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GaCiTa -The Google Spreadsheet Add-on for Classical Items and Test Analysis: Development and Evaluation Study

Mehmet Tekdal[1]

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Corresponding Author/İletişimden Sorumlu Yazar: mtekdal@cu.edu.tr

Abstract

The aim of this study was to evaluate Cloud-based *The Google Spreadsheet Add-on for Classical Items and Test Analysis* (GaCiTa) software, which is prepared in order to improve the ability of students to perform item and test analysis in the measurement and evaluation course, according to the opinions of pre-service teachers. The sample of the study consisted of 114 pre-service teachers who had previously taken the measurement and evaluation course. The standardized interview form was used to collect data. The collected data were analyzed by Nvivo 12 software. The results of this study revealed significant positive opinions about GaCiTA software. According to this result, it can be said that the use of the software in measurement and evaluation courses will contribute to the students.

Keywords: GaCiTa software, measurement and evaluation, item and test analysis, psychometric testing, classical test analysis.

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[1] Dr.Öğr.Üyesi, Çukurova Üniversitesi, Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü, Adana/Türkiye
Asst. Prof., Çukurova University, Faculty of Education, Computer and Instructional Technologies Education Department, Adana/Turkey
e-mail: mtekdal@cu.edu.tr **ORCID ID:** https://orcid.org/0000-0001-5429-7709

GaCiTa -The Google Spreadsheet Add-on for Classical Items and Test Analysis: Geliştirme ve Değerlendirme Çalışması

Öz

Bu çalışmanın amacı, öğrencilerin ölçme ve değerlendirme dersinde madde ve test analizi yapabilme becerilerini geliştirmek amacıyla hazırlanan Bulut-tabanlı GaCiTa (The Google Spreadsheet Add-on for Classical Items and Test Analysis) yazılımını öğretmen adaylarının görüşlerine göre değerlendirmektir. Araştırmanın örneklemini daha önce ölçme ve değerlendirme dersini almış olan 114 öğretmen adayı oluşturmaktadır. Verileri toplamak için standartlaştırılmış görüşme formu kullanılmıştır. Toplanan veriler Nvivo 12 yazılımı ile analiz edilmiştir. Bu çalışmanın sonuçları GaCiTA yazılımı hakkında anlamlı derecede olumlu görüşler ortaya koydu. Bu sonuca göre, yazılımın ölçme ve değerlendirme derslerinde kullanılmasının öğrencilere katkı sağlayacağı söylenebilir.

Anahtar Kelimeler: GaCiTa Yazılımı, ölçme ve değerlendirme, madde ve test analizi, psikometric testler, klasik test analizi

Introduction

Measurement and evaluation are seen as a quality control process of an education system. For this reason, teachers' proficiency in measurement and evaluation is accepted as one of the main competence areas in each country (Demirtaşlı, 2014). Given this situation, it is expected that the knowledge and skills of the teachers in the field of measurement and evaluation should be at the level of expertise. In order to provide the teachers with the necessary knowledge and skills in this subject, the "Measurement and Evaluation in Education" course is included in the curriculum of all departments of the Faculty of Education in Turkey. However, according to an important part of the studies in this field; it was found out that teachers and / or teacher candidates generally did not have sufficient knowledge and skills about measurement and evaluation subject and found themselves insufficient (Çakan, 2004; Gelbal & Kelecioğlu, 2007; Gencel & Özbaşı, 2013; Kilmen & Demirtaşlı, 2009; Yaman & Karamustafaoglu, 2011; Yasar, 2014).

Due to the nature of measurement and evaluation course, mathematical and statistical calculations should be used frequently. Difficult, complex and time-consuming calculations can be a factor in the students' inability to get enough efficiency in this course and to see themselves inadequate. Therefore, the use of software that simplifies calculations performs test statistics and item analysis and helps in interpreting the results can bring a new breath to this course. Moreover, these softwares will simplify the validity and reliability of the tests made by teachers. In addition, in order to have a good measurement and evaluation, students' learning should be measured by using with high validity and reliability assessment instruments. Only in this way it can be decided whether a learner has reached the expected level in the related behaviors (Özçelik, 1992). In this context, the aim of this study is to evaluate the GaCiTa (The Google Spreadsheet Add-on for Classical Items and Test Analysis) software developed in order to improve the students' ability to do the item and test analysis in the measurement and evaluation course.

