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Development of Classroom Management Scale for Science Teachers

Yeliz Temli-Durmuş

Department of Elementary Education, Usak University, Turkey

Abstract Students cannot learn in chaotic, badly managed classrooms. In the first years of teaching experiences, teachers revealed that novice teachers came to recognize the importance of discipline skills and classroom management for effective instruction. The purpose of the study was (i) to develop Science teachers' views towards classroom management scale and (ii) to determine science teachers' views towards classroom management. Further, identifying the views of the science teachers on people management, behavior management and instructional management were purposes of the study. In total 130 secondary school science teacher candidates (Physics and Biology pre-service teachers) voluntarily participate in the study. Results of the exploratory factor analysis (EFA) showed that 3-factor structure. After that, another data set was constituted for Confirmatory Factor Analysis. In total 253 elementary school science teachers' responses were included the data analysis process. For the main study, 3 cities (Şanlıurfa, Uşak and Afyon) were determined from a larger population. Convenience sampling was used. Teachers' teaching experience and gender do not have a statistically significant effect on people management, behavior management and instructional management.

Keywords Classroom Management, Science Teachers, Scale Development

1. Introduction

Classroom management is commonly mentioned as the most intricate aspect of teaching and effectively managed classrooms are essential for construction of effective learning environments [1]. From the beginning of the teaching experience, teachers commonly express their concern about controlling students; creating a disciplined environment and maintain it to create a proper atmosphere for learning [25]. Although classroom management affects students' success directly [7], managing student behavior and solving the problems have always been a stubborn task for teachers [20].Classroom management is still an increasing problem for teachers in primary schools [32]. There is a common perception of problems in classrooms such as side talking, interrupting teachers, incomplete assignments, giving students the opportunity to express their opinions, involving students in decision making processes, designing appropriate seating arrangement and so on [4,15]. Martin, Yin & Baldwin [17] indicate that classroom management skills can be categorized under 3 independent dimensions: instructional management, people management and behavior management

Although novice teachers had been taken into account in different studies in terms of classroom management [2,11,31,15], variables of teaching experience were not adequately specialized in classroom management. Although teaching experience is a continuous variable, it is designed as categorical variables based on Huberman's [14] Teacher Career Cycle Model. Teachers with 0-3 years of teaching experience (Career Entry Stage), 4-6 years of teaching experience (Stabilization Stage), 7-18 years of teaching experience (Experimentation-Diversification Stage), 19-30 years of teaching experience (Serenity Stage) and 31 or more years of teaching experience (Disengagement Stage) constitute the five categories. There was not any participant who had 31 or more years of teaching experience in the study. Therefore, four categories included in the study.

Some key points can be underlined based on different teaching fields. For example; preschool teachers give importance to keep children quit and orderly [13] while elementary school teacher stress flexibility in seating arrangement and study centers, accessibility of materials for the performance of an activity or task, and usability of materials and equipment [18]. The main aim of the study is to develop a reliable and valid data collection tool to determine science teachers' views towards classroom management. Another aim of the study is to determine graduation fields, teaching experience and gender's effect on science teachers' classroom management views.

Every course require different materials and equipments, free areas for students to use constructivism, information sources, and even qualified infrastructure of schools for

some courses like science teaching [1]. The research results showed that crowded classrooms are the one of the basic limitations in learning-teaching process [4]. Because the main philosophies of curricula are constructivism in Turkey, learning environment definition includes different areas and materials have special importance. So, arrangement of learning environment, time management, providing effective classroom management characteristics show variety [28].

2. Method

This study consists of two stages. The first one is scale development process including EFA and the second one is main study including CFA. The first stage of the study was conducted with secondary school science teacher candidates. The main study is a survey study and conducted in 3 different cities in Turkey. The cities were determined based on easily accessibility. In-service teacher training program dates were noted and data collected.

