Development and Validation of an Instrument for Assessing Perceived Competences in Didactic Activity

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In the context of teacher competences’ association with student performance, assessment of didactic competences is an important concern for educational professionals. The current study aims to develop and validate a tool for assessing perceived competences in didactic activity for a group of Romanian teachers. The study examined 160 teachers from 15 schools in Bucharest, Romania, aged 20-60 years old. In the process of development and validation of the instrument (Assessment of perceived competences in didactic activity), the recommended steps were followed. Exploratory factorial analysis indicated the existence of three factors: effective communication of the teacher, development of students’ critical thinking, and use of auxiliary resources. Reliability analysis showed high reliability coefficients, indicating good psychometric qualities of the scale. The correlations between the three factors were high, so the scale has acceptable convergent validity. Confirmatory factor analysis showed that the three factor model has indicators of good fit, also indicating good psychometric properties. The main practical implication is that the proposed instrument can be successfully used in identifying development needs of teachers resulting from the evaluation process. Based on the results derived from self-assessment of teaching competencies, customized professional development programs can be created for each teacher, aiming at developing skills and, implicitly, improving performance at the workplace.

Keywords: perceived competences in didactic activity, effective communication, development of students’ critical thinking, use of auxiliary resources

Introduction

Didactic Competence—Conceptualization and Operationalization

In order to capture the characteristics that a performant teacher should have, a number of hypotheses have been advanced. Kennedy, Ahn, and Choi (2008) generally referred to it as a person with high cognitive abilities, who enter the profession with the necessary intellectual potential to effectively adapt to the complexity and challenges of the educational environment during the teaching process. This hypothesis emphasizes the importance of a well-established recruitment and selection system, based essentially on identifying intelligent candidates, rather than on a continuous formal teacher training process (Kunter et al., 2013). However, the studies conducted so far on the relationship between the cognitive abilities of teachers and the performance of students, although reduced in number, have generated inconsistent results (Kuncel, Hezlett, & Ones, 2004;
Another hypothesis states that a competent teacher should essentially possess the specific knowledge of his profession (Shulman, 1987); precisely, for an efficient teaching process, he should have three types of knowledge: content information of the taught subject (a good mastery of matter content), pedagogical knowledge specific to the object of study, that is, those knowledge that facilitates assimilation (Krauss et al., 2008), and general or non-specific pedagogical knowledge, of a psychological nature, involving the necessary knowledge for any teacher to optimize the process and the learning environment (Voss, Kunter, & Baumert, 2011).

A large number of studies support the importance of appropriate teacher training (Andersson, Johansson, & Waldenström, 2011; Chu et al., 2015). However, the extent to which teachers’ qualification influences the assimilation of knowledge among students is often dependent on the way in which their level of expertise is determined; for example, Chu et al. (2015) showed that only the advanced degree of the teacher, not the awards or his educational level, predicts the quality of the teaching process and student performance.

Although important in predicting teacher performance, this hypothesis does not take into account all the factors that operationalize didactic competence. Goodman, Arbona, and Dominguez de Rameriz (2008), using an instrument that measures the individual characteristics of teachers, showed that these variables are significant predictors of professional competence.

In this context, Kunter et al. (2013) proposed and tested a third hypothesis, called the professional competence hypothesis, to explain the differences in teacher performance. The results showed that the teachers’ enthusiasm, the pedagogical knowledge specific to the subject of study, and the constructivist approach to the teaching process predict a higher level of school purchases among students. Moreover, they influence not only knowledge itself, but also their motivation, and the effects on student performance are mediated by the quality of the teaching process. Contrary to the first hypothesis presented, Kunter et al. (2013) did not find significant effects of general cognitive ability on the quality of the teaching process.

Tigelaar, Dolmans, Wolfhagen, and Van Der Vleuten (2004) proposed and validated a theoretical model of teacher competence in the academic environment. Using the Delphi method and factorial analysis, they identified a series of features grouped into five factors that characterize the competent teacher; precisely, he must have a good knowledge of the material; he must be empathetic towards students, a good facilitator of the learning process (by stimulating, counseling, and evaluating students), a good organizer (relative to colleagues), and a flexible professional, willing to constantly develop himself. Thus, the authors defined teaching competence as “an integrated set of personal characteristics, knowledge, skills and attitudes necessary for good performance in different teaching contexts” (p. 255).

