

# Designing and Psychometrics of Teacher–Student Relationship Questionnaire in Health Sciences: An Exploratory Mixed Study

## Abstract

**Background:** The teacher–student relationship is the basis of education. Assessment of this relationship requires the use of a valid instrument. This study was conducted to design psychometrics features of Teacher–Student Relationship Questionnaire in Health Sciences (TSRQ-HS). **Materials and Methods:** This exploratory study was carried out in two distinct phases. In the initial stage (qualitative phase), we established the framework for the teacher–student relationship by using 22 individual interviews with teachers and students. This was achieved through conventional content analysis. Subsequently, the quantitative phase, as the second stage, focused on evaluating the psychometric attributes of the questionnaire. This encompassed an assessment of face, content, and construct validity, as well as internal consistency and homogeneity. **Results:** The initial pool of items included a total of 121 entries, while the final scale was refined to encompass 31 items. The S-CVI/Ave, which is the average content validity index for the questionnaire, was determined to be 0.93; it was observed that item factor loadings through exploratory factor analysis ranged from 0.22 to 0.94 ( $\chi^2_{465} = 9568.15, p < 0.001$ ). Subsequently, five items were excluded, and the three dimensions established in the primary questionnaire were confirmed. The comprehensive intraclass correlation coefficient of the instrument was 0.97. The reliability of the instrument was evaluated regarding internal homogeneity, revealing a Cronbach’s alpha value of 0.96 for the entire instrument. **Conclusions:** The findings indicated that the newly developed questionnaire designed to evaluate the teacher–student relationship had a satisfactory level of reliability and validity. Educational administrators are recommended to utilize this instrument.

**Keywords:** Psychometrics, questionnaire, relationship, student, teacher

## Introduction

Strong teacher–student relationships may be one of the most important factors in the students’ success. A certain level of collegial and social closeness between teachers and students helps to acculturate the students into their professional community.<sup>[1]</sup> Health sciences education accounts for training people with necessary professional competence to enable them to meet the healthcare and treatment expectations of their society.<sup>[2]</sup> Numerous studies have thus far underscored the significance and impact stemming from a constructive rapport between educators and students. These studies have pointed out that a constructive educational relationship can lead to promoting inclusive growth and development, creating a better learning environment, causing a more positive academic attitude and more satisfaction

in students, and reducing disciplinary difficulties.<sup>[2,3]</sup> The teacher–student relationship in health sciences is unique and special, and this uniqueness comes from the fact that this relationship is formed and developed with a special objective, in a special context, between special people and with specific results.<sup>[4]</sup> One of the main factors that have qualified health sciences based on the nature of these professions is the fact that in health sciences education, besides theoretical education, there is also a complex and valuable part of clinical education.<sup>[5]</sup> Clinical education has a great deal of complexity and is affected by many factors. The setting of clinical education is uncontrollable and unstable and has many differences with the classical theory classrooms.<sup>[6]</sup>

The results of various studies show that health sciences education is facing

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insufficient knowledge regarding the teacher–student relationship.<sup>[5,7]</sup> Students talk about emotional support and the desire for closer and more intimate communication from professors to help them learn clinical skills in stressful therapeutic environments.<sup>[8]</sup> Health sciences education has a different background from other sciences, and it is necessary to consider the quality of teacher–student relationship in the process of professionalization and socialization.<sup>[4]</sup> Although the quality of the teacher–student relationship, especially in health sciences, is emphasized as a problem by everyone, its assessment has been sufficiently considered.<sup>[9]</sup> Perhaps, one of the reasons for disregarding this important issue has been the unavailability of an appropriate instrument. Also, the experience of the researcher, as a teacher with years of teaching experience in the university, also showed that the teacher–student relationship was not at an acceptable level, and this problem can cause the wasting of time and energy of teachers and students and delaying the achievement of educational goals. All the above points indicate the importance of the teacher–student relationship in health sciences and lack of studies in this field, especially in the cultural context of Iran; therefore, in order to strengthen and fill the existing theoretical and practical gap in knowledge, the researchers decided to conduct a mixed study for designing the psychometric features of the teacher–student relationship questionnaire in health sciences in Iran.

