

UDC 372

Typology of Analytical Errors in Sampling Method: An Analysis of the 2003-2007 Education Science Dissertations in Turkey

Engin Karadağ

University of Cambridge, UK
Educational Administration Supervision Planning
Associate Professor
E-mail: enginkaradag@ogu.edu.tr, engin.karadag@hotmail.com

Abstract. In this research, the level of quality of the sampling groups used and the analytical mistakes made in the doctorate dissertations carried out in the field of education science in Turkey have been tried to be identified. Case study pattern has been applied in the study in which qualitative research techniques have been used. The theoretical universe of the research consists of the doctorate dissertations done in the field of Education Science. The field of study which consists of 324 doctorate thesis written between the years 2003-2007, has been identified by taking into consideration the improvements in the field of methodology and up to datedness. In the research, the sampling method hasn't been applied and the whole field of study has been reached. However, due to the restrictions in the usage and publishment of certain dissertations, the number of the dissertations that could be examined in this sampling is 211. In the research, as the tool of data collection, the education research evaluation scale form improved by the researcher has been used. In the research, data collected through epistemological document analysis has been resolved by using frequency analysis, descriptive analysis and typological analysis. According to the findings obtained at the end of the research, the sampling models used in the doctorate dissertations done in the field of education are insufficient by means of quality.

Keywords: Education Sciences; sampling; analytical mistake.

Introduction

Most of the discussion on sampling comes from the researchers who use quantitative style. Their main objective is to obtain a sampling with a representative power or making sums of elements from a society or population. In this way, the researcher can come to a correct general conclusion on the big group by observing a small group (Neuman, 2007, p.319). For this reason, sampling is effective on coming to a conclusion through scientific research and improving politics. Thus a minor mistake made through the sampling process can lead to unexpected results, planning mistakes, wrong or missing investments, economical or social dead-ends (Koçak & Özgür, 2006). Sampling is the name given to the most important technique every living thing uses to make any decision by using its instinct or logic (İdil, 1980). Sampling is used in any kind of research, including qualitative research. For no research, either qualitative or quantitative or containing both cannot include everything: you cannot do research on everyone or everything by doing everything (Miles & Huberman, 1994). The sampling choice has to be in harmony with the research questions. For this reason if the research questions need to be representative, one of the representative sampling models should be chosen (Holsti, 1969). However, according to the research done on the researches on the representative samplings used in education sciences, it has been determined that the level of sampling quality is low (Punch, 2005).

In the research done and published by American Educational Research Association (AERA) in 1962, it was determined that there are serious problems in most of education researches. In a study which can be accepted as a follow up to AERA's research, Ward, Hall and Schramm (1975) have determined that the problems concerning the validity and reliability of the tools used in the researches, the appropriateness of the research pattern and problems on the sampling still continue to exist. In a study carried out by Shaver & Norton (1980) aiming to control the sizes of the samplings of the articles published in *American Educational Research Journal*, it was found out that in most of the articles printed, there were sampling mistakes. Again, in a study done by Onwuegbuzie & Daniel (2003) the mistakes of non-existence of the discussions on the sizes of the samplings were determined.

Purpose

In the related text observation done, it can be seen that there is no exclusive analysis study on the qualities of the sampling groups used in the doctorate thesis written in the field of educational sciences. In this research, taking its roots from this absence, the answer to the question *what are the levels of quality of the sampling method used and the analytical mistake types in the doctorate dissertations written in the field of educational sciences*, is being looked for.

Method

Design

While doing the research, which aims to determine the sampling method used and the analytic mistake types made in doctorate dissertations which were written in the field of education sciences between the years 2003-2007, the case study design has been used among the other qualitative research designs.