2.1. Scale Development Process

The study started with the developing conceptual framework and reviewing related literature. This stage covers related national and international conferences' proceedings and journals. In the second step, the author wrote the items and draft of the questions were constructed. Then, expert opinions were consulted from 5 experts. Two experts in Curriculum and Instruction, two Science Teachers and one Measurement and Evaluation expert gave feedbacks. The researcher administered two classroom management scales before starting the data collection tool developing process but their cronbach alpha reliability levels were found statistically unacceptable for the study's sample. The measurement and evaluation expert advised the researcher to examine Turkish classroom management scales. One of the instruments was developed by Martin, Yin and Baldwin [17] and adapted in Turkish [22]. The results of the instrument did not show statistically acceptable reliability results. The reason for reaching statistically unacceptable results might be related to participants' characteristics. The second instrument was the Teacher Efficacy in Classroom Management and Dicipline Scale [3] adapted to Turkish by Yerin-Güneri, Bulut and Özdemir [33]. The researcher cannot elicit statistically acceptable cronbach alpha level again. The reason might be the characteristics of participants again. As the third step, the researcher decided to develop a new scale on classroom management.

2.2. Exploratory Factor Analysis (EFA)

The study was conducted in two public universities in Turkey. Exploratory Factor Analysis (EFA) was conducted with 130 junior and senior Science Teacher Candidates in an English-medium university in 2011. According to Tabachnick and Fidell [27] five times more than the number of items in the questionnaire was acceptable as satisfactory for the number of participants. In order to reach appropriate sampling size for the study, the researcher involved secondary school Physics and Chemistry teacher candidates to study. Biology education department did not exist in the university. In total 89 female (73%) and 33 (27%) male teacher candidates voluntarily participated in the exploratory factor analysis.

Outliers and omitted items were checked. If the missing items are more than 10% in the whole questionnaire, the items cannot be analyzed [27]. In data set, 8 univariate outliers were excluded. Valid participant size were 122 Science Teacher Candidates for EFA. Appropriateness of data was examined with Kaiser Meyer Olkin (KMO) test which is used for measuring whether data distribution is adequate for performing factor analysis. The acceptable minimum level for KMO value is suggested as .60 [29]. In this study, KMO yielded a value of .80 [5], indicating that the data is appropriate in order to use factor analysis. In addition to the KMO test, Barlett's test of Sphericity was used to test whether correlation matrix is an identity matrix in which there are no correlations among the variables (items). In other words, Barlett's test of Sphericity is a test statistics used to examine the hypothesis that the variables are uncorrelated in the population [5]. In the current study, Barlett's test of Sphericity revealed a statistically significant value by rejecting the null hypothesis, x^2= 2260.578, p<.0001, indicating that the items of the questionnaire are correlated in a way which is appropriate for running factor analysis. Common factor analysis and oblimin rotation factor analysis were used. The analysis revealed 3 factors with eigenvalues greater than 1.0 [8]. The scree plot showed 2 sharp descents that mean the instrument consists of 2 factors. But when the researcher checked the CFA results, it was shown that three-factor structure explained 41% of the total variance and give statistically acceptable CFA results.

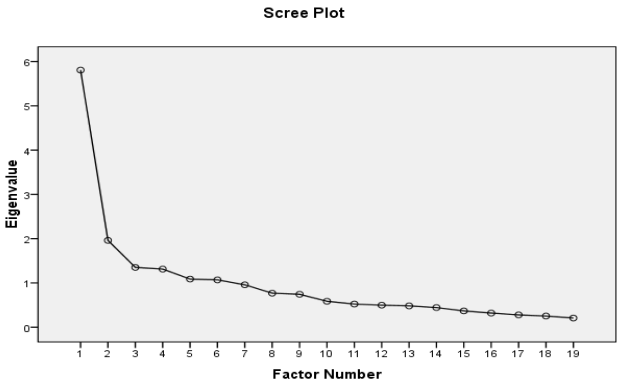

Figure 1. Scree Plot

The EFA results showed that the scale consisted of 3 subscales. Confirmatory factor analysis verified that the scale with 15 items consists of three subscales and 4 items were eliminated because of low item loading. Cronbach-alpha reliability coefficient of the first subscale

was.82, for the second subscale .75 and for the third subscale was .85.