## Materials and Methods

In the present study, which is a part of the PhD research project, we used a sequential exploratory mixed-method design of instrument development model; the study was conducted at Shiraz University of Medical Sciences in Shiraz, Iran, from 2019 to 2021. This design comprises two distinct phases: a qualitative and a quantitative one. During the qualitative phase, the investigation delved into the concept of the teacher–student relationship within health science. This exploration focused on the perspectives of both teachers and students, as well as insights gleaned from the existing literature; the required data for analysis were obtained from medical education Index, ProQuest, and Ovid databases. Subsequently, the initial items comprising the Teacher–Student Relationship Questionnaire in Health Sciences (TSRQ-HS) were formulated. Then, the quantitative phase started. The authors employed the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) framework for evaluating the psychometric features of the TSRQ-HS.<sup>[10]</sup>

In the qualitative phase, data collection consisted of a combination of both inductive and deductive methods, encompassing individual in-depth semistructured interviews with key informants, including students and educators, focus group interviews with students, and the extraction of codes from both interviews and literature review. The field notes were also used to record and document observations. Once the authors conducted and transcribed the interviews, they

initiated the data analysis process using conventional content analysis, following the Grameim and Lundman model.<sup>[11]</sup> Subsequently, the codes extracted from meaningful units were subjected to comparison and categorization, based on their conceptual similarities and distinctions. These codes were then organized into subcategories, with focus on interrelationships. These identified main categories and subcategories served as the foundation for constructing the initial item pool for the TSRQ-HS. In addition, to ensure the trustworthiness and rigor of the data during this phase of the study, we confirmed four key principles, including credibility, transferability, dependability, and confirmability, as commonly applied in qualitative researches.<sup>[12]</sup> Eligible participants were 11 teachers and 11 students of various fields (medicine, nursing, dentistry, pharmacy, etc.), who were teaching or studying at Shiraz University of Medical Sciences. In qualitative studies, the sample size is not predetermined but is instead determined by the point of data saturation. Data saturation occurs when the process of data collection reaches a point where no new or additional insights or findings emerge.<sup>[13]</sup> In this study, purposive sampling was done among the key informants who met the inclusion criteria. 22 initial individual interviews and 2 additional interviews ( $n = 24$ ) were conducted until we reached data saturation. The diversity in the selection of participants increased the reliability and confirmability of the data. Also, two focus group interviews, each with 6 subjects ( $n = 12$  in total), were conducted with students. The inclusion criterion was the participants' willingness to take part in the study. For teachers, a minimum teaching experience of 1 year at the university level was required, while students needed to have completed at least one semester of study at the university. Exclusion criteria included teachers and students who were unwilling to continue cooperation during the study.

In the quantitative phase, the primary emphasis lied on evaluating the psychometric attributes of the TSRQ-HS. The assessment covered multiple aspects: reliability and face, content, and construct validity. A total of 15 participants including students, teachers, and experts in education and instrument development were engaged in face-to-face interviews to establish the qualitative face validity. Following the confirmation of qualitative face validity, the quantitative face validity was further substantiated using the item impact method.<sup>[14]</sup> Content validity was tested through qualitative and quantitative approaches.<sup>[15]</sup> In the qualitative content review, the questionnaire items were provided to a panel of 15 experts. Three metrics, including Content Validity Ratio (CVR), Content Validity Index (CVI), and Scale-Level Content Validity Index (S-CVI/Ave), were utilized to confirm the quantitative content validity.<sup>[16]</sup> Data were gathered from 15 experts to compute the CVR. Whether an item met the requisite numerical threshold for inclusion was determined using the Lawshe table.<sup>[17]</sup> The method of Waltz and Bausell was used for CVI. Hence,