Universe and Sampling

The theoretical universe of this research is the doctorate dissertations written in Turkey in the field of education sciences. Yet, the theoretical universe to be worked in, which was identified by taking into consideration the improvements in the field of methodology and up to datedness, consists of 324 doctorate dissertations written in the field of education sciences between the years 2003-2007. Distribution of doctorate dissertations by year is as follows: 2003 ($\eta=43$, 13.2%), 2004 ($\eta=50$, 15.4%), 2005 ($\eta=50$, 15.4%), 2006 ($\eta=84$, 25.9%), and 2007 ($\eta=97$, 29.4%). In the research, has been identified by taking into consideration the improvements in the field of methodology and up to datedness. In the research, the sampling method hasn't been applied and the whole field of study has been reached. However, due to the restrictions in the usage and publishment of certain dissertations, the number of the dissertations that could be examined in this sampling is 211. Distribution of doctorate dissertations by year is as follows: 2003 ($\eta=6$, 2.8%), 2004 ($\eta=7$, 3.3%), 2005 ($\eta=30$, 14.2%), 2006 ($\eta=79$, 37.4%), and 2007 ($\eta=89$, 42.1%).

Instrument

Education Research Evaluation Form: The form developed within the scope of the research has been prepared to determine the methodological level of quality of the researches done in the field of education. Having taken into consideration the results of the *KMO and Bartlett Tests* it has been decided that the factor analysis of the form should be interpretable. It was understood that the factor analysis of the collected data can be done by using *Kaiser Meyer Olkin=.887*, $X^2=1946.109$, $DF=3825$ and *Bartlett* test analysis results for the structure validity of the form. According to the result of Varimax technique for perpendicular axial rotation, it was observed that the elements found in the scale grouped in 24 sub-scales. The announced variance amount of the form which has 24 sub-scales is %58,93. The variances that the sub-scales show are between %4.46 and %1.88 and the factorial loads of the elements vary between 0.32 and 0.76. The internal consistency coefficient of the form varies between .634 and .952 in Cronbach Alpha sub-scale. In this study, seven items and sampling method part containing its sub-scale of the form which consists of one hundred and fifty items and twenty-four sub-scales were used. The expressions used in the form are evaluated on a horizontal line going from *completely (10)* to *none (0)* with the help of 11 staged Likert type grading scale. The height of the points received on the basis of sub-scales of the form, shows the efficiency level of the variable that the sub-scale stands for.

Process

In this study, epistemological document analysis has been used as the data collecting method (i) accessing the documents which is the first stage of document analysis; the doctorate dissertations in the pre-identified sampling group have been obtained from YOK (Turkish higher education established) Documentation Head-office. The identified dissertations have been transferred from the web-site of YOK Documentation Head-office to the computer and coded. At the next stage, (ii) the transferred dissertations have been analysed according to the *educational research evaluation scale* which was organized in *Likert type* (Forster, 1995; Rowlinson, 2004). In this context, for the objectives related to the sampling method dimensions and quality levels of the research, from the qualitative data analysis types and content analysis types, *frequency analysis* and in the analysis of the mistake types, from the qualitative data analysis *descriptive analysis* and *typological analysis* have been used. In the research, the average of the findings obtained from frequency analysis (X) and standard deviation (SD) values have been given. The descriptive analysis used in the research consists of four stages. These are: (i) forming a frame for the descriptive analysis: At this stage by starting from the dimensions of the

conceptual framework of the research, a framework for data analysis was formed. Thus, it was determined under which themes the data would be presented. (ii) Processing the data: At this stage, the data gathered according to the framework formed at the previous stage have been read and organized. (iii) Identification of the findings: At this stage, the identification of the organized data and direct quotations for the necessary places has been done. (iv) Commenting on the findings: At this stage, the explanation, associations of the findings have been done. In the presentation of the collected data along with direct quotations, information related to identity, such as: the titles of the doctorate dissertations, the writers of the dissertations, the consultants of the dissertations have never been mentioned. The dissertations have been coded and categorized under names which are known only by the researcher and in this way; a direct transfer has been made. Moreover, in cases where direct quotations were made from the doctorate dissertations which may be recognized in means of content, alterations have been made, without damaging the content and unity of the text. The other analysis method of the research which is typological analysis has been done in three basic analytical stages, which are; (i) Categorization of the types (ii) association of the types (iii) building relationships between the types.