Related Studies

Various softwares like GaCiTa software have been developed within the scope of classical item and test analysis. These softwares will be briefly explained below:

- **jMeterik** - jMetrik is a free and open source software to perform comprehensive psychometric analysis. This software was developed by J. Patrick Meyer of the University of Virginia and works on any Windows, Mac OSX or Linux platform with a valid Java version. Within the scope of item analysis, it allows many analyzes to be carried out, especially the index of difficulty and discrimination. jMetrik also provides a mechanism for calculating basic descriptive statistics and plotting bar, pie, histograms and many other types of graphs (Meyer, 2014). For more information about jMetrik or to download the software, visit http://www.itemanalysis.com .
- **Iteman** - Iteman is a commercial software designed specifically for classical test analysis, giving results in graph, table, and rich text (RTF) supported reports. It shows the difficulty and discrimination index of each item as well as their performance with detailed graphs. It also calculates typical descriptive statistics, such as mean, standard deviation, reliability, and standard error of measurement for the tests. For more information about Iteman or to download the software, visit http://www.assess.com/iteman/.
- **Lertap** - Lertap is a comprehensive software package for classical test analysis developed for use with Microsoft Excel and includes test, item and option statistics, mastery, fraud detection procedures and comprehensive graphics in test analysis. Developed by Larry Nelson at Curtin University, this software is available in a free version for small classes (Nelson, 2000).
- **TAP -** TAP (The Test Analysis Program) is a free program developed by Gordon Brooks of Ohio University for the basic classical substance and test analysis (Brooks & Johanson 2003). This program, written in Borland Delphi Professional Version 6.0, performs classic test and item analysis under Windows 9x / NT / XP. In addition to conducting test analyzes, TAP software also includes some features to assist teachers to assess in the classroom.

The common feature of the software developed for classical item and test analysis, which is briefly mentioned above, is that they can only work on a desktop computer and provides free usage for a limited number of questions. For this reason, the GaCiTa software developed in this study was designed to eliminate the deficiencies of these existing softwares and fill the gap in this area.

What is GaCiTa?

Item analysis is a statistical process that examines students' answers to each question of the test to assess the items of a test and the quality of the test as a whole. GaCiTa (The Google Spreadsheet Add-on for Classical Item and Test Analysis) is cloud-based software that enables you to evaluate exam quality by calculating all item and test analysis statistics. The software is extremely easy to use, allowing you to quickly create all Classic Item and Test Analysis statistics, reports and graphs in just a few clicks. The GaCiTa software has been certified by Google and has taken its place at the firm's "G Suite Marketplace". The software is available at the following link: https://gsuite.google.com/marketplace/app/mtgacitaproject/460799464432