a group of 15 experts assessed the pertinence, lucidity, and simplicity of each item using a 4-point Likert scale. In addition, for CVI, Cohen's kappa coefficient was also measured due to the possibility of chance agreement. Kappa coefficient provides an index of agreement between evaluators regarding the relevance of the item. A Kappa coefficient exceeding 0.75 is classified as excellent, while a range between 0.6 and 0.74 is regarded as good, and a value below 0.59 is considered poor. Furthermore, the authors computed the Scale Content Validity Ratio (S-CVI) by averaging the individual CVI scores of the items. The CVI of the instrument was determined using two methods: the Scale-Level Content Validity Index-Universal Agreement calculation and the Scale-Level Content Validity Index-Averaging calculation (S-CVI/Ave). Polit and Beck have recommended a score higher than 0.9 in both cases to accept CVI.<sup>[18]</sup> The exploratory factor analysis assessed the construct validity of TSRQ-HS. Prior to conducting the factor analysis, an item analysis was carried out.<sup>[17]</sup> The sample size for construct validity is considered to be  $n = 5-10$  for each item. In this study,  $n = 10$  per item and a total of  $n = 360$  participated. The stratified sampling method was utilized to ensure the selection of students who displayed an interest in participation.<sup>[19]</sup> The authors conducted the exploratory factor analysis to uncover the underlying latent constructs within TSRQ-HS. The suitability of the sample was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity.<sup>[20]</sup> Promax Rotation was used to make the factors of the questionnaire simpler and more interpretable. A factor loading threshold of 0.4 or higher was established for the analysis. Consequently, items with communalities below 0.4 were excluded from the factor analysis.<sup>[21]</sup> Also, the authors used measures of internal consistency and stability to examine the reliability of the instrument. Cronbach's alpha coefficient was employed to gauge the internal consistency.<sup>[22]</sup> The feasibility and the floor and ceiling effects of TSRQ-HS were assessed.<sup>[23]</sup> SPSS version 16 (SPSS Inc. Chicago, IL, USA version 16) was used to analyze the data.

### **Ethical considerations**

This research was supported by the Vice Chancellor for Research, Shiraz University of Medical Sciences, and Shiraz, Iran. After full explanations about the research and its confidentiality, written informed consent was obtained from the participants (IR.SUMS.REC.1398.529).

## **Results**

### **Qualitative phase**

First, the concept of teacher-student relationship in health sciences was defined by conducting in-depth and semistructured individual and group interviews as well as by reviewing the literature. The questionnaire contained 121 items, which reached 145 items based on

the literature review. Through a series of meetings and expert consultations, specific items were either removed or combined based on their feedback. This iterative process led to a reduction in the number of items, initially to 91, and eventually further down to 51 items.

### **Quantitative phase**

#### *Psychometric properties (COSMIN)*

In the qualitative face validity, out of 51 items, 14 had editorial changes, and the questionnaire entered the quantitative face validity stage with the initial 51 items.

Every item obtained an impact score over 1.5, signifying their suitability for subsequent analysis. In terms of qualitative content validity, expert opinions were considered, and items sharing similar content were consolidated into single items. After the modifications were done, a questionnaire with 48 items was left. In the next step, CVR was calculated. The obtained results were compared based on Lawshe table for determining the numerical value, and the items that had the minimum value were kept. Four items could not get the necessary numerical value, so they were excluded, and the items were reduced from 48 items to 44 items. The calculation results of CVI showed that 15 items had changes in terms of simplicity and clarity, and 15 items were merged. Consequently, the total number of items was reduced from 44 to 36. Furthermore, the percentage of agreed scores regarding the relevance of the item was used to compute the CVI of each item. For the relevance, all items had CVI of 0.79, which was acceptable. In this study, the Kappa coefficient was computed for each individual item. The findings indicated that the Kappa coefficient for every item exceeded the threshold of 0.75, which is in the excellent category. Therefore, no item was excluded. The mean scores of the CVI of the items were considered as the total S-CVI/Ave. At this stage, the total S-CVI in the form of AVE was equal to 0.93, which was placed in the excellent category. Subsequently, the authors employed the exploratory factor analysis to evaluate the construct validity of the questionnaire. For the normality of the items, maximum likelihood extraction, KMO test, Bartlett's sphericity test, and Promax rotation were used. At this point, the KMO test yielded a sampling adequacy measure of 0.968, which was deemed satisfactory and validated. The outcomes of Bartlett's sphericity test yielded a significant Chi-square value of 9568.155 with 465 degrees of freedom, revealing significance at the 0.001 alpha level. The obtained statistical results and the correlation matrix derived from the examined sample confirmed that the factor analysis was suitable. Furthermore, the communalities table for the items revealed that all items, except for two, yielded scores over 0.5. According to the research team, these two items were kept due to the necessity of the items for the next stages. The scree plot was also employed to ascertain the extracted factors. This graphical representation indicated that a significant portion

of the variance was accounted by the first factor; while starting from the third factor onward, the plot exhibited a nearly level pattern [Figure 1]. Consequently, a decision was made to restrict the number of factors to three, and factor analysis was conducted to explore the constructs and items within this framework.

