' competence at student mentorship. Both the raw data and correlation matrix met Barlett's test and KMO test criteria for EFA suitability ( $P < 0.001$  and  $P > 0.60$  respectively). The statistical significance observed might be attributed to the rather large sample size, and the data volume might have led to an overestimate of the number of significant factors. Therefore, a scree test was used, instead of eigenvalues, to restrict the number of factors, as recommended by Kline (1994). Five variables were excluded from further analysis due to loading values. This EFA indicated that the instrument has good construct validity: the retained factors explained 61% of the total variance in aspects regarding competence at mentorship. Furthermore, this EFA indicated that the content of factors retained within

the instrument corresponded well to the operationalization of the concepts: eigenvalues varied between 1.179 and 20.192 and the loadings ranged from 0.340 to 0.895 (Table 2).

The instrument's reliability was assessed by testing it on samples of mentors, paying attention to the clarity and logic of the items (Burns & Grove 2009, Polit & Beck 2011). Cronbach's alpha coefficients were calculated from the responses of sample populations for both individual items and factors, based on at least three items, that may be inflated for the entire instrument (Nunnally & Bernstein 1994). Cronbach's alpha values of empirical data indicated that the instrument had good internal consistency for a newly developed instrument ( $\geq 0.70$ ; DeVellis 2012, Streiner & Norman 2014a). More than 10 items in a given instrument may show high alpha coefficient values (Kimberling 2008). However, DeVellis (2012) presented that alpha coefficient values over 0.90 indicate redundancies and suggest the need to shorten instruments. Furthermore, alpha coefficients are sample specific (Waltz et al. 2005), hence different samples may yield substantially differing internal consistency results.

During initial psychometric testing of the instrument, including the EFA and the internal consistency analysis of each factor, five items were excluded, and items were grouped into 10 factors. The five items were excluded because they loaded 0.3 or above on more than one factor. The results of initial psychometric testing indicated that the instrument's validity and reliability were satisfactory (DeVon *et al.* 2007, DeVellis 2012).

Similar existing instruments were developed in Asian (Hsu et al 2014, Hou et al. 2011) and Iranian (Shahsavari et al 2014) contexts; however, cultural differences exist between Asia and Iran compared to member countries of the Organization for Economic Co-operation and Development (OECD). Furthermore, the MCI explains extensive dimensions of competence at nursing student mentorship in clinical practice. In Finland, the mentor is responsible for comprehensive student mentorship during clinical practice that especially includes constructive evaluation. MCI assesses reciprocal and supportive relationships with students during the student learning process in the clinical field, as well as mentor motivation. We suggest that improved mentorship can influence education on nursing and patient safety in clinical practice.

### **Study limitations**

Despite the methodological rigor used during instrument development and validation, one limitation of this study was that the instrument was applied to university hospitals and in a Finnish context. These limitations suggest that new

empirical studies be conducted in different contexts and cultures of clinical practice. Consistency between clinical nursing mentors and nursing students was not examined as each mentor evaluated himself or herself.

The low response rate (17 %) could be due to use of an electronic survey. The MCI was tested with a representative sample. All five Finnish university hospitals participated in the survey. Mentors varied in age and length of work experience, and the larger study sample met the sample size requirement of being more than five times the number of items (Pett *et al.* 2003). The MCI was designed to assess competence at mentoring students from the mentor's perspective, and the instrument was tested only by registered nurses, although other healthcare providers also mentor students in clinical practice.

## CONCLUSION

The MCI is a valuable tool for mentors' self-evaluation, to improve their competence at mentoring students. The tool has high content and face validity. Moreover, statistical tests indicate that its psychometric properties are good. The MCI requires further assessments of its reliability and validity in different contexts and cultures.

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Table 1. The mentors' demographic characteristics in the survey ( $n = 576$ ).

<i>Variables</i>		<i>n (%)</i>
Gender	Male	73 (13)
	Female	503 (87)
Age	$\leq 29$	97 (17)
	30–49	315 (55)
	$\geq 50$	164(28)
Work experience in health care in years	$< 11$	231 (40)
	11–20	171 (30)
	$> 20$	174 (30)
Workplace where students are mentored	Outpatient clinic	222 (39)
	Inpatient unit	306 (53)
	Other	48 (8)
Role of mentor	Named mentor	325 (56)
	Mentor	251 (44)
Mentor education	No education	354 (61)
	Education	222 (39)