Table 1. Factor name, abbreviations, eigenvalues, and variance of factors

Factor Name	Eigen Values	% of Variance
F1 (People Management)	5.8	17.22
F2 (Behaviour Management)	1.96	17.07
F3 (Instructional Management)	1.35	7.13

2.3. Method of Main Study

After completing exploratory factor analysis process, the main study was conducted with elementary school Science Teachers. The study is a survey study that is used for describing some aspect of the population that the results can be generalized [7]. Categorical variables were determined and sample selection was done. Among Nonrandom sampling methods, convenience sampling was selected. In Şanlıurfa, Science Teachers participated in an in-service teacher training program. That is why the researcher sent out the questionnaires to a researcher to administer the scale. Uşak, Manisa and Afyon cities are other easily accessible cities to collect data. The researcher administered the instrument in Uşak and Afyon. In Manisa, another researcher collected the data. In total 253 Science Teachers working in public schools participated in the city from four cities but 2 participants' exceeded from the study because of outliers based on mahalanobis distances values.

Confirmatory Factor Analysis (CFA) and main study were conducted with same dataset with the participation of 253 elementary school Science Teachers in four different cities of Turkey; namely, Şanlıurfa, Uşak, Manisa and Afyon. In total 158 female (62.45%) and 95 male (37.55%) elementary school science teachers participated in the study. In total 2 outliers deleted from the data set.

Totally 6 items were loaded in first factor, 3 items were loaded in second factor, and 6 items were loaded in third factor. Items with factor loading less than .35 were not considered for the analysis. Shevlin and Miles [24] identify three levels of factor loadings which are acceptable for statistical analysis; low factor loading (.30), medium (.50) and high (.70).

The analysis resulted in a χ^2 of 231.9 with 87 degrees of freedom, $p<.05$. In addition to model chi-square, Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) fit indices were inspected. Values of indexes were CFI = .92, TLI = .89 and RMSEA = .081 with a confidence interval of .05 to .07. These values indicated good model fit since CFI values higher than .90, TLI values smaller than .90, and RMSEA values smaller than .10 are considered favorable (Kline, 2005, [11].