Findings

In Table-1 the sampling methods used in the doctorate dissertations written in the field of educational sciences in Turkey and the percentage values related to them are presented. In the 132 doctorate dissertations in which the sampling method is mentioned, a sum of 11 sampling methods has been used. The first four most frequently used sampling methods used are as follows: (1) simple random sampling ($n=97$, 62.1%), (2) Stratified sampling ($n=17$, 10.8%), Purposeful sampling ($n=13$, 8.3%), and (4) Cluster sampling ($n=11$, 7.0%).

Table 1

The lay-out of the sampling methods used in the doctorate dissertations written in Turkey

Method	n	%
1-Simple random sampling	97	62.1
2-Stratified sampling	17	10.8
3-Purposeful sampling	13	8.3
4-Cluster sampling	11	7.0
5-Maximum variation sampling	5	3.2
6-Criterion sampling	4	2.5
7-Critical case sampling	3	1.9
8-Systematic sampling	2	1.2
9-Extreme case sampling	2	1.2
10-Convenience sampling	1	0.6
11-Snowball sampling	1	0.6
Total	156	100

The findings related to the dimension of universe-sampling (working group) of the doctorate dissertations covered in this research are presented in Table 2. The level of quality of the universe-sampling dimension varies between 0.60-3.67 on item basis. According to this, the lowest point belongs to *the width of the universe and its subordinates...* which contains the expression of [$X=0.60$, $SD=1.39$]; the highest point belongs to *the appropriateness of the technique of sampling choice* which contains the expression [$X=3.67$, $SD=3.16$] if a sampling has been taken. The average of the points related to the levels of quality of universe-sampling has been calculated as 2.27 [$SD=1.82$, Median=1.86]

Table 2

Descriptive statistics of the qualitative points of universe-sampling

Item	n	X	SD
1-The definition of the universe and its qualities...	150	1.68	1.52

2-The explanation of sampling choosing technique, if taken...	194	2.76	2.22
3-The appropriateness of sampling choosing technique, if taken...	194	3.67	3.16
4-The adequacy of the size of the sampling...	192	3.6 6	3.29
5-The width of the universe and its subordinates...	148	0.6 0	1.39
6-EExplanation of the representation efficiency and power of the universe...	191	3.53	3.07
Total	211	2.2 7	1.82

PS As there are missing coding in some items number n hasn't reached the number 211 existing in the sampling.

The findings related to the quality level of the dimension of universe-sampling of the doctorate dissertations covered in this research have been presented in Table-2. Parallel to this, as a result of the typological and descriptive analysis done, in the dimension of universe-sampling the following three mistakes can be counted; (i) not explaining the sampling method; (ii) definition of a universe with a low representation power (iii) determination of a universe for experimental research. When the categories forming the universe-sampling dimension of the research are analyses, the common qualities can be summarized as follows;

(i) The explanation of the sampling method: Scientists working on a problem have found the concept of sampling to get to solutions. Because, instead of studying the whole universe, including a limited number of individuals, events or facts with a power of representing the universe is thought to be a practical solution (Mertens, 1998; Creswell, 2002; Yıldırım & Şimşek, 2005). This state works upon the reduction of the science apprehension (Popper, 2005). In this reduction process, the universe which contains a wide variety of individuals or facts is reduced to a size that can be worked on with a method called sampling. At the end of the process the results obtained are generalized to the whole universe in reverse (McMillan & Schumacher, 2006). In short, in a study if universe-sampling concepts are mentioned, choosing a sampling method is a must. Although there is no agreement on the classification of these sampling methods, they are generally classified as depending on probability and not depending on probability (Neuman, 2007). In addition, explanation of a sampling method chosen in a study is essential to generalize the results of the study to the universe. In spite of this fact, in most of the researches covered in this study, although universe-sampling group has been used, an explanation on how or which sampling method is used isn't given.

"The sampling universe of this research consists of the Turkish teachers working in the central counties of Ankara, (such as; Çankaya, Altındağ, Keçiören, Mamak, Yenimahalle, Sincan, Gölbaşı and Etimesgut). As for the sampling 257 teachers working in these counties have been reached and given the survey." [941]

"The necessary permission to apply the tests and collect the composition sheets which form one side of the research has been taken from the school administrations of 6 (six) primary schools in the centre of Erzincan and two Anatolian high schools. The fact that the teachers who give the tests and collect the sheets and I teach in the same branch and from time to time we have found the opportunity to work together has made the process work even better and safer."