**Assessment of Didactic Competence**

The assessment of didactic competence is of major importance in determining the efficiency of the educational process, and in identifying the potential problems requiring intervention and of those areas that can be improved in teacher performance (Drovnikov et al., 2016). In this context, developing instruments becomes a real challenge.

**Objective sources of assessment of didactic competence.** A number of studies have used as indicators of teachers’ competence objective sources, such as years of education, the institution in which they were formed, years of experience or certificates obtained, the results being generally mixed (Buddin & Zamarro, 2009;
Andersson et al., 2011; Johansson, Myrberg, & Rosen, 2015). These instruments only partially capture didactic competence and reflect rather the traditional approach, which places the teacher in the center of the educational process. Important components that define student-centered modern approach, such as respect, the interest in developing and guiding him, creating an attractive learning environment, and the individual characteristics of the teacher, can only be measured by subjective instruments, competence being evaluated either by students or by teachers themselves (Bhargava & Pathy, 2011; Tigelaar et al., 2004).

**Assessment of teaching competence by students.** Most instruments of this type include a set of items that refer to the behaviors, attitudes, and knowledge of the teachers, evaluated by students and based on their classroom performance (Goodboy & Bolkan, 2009; Kunter et al., 2013; Moreno-Murcia, Torregrosa, & Pedro, 2015). Although widely used, the psychometric properties of these instruments have rarely been presented; this problem is even greater as, frequently, the information obtained on the basis of student evaluations leads to important decisions in the educational environment (Simpson & Siguaw, 2000).

Despite these limitations, these instruments proved to be useful in predicting some criteria. For example, Kornell and Hausman (2016) showed that teachers evaluated as competent by students better determine a short-term performance among them, while teachers evaluated as less competent seem more effective in the acquisition of knowledge by long-term trained students.

**Self-assessment of teaching competences.** Ross and Bruce (2007) argue that self-assessment involves three important processes: observations on didactic practice, compared to subjective standards of success; judgments on the extent to which practice is reflected in pupils’ outcomes and acquisition; and the reactions that the two processes generate, which can be represented by satisfaction or dissatisfaction with the teaching process and their own abilities. Self-assessments are not based solely on one’s own standards and beliefs, but involve assimilation of external feedback sources, such as colleagues (Ross & Bruce, 2007).

Various evaluation tools have been developed: Borg and Edmert (2018) developed a self-evaluation tool for English teachers with nine dimensions of didactic competence (lesson planning, lesson management, empathy towards students, knowledge of the subject matter, resource management, student acquisition assessment, the use of technology in teaching practice, the use of inclusive practices and the encouragement of critical thinking, leadership, digital literacy and citizenship); Schiefele, Streblow, and Retelsdorf (2013) have developed a tool that measures the interests of teachers as a dimension of didactic competence (educational, didactic and interest in the subject taught); Schmidt et al. (2009) developed a self-assessment tool for teachers’ technical skills (technical knowledge, technical knowledge of content, pedagogical technical knowledge); testing the factorial structure of a self-evaluation tool of emotional intelligence, developed by Schutte et al. (1998), Chan (2004) identified four factors: empathic sensitivity, positive emotional self-regulation, the use of positive emotions, and awareness and assessment of one’s own emotions.

Self-evaluation tools have certain limitations, the most important being the lack of accuracy of self-evaluation. Studies show that, regardless of profession, people tend to overestimate their professional performance, especially under certain conditions (for example, when they are very confident in their own competence, when their professional skills are low, or when they are dealing with familiar tasks; Fitzgerald, White, & Gruppen, 2003; Dunning, Heath, & Suls, 2004; Davis et al., 2006). One of the most plausible explanations is the so-called Dunning-Kruger effect, which states that people are more likely to overestimate their knowledge, the less prepared they are (Kruger & Dunning, 1999). The effect has major implications, not only because it leads people to make mistakes due to low skills, but prevents them from recognizing and
correcting these mistakes. Solutions seem to be increase training (Schlosser, Dunning, Johnson, & Kruger, 2013) clearly defining the dimensions that people need evaluate, and a good understanding of the instrument (Andrade & Valtcheva, 2009).