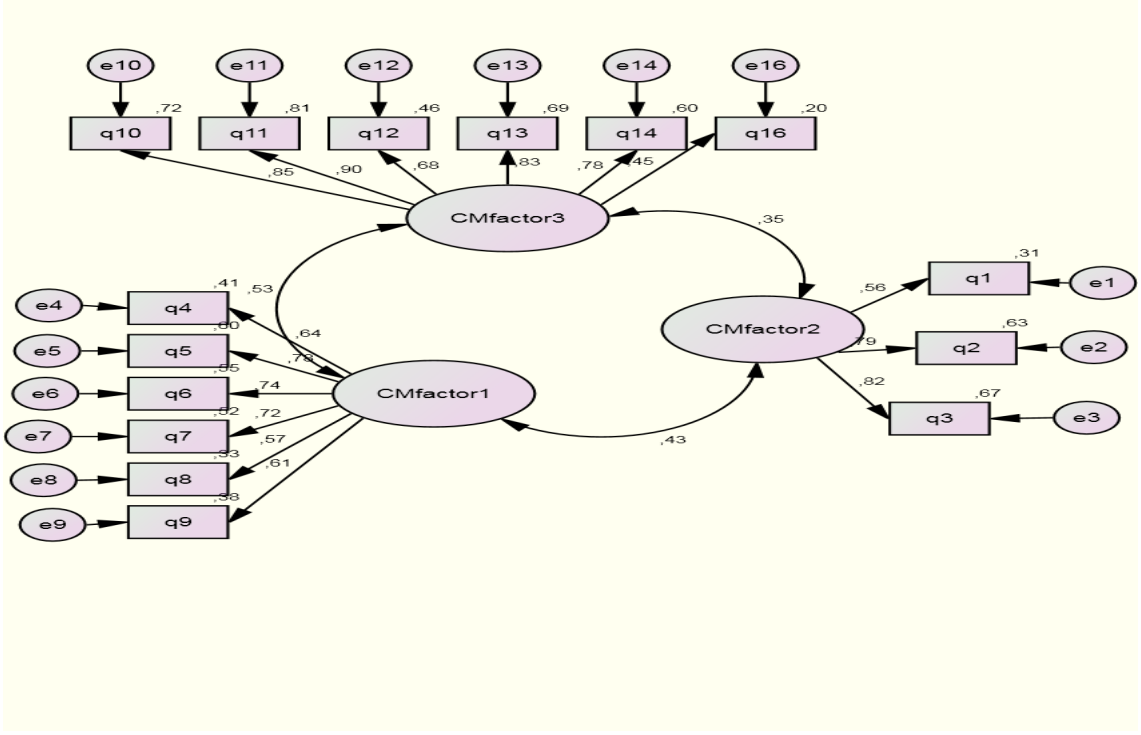

Figure 2. Confirmatory Factor Analysis

3. Data Analysis

During confirmatory factor analysis process, data set was screening. Tabachnich and Fidell [27]) suggested eliminating the data set which includes non-replied items more than 10% of the total item number. Hair, Anderson, Tatham, and Black [9] determined the criterion that variables with higher than 4% of missing data should be ignored. Based on their suggestion, data cleaning process was performed. In the questionnaire there were 15 items, if a participant did not answer 1 item, the data was eliminated by means of listwise method. Data in Demographic Information Part was analyzed with descriptive statistics including means, standard deviations, frequencies and percentages. Confirmatory factor analysis was performed with AMOS to confirm the factors and items' loads found in the exploratory factor analysis. After completing CFA, some participants submitted in the questionnaires and the participant rate was increased. In order to find answers of research questions, MANOVA was performed.

Outliers were checked to determine the characteristic which is different from the other observations [9]. In the study, mahalanobis distance was used to determine whether there are any influential outliers in the data set. Results revealed that two cases give extreme values and deleted from data set. The analyses were done with and without deleting outliers. As there were no differences between the results, complete data set was used throughout the study. That the reason why the researcher presents TLI in the CFA.

The research questions of the study were stated as

1. What are the science teachers' views on classroom management?
   1a) What are the science teachers' views on the people management?
   1b) What are the science teachers' views on behavior management?
   1c) What are the science teachers' views on the instructional management?
2. Are there statistically significant differences among the views of science teachers who differ in relation to some demographic variables towards classroom management?
   2a) Are there statistically significant differences between male and female science teachers' views towards classroom management?
   2b) Are there statistically significant differences among the views of science teachers who are in different stages of teaching career towards classroom management?

Overall results regarding the first research question, presented as mean and standard deviation, are summarized in Table 2. The results indicated that teachers had positive views (agree and totally agree) on people management, behavior management and instructional management.

Table 2. Mean and Standard Deviations of the Subscales of Teachers' Views on CM** (n=253)

	*M**	*SD*
people management	4.34	.58
behavior management	4.15	.66
instructional management	4.31	.62

*calculated out of 5.

**Classroom Management

Mardia's test showed non-normal multivariate distribution; whereas the F statistics is robust with respect to Type I error against non-normality [26]; and the sample size is sufficient to carry out the MANOVA analysis. Because the sample size was 253 and the smallest number of sample size in each cell (subgroups of variables) was 51 in the current study, it was assumed that the non-normal distribution of data would not affect the results of the MANOVA analyses.

The Effect of Gender and Teaching Experience on their Views on Classroom Management

A multivariate analysis of variance (MANOVA) was conducted to test whether there was any difference between teachers' views on classroom management with regard to their gender and teaching experiences. Teaching experiences were divided into 5 categorical variables and each category was named as cell. All cells do not have equal participants. Cell size of 30 is acceptable and the minimum number is determined as 7 per cell [29]. Another resource shows that the minimum cell size is 20 observations [6]. If the cell size is greater than .30, assumptions of normality and equal variances are of less concern [19].