"...the survey was applied as an e-survey to the teachers who are the members of a mail group named as "Turkish Geography Teachers' Union" with a member population of 1480 teachers on 17 October 2006 which functions through e-mails on the internet with the address http://tech.groups.yahoo.com/group/cografya_ogretimi and to which only geography teachers can become members." [204]

"The fact that the principle and two science teachers have given importance and acted voluntarily for the experimental study to continue is the reason why Şehit Doğan Sevinç Primary School has been chosen for the study." [397]

(ii) Defining a universe with a low representation power: How the sources from which the research data is obtained are chosen is important for the representation power of the research results and for similar groups or its meaningfulness in its environment (Yıldırım & Şimşek, 2005). The importance of this situation comes from the idea of generalization of science. The findings

related to the limited number of variables included in the research, within certain safety limits, by generalizing the universe in which the variables are included, ideas are found for the parameters of the universe. The most important quality of the sampling is its power of representation of its universe. In this situation, the issue how many samplings and how big a sampling should be used to represent the universe gains importance. At this point the basic rule is that the sampling should be as big as the universe (Bailey, 1987). Despite this general opinion, the size of the sampling can change according to; the planned analysis type of the research, the objectives of the research, and the qualities of the population. In spite of these variables, a researcher should decide on the size of the sampling according to the following; (i) the necessary level of accuracy, (ii) the variety and power of change of the population, (iii) in the analysis of the data, the number of different variables in the same field of study determines the size of the sampling (Neuman, 2007). However, as we will be observing in the examples given below, despite the importance of the size of the sampling in the studies, in many of the dissertations studies, the sampling is inefficient in number and in addition to this finding, in most of the studies its power to represent the universe hasn't been mentioned. For example:

“Within the borders of Turkey, in the primary schools under the control of Minister of Education, the teachers of the first grade form the universe of this study. In the schools within the borders of Kadıköy- Maltepe-Kartal-Pendik, of the teachers working in the first grade 161 are male and 261 are female.”

(iii) Determining a universe for experimental research: The main purpose of scientific research is to make generalizations for the whole universe by using the results of the research. In this kind of experimental research, the results obtained are only valid for the group that is being worked on. Besides, as for the details mentioned in the experimental method part of this study, the need for the groups to be assigned randomly is an indicator which shows that in experimental research the concepts universe-sampling cannot be used. Anyhow, in the experimental researches found in text of methodology, instead of sampling-universe, the terms working group and participant are used. Although it is clearly mentioned in the text of methodology; in most of the studies covered in this research, universe-sampling has been used and incorrect generalizations have been made. For example:

“The universe of the research consists of 50,000 students studying at Faculties of Education in Turkey. The sampling is formed of 94 students studying at the department of primary school teaching at Gökusu University in Faculty of Education in the second grade. 46 of these students form the experiment group and 48 of them form the control group.” [859]

“The universe of this research consists of the students studying in the central and neighboring counties of İzmir at 3rd, 4th, 5th and 6th grades of the primary schools. The sampling of the study varies according to the qualitative and quantitative scales used and the number of students that these scales have been applied to. The sampling consists of; in Mathematics Approach Scale (MAS) 460 of the students studying at the 5th grade, in Graphics Vision and Approach Scale 395 students studying at the 3rd, 4th, 5th, and 6th grades, in qualitative researches, 10 class teachers and 26 students studying at the 3rd, 4th, 5th and 6th grades. In the experimental study, the experiment and control groups consist of students studying at the 5th grade, 35 each, at Ankara Primary School, Izmir, Karşıyaka.” [029]

“Students studying at the Faculties of Education at the Department of Science Teaching and practicing basic Physics Laboratory Applications form the universe of this research. The sampling of the universe consists of first grade and second grade students studying at Gazi Faculty of Education, Department of Science Teaching, in the first term of 2005-2006 academic years and attending Basic Physics Laboratory Course.” [209]