Table 2. MCI exploratory factor analysis

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
During the evaluation, I guide the student in dealing with possible negative feelings.	0.876									
I encourage the student to remember his/her experiences as they happened and to evaluate them.	0.772									
I emphasize that the evaluation of one's own learning can bring forth new thoughts, feelings and performances that the student may not have previously been aware of.	0.753									
I encourage the student to evaluate the situation from many perspectives / to find alternative explanations for events.	0.751									
I ask the student to critically and holistically reflect upon why things happened the way they did.	0.735									
I encourage students to actively deal with their experiences during the entire clinical practice.	0.664									
I reflect upon which activities could be developed and how together with the student.	0.545									
I support the student in evaluating his or her own activities.	0.458									
I guide the student to question what is regarded as self-evident.	0.436									
I keep in touch regularly with the mentoring teacher responsible for the student's clinical practice.	0.407									
I find out if the student's learning goals are concrete enough so that in practical situations the student knows what his or her goals are and how to attain them.		0.895								
I find out whether or not the student's learning goals correspond with the learning opportunities provided at the place where the clinical practice is completed.		0.800								
I clarify to the student what is expected of him or her in order to reach the set goals.		0.743								
I find out if the student's learning goals are consistent with the goals of the programme curriculum for student development during clinical practice.		0.688								
I provide feedback to the student on the goals that he/she has set.		0.669								
I go through the goals and the fulfillment of these together with the student (for example in a mentoring session at the end of the clinical practice).		0.601								
I guide students in setting the goals that they want to achieve during the clinical practice.		0.521								
I encourage the student to follow the fulfillment of his or her goals independently.		0.443								
I contact the mentoring teacher only when problems arise with the student.		0.372								
I am aware of generally agreed practices for student mentoring within my organization.			0.893							
I am familiar with the tasks and responsibilities of the mentor.			0.759							
I follow generally agreed practices during student mentoring.			0.742							
I am well-acquainted with the mentoring process of students in clinical practice within my organization.			0.737							
I am familiar with the tasks and responsibilities of the person in charge of mentoring students.			0.622							
I am well-acquainted with the quality requirements and criteria relating to clinical practice and learning at work in social and health care.			0.595							
I encourage the student to share his or her experiences.				0.886						
I try to create a safe atmosphere during the reflection time.				0.883						
I relate empathetically to the student's experiences.				0.794						
During the reflection time, I aim to encourage reciprocal feedback with the student.				0.743						
I am aware that the student's experiences are unique and significant for his/her learning.				0.653						
I believe that discussion on the student's experiences improves his/her learning.				0.651						
I am empathetic towards students during mentoring.					0.749					
I am flexible during the mentoring of students.					0.732					
I am patient during the mentoring of students.					0.713					



[illegible]

## Highlights

What are the key findings?

- A mentor competence instrument (MCI) was developed to assess mentors' competence at mentoring nursing students in clinical practice.
- The MCI shows good estimates of the content and construct validity, and acceptable internal consistency, supporting its clinical use in nursing education.

## Phase 1: The development of the conceptual framework and item generation

Systematic  
literature review



Dimensions, 179 items:

- individual learning objectives
- core elements of nursing
- learning processes
- reciprocal and trusting relationship
- feedback
- evaluation
- cooperate with stakeholders
- qualities of the mentor

## Phase 2: Judgment quantification

Expert panel  
(n = 6)



Face and content validity index (CVI)  $\geq 0.94$

177 items

## Phase 3. Testing the construct validity and reliability of the instrument

Pilot study



Construct validity result

The 13-factor model of aspects of mentor competence that were identified and confirmed:

- Mentoring practices in the workplace (6 items)
- Mentoring practices between the student, teacher and mentor (7 items)
- Mentor characteristics (10 items)
- Identifying the student's level of competence (6 items)
- The motivation of the mentor (3 items)
- Motivating the student (5 items)
- Supporting the learning process of the student (8 items)
- Goal orientation in mentoring 1. (5 items)
- Goal orientation in mentoring 2. (5 items)
- The style of learning (4 items)
- Reflection during mentoring (12 items)
- Student-centered feedback and evaluation (7 items)
- Constructive feedback and evaluation (7 items)

85 items

Internal consistency:  
Cronbach's alpha 0.77–0.92

Study



Construct validity result

The 10-factor model of aspects of mentor competence that were identified and confirmed:

- Student-centered/ reflective evaluation (10 items)
- Goal orientation in mentoring (9 items)
- Mentoring practices in the workplace (6 items)
- Reflection during mentoring (6 items)
- The characteristics of the mentor (7 items)
- Supporting students' learning process (8 items)
- The motivation of the mentor (5 items)
- Identifying the student's level of competence (4 items)
- Constructive feedback and evaluation (4 items)
- Mentoring practices in the workplace (4 items)

Eigenvalues 1.179 to 20.192

Factor loading 0.340 to 0.895

63 items

Internal consistency:  
Cronbach's alpha 0.76–0.90

Figure 1