Results showed that, overall, teaching experience did not have statistically significant effect on their views of classroom management. In a similar vein, science teachers' views on classroom management were not statistically different between male and female teachers. Similarly, science teachers' graduation fields did not affect science teachers' views.

The effect of teaching experience on each dependent variable (behavior management, people management, instructional management) was examined. Results indicated that teaching experience did not have any statistically significant effect on teachers' views on behavior management, and on people management, and on instructional management. In addition, the interaction between teaching experience and gender on science teachers' views on classroom management was not statistically significant. Additionally, statistically significant differences for gender were not found (Table 3).

Table 3. Gender and experience interaction

Source	Dependent Variable	SS	df	MS	F	Partial η^2
experience	people management	1.64	13	.127	.401	.02
	behavior management	4.07	13	.313	.653	.02
	instructional management	6.8	13	.528	1.47	.01
gender	people management	.008	1	.008	0.26	.00
	behavior management	.062	1	.062	1.29	.00
	instructional management	.184	1	.184	.51	.00
experience * gender	people management	1.39	4	.348	1.1	.00
	behavior management	.847	4	.21	.44	.00
	instructional management	1.31	4	.327	.91	.01
Error	people management	67.63	214	.31		
	behavior management	102.70	214	.48		
	instructional management	76.62	214	.36		
Total	people management	85.517	252			
	behavior management	111,67	252			
	instructional management	98.40	252			

*p<.05

3.1. Teachers' Views on People Management

The first sub-question of the first research question was: "What are the teachers' views on people management". This component composed of 6 items (4, 5, 6, 7, 8, and 9). Descriptive data analysis indicated that, overall, teachers' views were positive (agree) (*M = 4.34, SD = .58, n = 253)* about the people management as a part of classroom management. General mean of people management *M*=4.34 (*SD*=.58) showing that participants strongly agree with the aspects of the people management.

It was shown that the participants agree about the all items of People Management factor. One of the items related to People Management was "I can encourage students to determine classroom rules" (*M = 4.11, SD = .69).* In the scale the lowest mean score belongs to 6th item "I have required skills about classroom management" (*M = 3.87, SD = .77).* Although the item has the lowest mean score, 54.1% of the participants agree with the possessing required skills about classroom management. The results showed that more than half of the participants (56.6%, n=253) agree about their encouragement skills to involve in the students to classroom rules determination process.

3.2. Teachers' Views on Behavior Management

The second sub-question of the first research question was: "What are the teachers' views on behavior management". This component composed of 3 items (1, 2, and 3). Descriptive data analysis indicated that, overall, teachers' views were positive (agree) (*M = 4.15, SD = .66, n = 253)* about the behavior management as a part of classroom management. General mean of people management *M*=4.15 (*SD*=.66) showing that participants agree with the aspects of the behavior management. The results showed that the participants agree with the all aspects of the behavior management with all of the three items. It attracts attention that the lowest mean belongs to Behavior Management factor in the instrument.

3.3. Teachers' Views on Instructional Management

The third sub-question of the first research question was: "What are the teachers' views on instructional management". This component composed of 6 items (10, 11, 12, 13, 14, and 16). Descriptive data analysis indicated that, overall, teachers' views were positive (agree) (*M = 4.31, SD = .62, n = 253)* about the behavior management as a part of classroom management. General mean of people management *M*=4.31 (*SD*=.62) showing that participants strongly agree with the aspects of the instructional management. The participants strongly agree about the instructional management the indicators of the factor.

4. Discussion

The main aim of the study was to develop a reliable and valid data collection tool to determine science teachers' views on classroom management. In order to realize the first aim, an item pool was constituted and 5 experts' opinion was demanded and then exploratory and confirmatory factor analyses were administered. The results showed that three-factor structure with 15 items was confirmed. Three factors were named as people management, behavior management and instructional management with statistically acceptable cronbach-alpha values.