“The research covers the public high school students and the universe and sampling of the universe consists of Bursa Süleyman Çelebi High School 9th grade students who studied in the year 2004-2005. The sampling consists of 615 students of the 1976 students studying at the 9th grade of the fore-mentioned school” [209]

“The universe of the research consists of the 7th grade students who study at the second stage in the central primary schools in Ankara. Since it is not possible to include all the students present in the universe to the research, sampling method has been chosen. The students studying at the seventh grades of the primary schools which have been chosen randomly, namely as Ankara Yenimahalle Harzemşahlar Primary School and Mamak Metehan Primary School form the sampling of the universe. There are two seventh grade classes in each of the fore-mentioned schools. One of the classes in each of the schools has been chosen randomly as the experiment group and the other, as the control group. The

evaluation made at the end of the research is based on the students who have attended both the first test and the final test. According to this, in Harzemşahlar Primary School there are 20 students in the experiment group and 15 students in the control group; in Metehan Primary School, there are 25 students in the experiment group and 17 students in the control group. Totally, there are 45 students in the experiment group and 32 students in the control group.” [400]

“The seventh grade students of the primary schools which were open in the year 2006-2007 within the borders of Istanbul form the universe of this research. The sampling of the universe is formed of two classes chosen randomly in Mustafa Eravutmus Primary School which is a primary school chosen in Istanbul, Küçükçekmece.” [314]

“While the experiment group was being chosen, the following points were considered; the willingness of the administration and the teachers, the representation power of the school, classes and the students, the convenience of reaching the school, the researcher’s finding the necessary conditions to perform the study.” [058]

Discussion

One of the important results obtained in this study consists of the mistakes made in sampling-universe (working group). The level of efficiency of the dissertations studies made is inefficient in general. As a result of the qualitative analysis made can be counted as follows; (i) not explaining the sampling method, (ii) defining a big universe with a low representation power, (iii) defining a universe for experimental researches. Moreover, another ascertainment is that the size of the universe is not mentioned and the subordinates are not mentioned. The sampling methods and the research methods do not have a wide variety in the sampling group covered in this study. While in 79 dissertations studies of the 211 dissertations studies the sampling method is not mentioned, in 132 dissertations in which the sampling method is mentioned it has been determined 11 different methods have been used. The most frequently used methods are simple random sampling (62.1%), Stratified sampling (10.8%), and Purposeful sampling (8.3%) methods. The shortfall of the samplings which is an important finding of this research is determined as a significant mistake type by other researchers as well [see: Hall, Ward & Comer, 1988; Kabaca & Erdoğan, 2007; Onwuegbuzie, 2002; Onwuegbuzie & Collins, 2007; Onwuegbuzie & Daniel, 2003; Shaver & Norton, 1980]. Besides, not explaining the representation power of the universe was a finding obtained by Dunkin (1996), Onwuegbuzie (2002), Onwuegbuzie & Daniel (2003), and Onwuegbuzie & Collins (2007) and is mentioned in most of the researches. All of these findings overlap with the results of the research. When the obtained results related to this part are evaluated, as generalizing the results of the samplings used in the dissertations studies to the whole universe is not realistic, the suggestions made parallel to the results obtained do not reflect the reality. This is because; making comments based on the findings obtained from a small sampling that is generalizing the findings over the sampling is wrong.

References:

1. Bailey, K. D. (1987). *Methods of social research*. New York: The Free Press.
2. Creswell, J. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Ohio: Merrill Prentice Hall.
3. Dunkin, M. J. (1996). Types of errors in synthesizing research in education. *Review of Educational Research*, 66(2), 87–97.
4. Forster, N. (1995). *The analysis of company documentation*. C. Cassell & G. Symon (Eds). *Qualitative methods in organizational research: A practical guide*. London: Sage Publications.
5. Hall, B. W., Ward, A. W., & Comer, C. B. (1988). Published educational research: An empirical study of its quality. *Journal of Educational Research*, 81(3), 182-189.
6. Holsti, O. R. (1969). *Content analysis for the social sciences and humanities*. Reading, MA: Addison-Wesley Publishing Company
7. İdil, O. (1980). *Örnekleme teorisi ve işletme yönetiminde uygulanması*. İstanbul: İstanbul Üniversitesi Yayınları.
8. Kabaca, T., & Erdoğan, Y. (2007). Fen bilimleri, bilgisayar ve matematik eğitimi alanlarındaki tez çalışmalarının istatistiksel açıdan incelenmesi. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 22(2), 54-63.
9. Koçak & Özgür, 2006.
10. McMillan, J. H., & Schumacher, S. (2006). *Research in education: Evidence based inquiry*. Boston: Brown and Company.
11. Mertens, D. M. (1998). *Research methods in education and psychology: Integrating diversity with quantitative and quantities approaches*. London: Sage.