The application of factor analysis resulted in identification of three distinct factors within TSRQ-HS, collectively explaining 62.35% of the variance. In this research, exploratory factor analysis established the factors in the questionnaire, considering primary eigenvalues above one and a minimum factor loading of 0.4. During this phase, five items (items 12, 13, 27, 34, 36) failed to meet the minimum factor loading criterion and were consequently eliminated, leaving 31 items for further analysis. The exploratory factor analysis indicated the factor loading values of the items ranged from 0.22 to 0.94, with the three key dimensions originally proposed in the main instrument being validated with satisfactory values. Ultimately, the thematic content of the items was used to label the three factors. The first factor is called “adherence to moral values” (16 items), the second factor is referred to as “trust-based communication strategies” (7 items), and the third factor is named the “crystallization of purposeful relationships” (8 items). Table 1 displays the factor loading for each dimension following the application of the Promax rotation.

### Reliability (internal homogeneity, internal consistency)

The results of internal homogeneity showed that the total Cronbach’s alpha coefficient of the questionnaire subscales with a sample consisting of 360 subjects was higher than 0.7, which was acceptable, showing that the questionnaire had an acceptable reliability. Also, the results of the split-half reliability to calculate internal homogeneity showed that

the correlation coefficient between even and odd-numbered questions was 0.96, signifying strong internal homogeneity within the questionnaire. The findings of the test–retest assessment, which aimed at measuring the stability of the questionnaire, revealed that the intraclass correlation coefficient (ICC) for the entire questionnaire between the

two test instances was 0.97. This result was statistically significant ( $p < 0.001$ ) [Table 2].

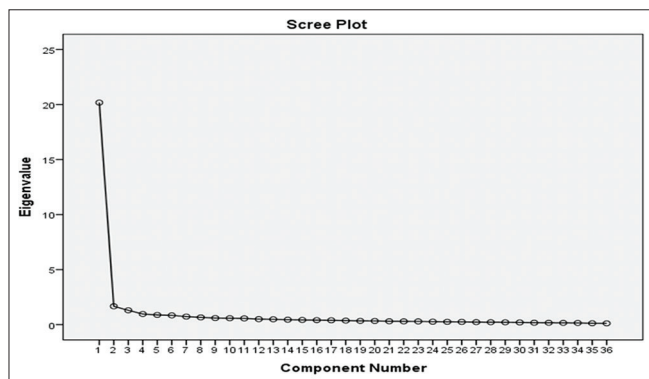
**Table 1: Rotated Component Matrix of items**

Items	Factors		
	1	2	3
Q7	0.84		
Q1	0.84		
Q2	0.83		
Q9	0.78		
Q8	0.75		
Q3	0.69		
Q10	0.62		
Q4	0.60		
Q5	0.58		
Q11	0.55		
Q18	0.54		
Q17	0.52		
Q15	0.52		
Q14	0.47		
Q19	0.45		
Q6	0.44		
Q12	0.32		
Q13	0.22		
Q22		0.90	
Q21		0.87	
Q16		0.74	
Q24		0.63	
Q23		0.62	
Q25		0.60	
Q20		0.57	
Q27		0.34	
Q29			0.94
Q30			0.92
Q33			0.78
Q31			0.59
Q35			0.54
Q32			0.48
Q26			0.47
Q28			0.42
Q34			0.32
Q36			0.22

**Table 2: The score and the Intraclass Correlation Coefficient (ICC) values of teacher–student relationship scale dimensions**

Factor	Dimensions	ICC*	Confidence interval	$p$
1	Adherence to moral values	0.98	0.95-0.99	$p < 0.001$
2	Trust-based relationship strategies	0.96	0.93-0.98	$p < 0.001$
3	Crystallization of purposeful relationship	0.97	0.96-0.97	$p < 0.001$
Total		0.97	0.96-0.97	$p < 0.001$

\*Intraclass Correlation Coefficient



**Figure 1: The factor analysis scree plot**

## Feasibility

The average time taken to complete the questionnaire by students was between 3 and 5 minutes (4 minutes on average). Also, the rate of not answering the items was determined to be 3%, and this is acceptable.