The confirmatory factor analysis results showed statistically acceptable results. Comparative Fit Index (CFI) was acceptable for above .90. In the study CFI: .92 and

TLI: .89 that acceptable for smaller than .90 [12]. Briefly, fit indexes were found acceptable. It is expected that the developed instrument will shed light on science teachers' sense related to classroom management skills. The proves showed that the scale is a reliable and valid scale that can be administered in future studies

As the second aim of the study, the researcher investigated the effect of teaching experience, gender and graduation field. Science Teachers graduated from faculty of education, and art and science faculties participated in the study. Cultural backgrounds and teaching experience affect teachers' classroom management perception [30]. In the study's sample, teaching experience did not have an effect on classroom management components. The reason might be related to scale's general content. The teaching experience did not divided into main groups like novice teachers and experienced teachers. Gender and graduation field did not show statistically significant differences. In terms of gender, a similar result was presented by Sezgin and Duran [23]. Statistically significant differences were not found in terms of gender while examining the classroom management strategies towards students' misbehaviors. Unlike this study, Martin and Yin [16] found that male teachers are stricter in classroom management than female teachers. Klassen and Chiu [10] also found that female teachers had greater classroom stress on students' misbehaviors. The reason of the differences might be related to teaching fields or cultural differences between countries. Additionally, although the research results are related to classroom management, main focuses of the studies are different. The developed instrument includes some items related to strategies but not focused on the strategies. For example, the first item can be perceived as related to interventional classroom management strategies but not reflect the general characteristic of scale. That is why the name of the instrument was determined as "views" to underline general opinions on classroom management. As for graduation field, like Ritter and Hancock's [21] study, graduation field did not affect classroom management views of teachers as the current study.

The result of the study showed that the science teachers feel qualified themselves about the requirements of classroom management. Findings suggest that the scale is a valid and reliable measurement tool to examine science teachers' perceived qualification related to classroom management. The results drawn from the data set of the present study showed that the science teachers feel qualified about the classroom management skills. The mean of the factors found that the science teachers agree with the classroom management skills in three dimensions, namely; people management, behavior management and instructional management. The participants strongly agree with the requirements of people management and instructional management factors. Only behavior management factors showed that the participants agree with the requirements students' behaviors.

For future studies, the instrument can be used to clarify the differences between teacher candidates and teachers, and also novice teachers and experienced teachers. It is also suggested that qualitative studies focused on observations are suggested. During data collection process in Uşak, the participants talked about the bad experiences with special education students as informal speech and demanded for the conduct qualitative research project related to classroom management in learning environments where special education students exist. The researcher demand for general views; therefore in detailed information can be elicited by using qualitative studies.

Classroom size was not a variable in the study that affects classroom management views of science teachers. This situation can be accepted as a limitation. Another limitation is related to reliability studies. Test-retest and parallel forms might be administered to elicit broader information about the data collection tools.

Items of the Instrument

Factor 1 (People Management)	4th item. I can encourage students to determine classroom rules.
Factor 1 (People Management)	5th item. I can persuade students to obey the classroom rules.
Factor 1 (People Management)	6th item. I have required skills about Classroom Management
Factor 1 (People Management)	7th item. I can provide effective communication skills in classroom.
Factor 1 (People Management)	8th item. I can notice what students demand
Factor 1 (People Management)	9th item. School facilitates are enough to design effective learning environment
Factor 2 (Behavior Management)	1st item. I can cope with disruptive behaviors.
Factor 2 (Behavior Management)	2nd item. I can use preventive strategies.
Factor 2 (Behavior Management)	3rd item. I can deal with students misbehaviors
Factor 3 (Instructional Management)	10th item. I encourage students to engage in learning tasks.
Factor 3 (Instructional Management)	11th item. I can prepare good structured learning activities.
Factor 3 (Instructional Management)	12th item. I can encourage students to be active during learning –teaching process.
Factor 3 (Instructional Management)	13th item. I am good at time management.
Factor 3 (Instructional Management)	14th item. I know effective strategies to attract students attention.
Factor 3 (Instructional Management)	16th. I can design suitable seating arrangement.

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