**Objective**

The current study aims to develop and validate a tool for assessing perceived competences in didactic activity for a group of Romanian teachers.

**Method**

**Participants and Procedure**

The study examined 160 ($M = 40.58, SD = 9.26$) teachers from 15 schools in Bucharest, aged 20-60 years old, teaching for primary schools/classes 0-IV (54—33.8%), secondary (35—21.9%), high school (54—33.8%), secondary & high school (16—10.0%), and primary, secondary, & high school (1—0.6%). Prior to recruiting participants, consent has been obtained from the school principal where the teacher was employed. The questionnaire was administered in pencil-paper format, between November and December 2015. Before completing the questionnaire, the participants agreed to participate in the research. Completion lasted an average of 15 minutes for each participant.

**Instruments**

*Assessment of perceived competences in didactic activity.* In the process of development and validation of this instrument, the recommended steps were followed: investigation of substantive validity, and of structural and external validity (Simms & Watson, 2007). Based on the conceptualization of perceived competences in didactic activity mentioned before, 22 items have been developed, in the original version of the instrument. The final conceptual model comprised three dimensions: effective communication (four items), development of students’ critical thinking (four items), and use of auxiliary resources (three items). There were five versions of response for each item ($1 = $strong disagreement$, 5 = $strong agreement$). The overall score is obtained by summing the scores of the three dimensions.

**Results**

*Descriptive Data*

For the first item (“I have the ability to come up with new and different ideas while teaching lessons”), the participants obtained scores ranging from a minimum of 2 to a maximum of 5, with an average of 4.14 and a standard deviation of 0.77; for the second item (“I encourage students to think about new ways of solving tasks”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 4.17 and a standard deviation of 0.85; for the 3rd item (“When teaching the lesson, I use different auxiliary resources”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 4.05 and a standard deviation of 0.87; for the 4th item (“When teaching the lesson, I provide intuitive examples to students”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 4.25 and a standard deviation of 0.86; for the 5th item (“When teaching the lesson, I often use interaction with students”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 4.09 and a standard deviation of 1.22; for the 6th item (“Throughout the teaching experience there have been situations where a topic discussed with a student has become a topic in the syllabus”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 2.90 and a standard
deviation of 1.17; for the 7th item (“I use modern means of communication to get new information about a particular subject”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 4.06 and a standard deviation of 0.93; for the 8th item (“I use video equipment or other technical equipment in teaching lessons”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 3.58 and a standard deviation of 1.12; for the 9th item (“I use short “stories” to show students the usefulness of the information delivered”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 3.91 and a standard deviation of 0.88; for the 10th item (“I guide the students to analyze the implications of the answers they provide”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 3.98 and a standard deviation of 0.85; for the 11th item (“I use the sense of humor to overcome the unpleasant situations that appear in the classroom”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 4.05 and a standard deviation of 0.92; for the 12th item (“For most lessons, I write to the blackboard or I dictate to students the information to be learned”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 3.31 and a standard deviation of 1.15; for the 13th item (“I encouraged students to seek new information on the subject discussed in class”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 3.98 and a standard deviation of 0.82; for the 14th item (“The homeworks that I give to students involve their critical analysis”), the scores ranged from a minimum of 1 to a maximum of 5, with an average of 3.48 and a standard deviation of 0.97; for the 15th item (“During teaching I aim to develop students’ critical thinking”), the scores ranged from a minimum of 2 to a maximum of 5, with an average of 3.88 and a standard deviation of 1.01.