12. Miles, M. B. & Huberman, A. M. (1994). *An expanded source book: Qualitative data analysis*. London: Sage Publications.
13. Neuman, L. W. (2007). *Toplumsal araştırma yöntemleri: Nitel ve nicel yaklaşımlar* (Çev. S. Özge). İstanbul: Yayın Odası.
14. Onwuegbuzie, A. J. (2002). Common analytical and interpretational errors in educational research: an analysis of the 1998 volume of the British Journal of Educational Psychology. *Educational Research Quarterly*, 26, 11-22.
15. Onwuegbuzie, A. J., & Collins, K. M. T. (2007). A typology of mixed methods sampling designs in social science research. *The Qualitative Report*, 12(2), 281-316.
16. Onwuegbuzie, A. J., & Daniel L.G. (2003). Typology of analytical and interpretational errors in quantitative and qualitative educational research. *Current Issues in Education* [On-line], 6(2). <http://cie.ed.asu.edu/volume6/number2/>
17. Popper, K. (2005). *Bilimsel araştırmanın mantığı* (İ. Aka, & İ. Turan, Çev.). İstanbul: Yapı Kredi Yayınları.
18. Punch, K. F. (2005). *Sosyal araştırmalara giriş* (D. Bayrak, H. B. Arslan, & Z. Akyüz, Çev.). Ankara: Siyasal Kitabevi.
19. Rowlinson, M. (2004). Historical analysis of company documents. C. Cassell & G. Symon (Eds). *Essential guide to qualitative methods in organizational research* (s.301-312). London: Sage Pub.
20. Shaver, J. P., & Norton, R. S. (1980). Randomness and replication in ten years of the American educational research. *Educational Researcher*, 9(1), 9-15.
21. Ward, A. W., Hall, B. W., & Schramm, C. E. (1975). Evaluation of published educational research: A national survey. *American Educational Research Journal*, 12, 109-128.
22. Yıldırım, A., & Şimşek, H. (2005). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin Yayıncılık.

УДК 372

Типология аналитических ошибок в методе выборочного исследования: анализ педагогических диссертаций 2003-2007гг. в Турции

Энгин Карадаг

Кембриджский университет, Объединенное королевство
 Управление по образованию и надзору по планированию
 доцент
 E-mail: enginkaradag@ogu.edu.tr & engin.karadag@hotmail.com

Аннотация. В данном исследовании автор пытается определить уровень качества исследуемых групп образцов и аналитические ошибки, допущенные в докторских диссертациях в области педагогики в Турции. Образец изучения был использован в работе с использованием методов качественного анализа. Теоретической основой исследования являются докторские диссертации в области педагогики. Область исследования, состоящая из 324 докторских диссертаций, написанных в 2003–2007 годах, была изучена, принимая во внимание улучшения в области методики и современность. В исследовании не был применен метод выборки, и вся область исследования была изучена. Тем не менее, из-за ограничений использования и публикации некоторых диссертаций, количество диссертаций, которые можно было исследовать, сократилось до 211. В качестве инструмента сбора данных, в работе была использована шкала оценки педагогического исследования, улучшенная автором. Данные, собранные с помощью эпистемологического анализ документов, были обработаны с использованием частотного анализа, описательного анализа и типологического анализа. Согласно полученным результатам, модели выборки, используемые в докторских диссертациях в области педагогики – непригодны с точки зрения качества.

Ключевые слова: Педагогика; образец; аналитическая ошибка.