## Floor and the ceiling effects

The current study findings, involving a sample size of  $n = 360$ , indicated that both the ceiling and floor effect scores were below 15% for each of the subscales as well as for the overall tool.

## Scoring system

The final form of TSRQ-HS has 31 items. The maximum score of the questionnaire was 186, and the minimum score was 31. Responses were evaluated using a 6-point Likert scale, ranging from “completely agree” (6) to “completely disagree” (1), with intermediary points including “somewhat agree” (5), “slightly agree” (4), “slightly disagree” (3), “somewhat disagree” (2), and completely disagree (1) [Table 3].

## Discussion

Based on the results of the qualitative phase, the teacher–student relationship of health sciences is said to be a relationship in which the parties, while adhering to moral values, try to reach a relationship based on trust and comprehensive educational, social, and emotional goals, especially in complex clinical environments. On this basis, the main objective of this study was to design the teacher–student relationship questionnaire on the teacher–student relationship in three fields of adherence to moral values (16 items), trust-based communication strategies (7 items), and crystallization of purposeful relationships (8 items). The validation process for the current questionnaire has demonstrated favorable reliability and face, content, and construct validity. As a result, this questionnaire effectively measures the quality of the teacher–student relationship, particularly from the perspective of the students. The relationship strategy based on trust was one of the main and important themes of teacher–student relationship in clinical environments; this was emphasized and considered by most of the participants as a manifestation of effective communication. If the student and teacher trust each other, clinical errors can be corrected better, and the transfer of clinical knowledge and skills will happen through verbal and nonverbal communication in the presence of the patient and others. In other studies, in the questionnaires evaluating teacher–student relationship, relationship in clinical settings was less considered. This aspect stands out as a notable strength of the current questionnaire compared to similar instruments. Another significant theme that emerged from the participants’ experiences was the crystallization of purposeful relationships; that is, strengthening the student’s self-confidence through a calm and encouraging

atmosphere in order to learn the procedures in high-stress clinical environments is a necessity for professionalization of a health sciences student. Strengthening the student’s self-confidence through cooperative teaching methods can help the student’s sustainable and effective learning.<sup>[24,25]</sup> However, the importance of this issue in clinical environments and its measurement has not been addressed. This aspect represents a key strength of the current questionnaire, which was thoroughly examined in this study. One of the indicators of crystallization of the purposeful relationship between the teacher and health sciences student was the effective clinical communication that the participants had experienced; if the relationship was accompanied by intimacy, compassion, and kindness, and the communication was accompanied by respect and trust between the teacher, student, clinical personnel, and patient, hopefully, the learning of clinical skills will be more effective and the student’s motivation to learn will increase. This issue was less investigated in other studies, especially in clinical environments, and this is one of the strengths of the present study, which was investigated using this questionnaire.

In literature review, no instrument that measures the quality of teacher–student relationship, especially in the field of health sciences and in the cultural context of Iran, was found. Therefore, relatively similar studies in the field of teacher–student relationship were reviewed.

Rahbar *et al.* (2014) designed factors of the teacher–student relationship from the perspective of students of health sciences. Face and content validities of the questionnaire were assessed, while exploratory and confirmatory factor analyses were used to confirm the construct validity. For establishing reliability, calculations were performed for Cronbach’s alpha coefficient and intraclass correlation coefficient. It is noteworthy that the questionnaire developed by Rahbar *et al.*<sup>[26]</sup> was employed to extract the influential factors on the teacher–student relationship. However, the current research has designed a tool to measure the quality of the teacher–student relationship, which was developed through observations and interviews with maximum diversity in educational groups, students, and teachers; then, psychometric features were investigated.