Table 1

| Item Description                                                                 | N   | Minimum | Maximum | Mean   | Standard deviation |
|---------------------------------------------------------------------------------|-----|---------|---------|--------|--------------------|
| 1. I have the ability to come up with new and different ideas while teaching lessons. | 160 | 2.00    | 5.00    | 4.14   | 0.77               |
| 2. I encourage students to think about new ways of solving tasks.               | 160 | 1.00    | 5.00    | 4.17   | 0.85               |
| 3. When teaching the lesson, I use different auxiliary resources.              | 160 | 2.00    | 5.00    | 4.05   | 0.87               |
| 4. When teaching the lesson, I provide intuitive examples to students.         | 160 | 1.00    | 5.00    | 4.25   | 0.86               |
| 5. When teaching the lesson, I often use interaction with students.            | 160 | 1.00    | 5.00    | 4.09   | 1.22               |
| 6. Throughout the teaching experience there have been situations               | 160 | 1.00    | 5.00    | 2.90   | 1.17               |
| where a topic discussed with a student has become a topic in the syllabus.     |     |         |         |        |                    |
| 7. I use modern means of communication to get new information about a particular subject. | 160 | 2.00    | 5.00    | 4.06   | 0.93               |
| 8. I use video equipment or other technical equipment in teaching lessons.     | 160 | 1.00    | 5.00    | 3.58   | 1.12               |
| 9. I use short “stories” to show students the usefulness of the information delivered. | 160 | 2.00    | 5.00    | 3.91   | 0.88               |
| 10. I guide the students to analyze the implications of the answers they provide. | 160 | 2.00    | 5.00    | 3.98   | 0.85               |
| 11. I use the sense of humor to overcome the unpleasant situations that appear in the classroom. | 160 | 2.00    | 5.00    | 4.05   | 0.92               |
| 12. For most lessons, I write to the blackboard or I dictate to students the information to be learned. | 160 | 1.00    | 5.00    | 3.31   | 1.15               |
| 13. I encouraged students to seek new information on the subject discussed in class. | 160 | 2.00    | 5.00    | 3.98   | 0.82               |
| 14. The homeworks that I give to students involve their critical analysis.     | 160 | 1.00    | 5.00    | 3.48   | 0.97               |
| 15. During teaching I aim to develop students’ critical thinking.              | 160 | 2.00    | 5.00    | 3.88   | 1.01               |
Exploratory Factorial Analysis

Exploratory factorial analysis indicated the existence of three factors: effective communication of the teacher, development of students’ critical thinking, and use of auxiliary resources. The extraction procedure was Principal Component Analysis, and the Rotation Method was Varimax. After the exploratory analysis, four items were removed.

Table 2
Exploratory Analysis of the Scale

| Factor | 1  | 2  | 3  |
|--------|----|----|----|
| 1. I have the ability to come up with new and different ideas while teaching lessons. | 0.725 | | |
| 2. I encourage students to think about new ways of solving tasks. | 0.678 | | |
| 3. When teaching the lesson, I use different auxiliary resources. | | 0.681 | |
| 4. When teaching the lesson, I provide intuitive examples to students. | | 0.570 | |
| 5. When teaching the lesson, I often use interaction with students. | | | |
| 6. Throughout the teaching experience there have been situations where a topic discussed with a student has become a topic in the syllabus. | | | |
| 7. I use modern means of communication to get new information about a particular subject. | 0.686 | | |
| 8. I use video equipment or other technical equipment in teaching lessons. | 0.757 | | |
| 9. I use short “stories” to show students the usefulness of the information delivered. | | | |
| 10. I guide the students to analyze the implications of the answers they provide. | 0.636 | | |
| 11. I use the sense of humor to overcome the unpleasant situations that appear in the classroom. | | 0.515 | |
| 12. For most lessons, I write to the blackboard or I dictate to students the information to be learned. | | | |
| 13. I encouraged students to seek new information on the subject discussed in class. | 0.621 | | |
| 14. The homeworks that I give to students involve their critical analysis. | 0.741 | | |
| 15. During teaching I aim to develop students’ critical thinking. | 0.682 | | |

Reliability Analysis

In order to assess the scale’s reliability, the Cronbach’s Alpha index was calculated. Both the entire scale (Cronbach’s Alpha = 0.87), and the three factors (effective communication, Cronbach’s Alpha = 0.78, development of students’ critical thinking, Cronbach’s Alpha = 0.85, and use of auxiliary resources, Cronbach’s Alpha = 0.78), showed high reliability coefficients, indicating good psychometric qualities of the scale.

Table 3
Reliability Analysis of the Scale

| Factor | Cronbach’s Alpha | Number of items |
|--------|------------------|----------------|
| Effective communication | 0.78 | 4 |
| Development of students’ critical thinking | 0.85 | 4 |
| Use of auxiliary resources | 0.78 | 3 |
| Perceived competences in didactic activity | 0.87 | 11 |

Correlations Between Factors

In order to assess the convergent validity, the correlation between the scales’ factors were analyzed. The correlations between the factors and the overall score of the scale were high (r = 0.83 with effective communication, r = 0.86 with development of students’ critical thinking, and r = 0.76 with use of auxiliary resources). The correlations between the three factors were high (between 0.46 and 0.60). We can conclude that the scale has acceptable convergent validity.
Table 4  
*Correlations Between The scales’ Factors*

|                      | 1  | 2    | 3    | 4    |
|----------------------|----|------|------|------|
| Effective communication | -  |      |      |      |
| Development of students’ critical thinking | 0.60** | -    |      |      |
| Use of auxiliary resources | 0.46** | 0.47** | -    |      |
| Perceived competences in didactic activity | 0.83** | 0.86** | 0.76** | -    |

Notes: * p < 0.05; ** p < 0.01.

Confirmatory Factor Analysis

The MPlus program was used to perform confirmatory factorial analysis. As a result, the three factor model has indicators of good fit (RMSEA = 0.07, CFI = 0.96, TLI = 0.95), indicating that the instrument has good psychometric properties.

![Figure 1. Confirmatory factor analysis.](image)

Notes. ec = effective communication; dct = development of students’ critical thinking; uar = use of auxiliary resources.

Table 5  
*Confirmatory Factor Analysis*

| Model          | χ²   | Df  | RMSEA | CFI  | TLI  |
|----------------|------|-----|-------|------|------|
| 3 factor model | 72.30| 41  | 0.07  | 0.96 | 0.95 |

Notes. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index.

Discussions

This study aimed to develop and validate a tool for assessing perceived competences in didactic activity for a group of Romanian teachers.
So far, the main evaluation tools are considering characteristics such as self-efficacy, empathy to students, integrating technology into teaching practice and interest of teachers (Bhargava & Pathy, 2011; Schiefele et al., 2013; Borg & Edmett, 2018). This study proposes teaching skills such as effective communication, development of students’ critical thinking, and use of auxiliary resources. Therefore, the questionnaire offers the possibility of evaluating several teaching competencies of interest for the research in the educational field, but which did not materialize into competency assessment resources.

An important condition for an instrument to be usable in practice is its psychometric qualities. The results of the research showed a very good internal consistency of scales. Moreover, the factorial structure tested by exploratory and confirmatory factorial analysis showed good construct validity. However, the factorial structure obtained from the factorial analysis was not entirely similar to the hypothetical one. The structure obtained contained three factors: effective communication, development of students’ critical thinking, use of auxiliary resources. Other specific items did not load the theoretical factor and therefore were eliminated. A possible explanation for this result may be that these items, although referring to important features in the didactic process, are not a single-size dimension, compared to the rest of the factors, as the original items have heavily loaded the other factors.

Conclusions

The results of this study may be useful for psychologists working in the educational field. Due to the appropriate psychometric qualities of the instrument, specialists can trust scores, so that useful inferences and predictions can be made. The main practical implication is that the proposed instrument can be successfully used in identifying development needs of teachers resulting from the evaluation process.

Teachers will therefore gain information leading to high awareness and insight on important aspects of their workplace, such as developing students’ critical thinking, effective communication, and the use of auxiliary resources. Based on the results derived from self-assessment of teaching competencies, customized professional development programs can be created for each teacher, aiming at developing skills and, implicitly, improving performance at the workplace.

Like any research, our study is characterized by a series of limits. First, a limited range of psychometric qualities, such as internal consistency and construct validity and convergence, have been investigated. Important features, such as relative criterion validity, divergent validity, and test-retest reliability were not aimed. Another important limitation is the nature of the group of participants, which is one of convenience. Therefore, the results depend on the characteristics of the group of participants, which limits the generalization of the results.

The results of this study may provide a basis for future research in the educational psychology field. Future studies can test the psychometric qualities of the instrument across multiple groups of participants, taking into account several teacher characteristics, such as their specialization, teaching experience, and the reputation of the educational institution.

Also, future studies could test the relative criterion validity of the instrument, by associating the scores with the students’ academic performance.

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