Rehim quoted by Klakovich,<sup>[27]</sup> the Interpersonal Communication Assessment Scale (ICAS) was designed and tested. This tool measures interpersonal communication skills of nursing students by teachers. A noteworthy similarity between the current study and the study carried out by Klakovich *et al.* (2005)<sup>[27]</sup> is data collection from multiple sources. In the mentioned study, data were gathered from three distinct sources (students, faculty members, and nursing managers), a feature that contributes to the robustness of their investigation and is regarded as a strength of their study. Data collection through multiple sources increases the validity of the data. A study by

**Table 3: The final version of the teacher–student relationship questionnaire (31 items)**

Item	Completely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Completely disagree
1. The teacher calmly answers my questions						
2. The teacher is open to criticism						
3. The teacher is available to answer my questions						
4. The teacher feels responsible for my educational problems						
5. Morally, the teacher is a good role model for me						
6. The teacher discriminates against the students						
7. The teacher treats me with respect						
8. The teacher has flexible behavior						
9. The teacher is good-natured						
10. The teacher has a humble behavior						
11. The teacher’s relationship with me is friendly						
12. The teacher creates a safe and comfortable atmosphere to communicate with me						
13. The teacher welcomes my interaction						
14. The teacher’s expectations from me are clear and reasonable						
15. The teacher’s behavior with me is honest						
16. When the teacher does not know the answer to a question, he honestly says he does not know						
17. The teacher has a suitable expression technique						
18. The teacher keeps my personal information confidential						
19. The teacher uses nonverbal communication methods such as eye contact and facial expression during communication						
20. The teacher has a good appearance						
21. The teacher strives for the professional advancement of himself and his students						
22. The teacher puts her educational and clinical experiences at my disposal.						
23. The teacher encourages me to apply what I have learned						
24. The teacher uses new teaching methods such as problem solving and critical thinking to better convey educational materials						
25. The teacher provides me with new learning opportunities in different educational environments.						
26. The teacher helps my inclusive (emotional and cultural-social) development						
27. When dealing with problems, especially in clinical environments, I feel the teacher as a source of support by my side.						
28. The teacher cares about my opinions						
29. My progress is important to the teacher						
30. I can share my emotions and feelings freely with the teacher						
31. The teacher’s behavior is such that it strengthens my self-confidence						

Klakovich *et al.* (2005)<sup>[27]</sup> has many strengths. For the items, two analogical and inductive methods were used. Thus, the target group was also involved in the items. On the other hand, the steps of validity and reliability of the tool were well explained, which helps to increase the reliability of the tool. However, there exists a distinction between the objective of the current study and that of Klakovich *et al.* (2005).<sup>[27]</sup> The present study developed a comprehensive instrument for evaluating the quality of teacher–student relationships, specifically from the students’ viewpoint, delving deeply into this aspect.<sup>[27]</sup> In this pursuit, the questionnaire items were made based on

insights derived from teachers and students, as well as extensive literature review, ensuring the pertinence of each item. This approach utilized a combination of inductive and deductive methodologies. Additionally, the entire spectrum of psychometric properties of the newly devised instrument underwent thorough testing and evaluation. Therefore, the findings of this study can serve as an introduction for researchers all over the world; the tool is used to identify the relationship needs of teachers and students in order to improve the effective teacher–student relationship in health sciences. A limitation of this study was that the survey took place during the Covid-19 period, and the social distancing

measures induced barriers to access to the participants. Another limitation about the samples is that we had a few volunteers for the interviews of the qualitative part.

## Conclusion

The questionnaire provided in this study has 31 items that are prepared to measure the quality of the teacher–student relationship in health sciences. Having an appropriate number of items, being easy to use, having convenient scoring, and having simple questions and acceptable validity and reliability are considered as the most important advantages of this questionnaire. The present study identifies the dimensions of the concept of student–professor communication and reminds the experts to teach the components of communication (moral values, trust-based communication, and crystallization of purposeful communication) to students and professors in the form of workshops and training courses.

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## Conflicts of interest

Nothing to declare.

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