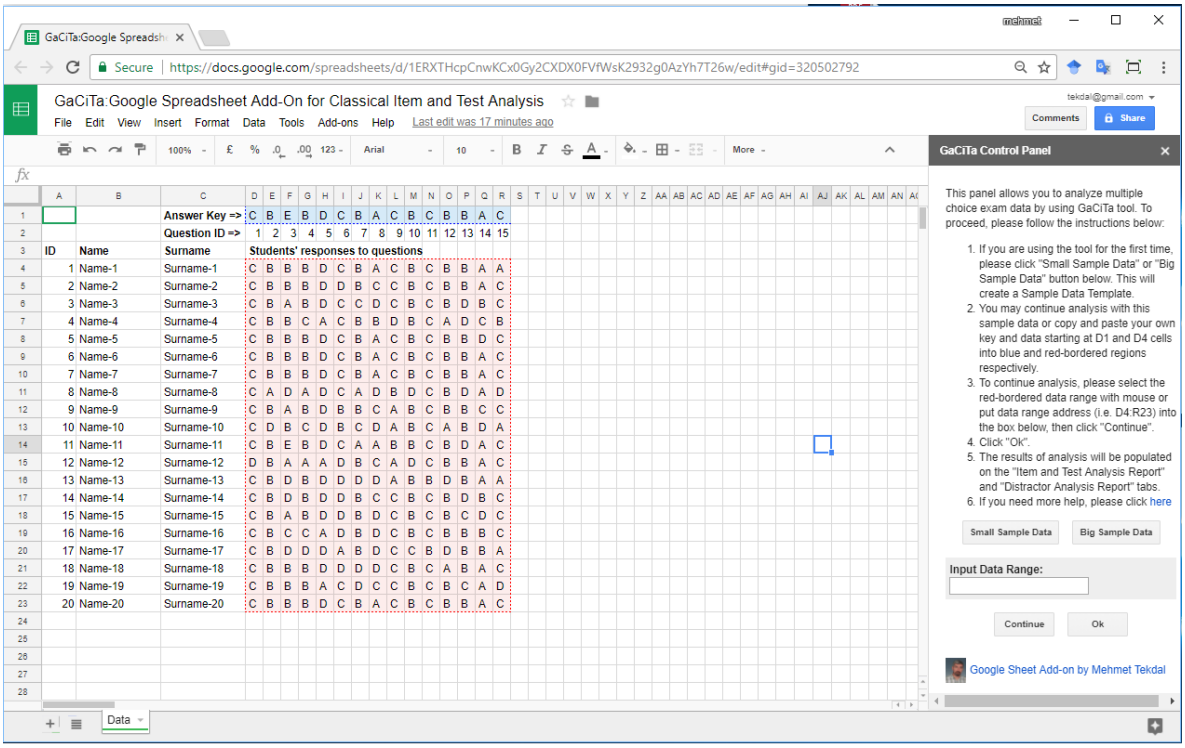

Figure 1. The GaCiTa data editor

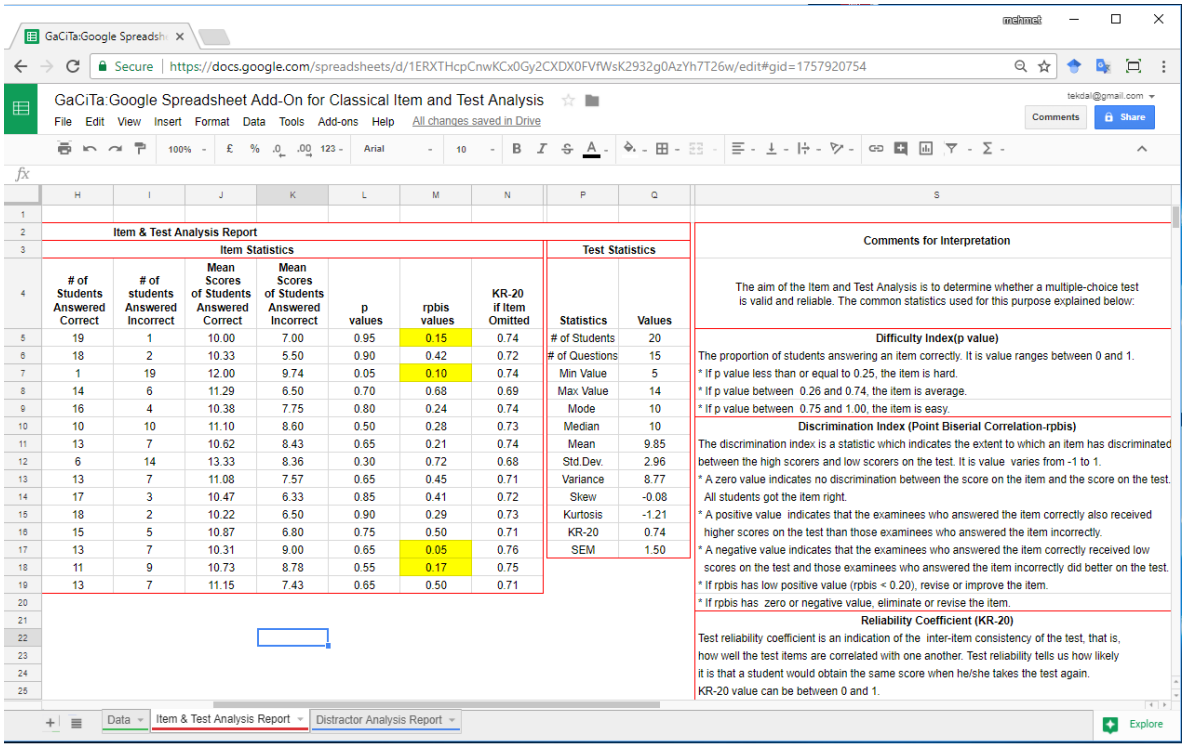

Figure 2. Item and test analysis report

In order to use GaCiTa for your item and tests analysis procedure, you only need to have a Google account. If you have an account, follow the steps at the following site to easily set up the installation.

https://sites.google.com/site/gacitaprojectsite/. Sample screenshots of the GaCiTa software are given in Figure 1, Figure 2 and Figure 3.

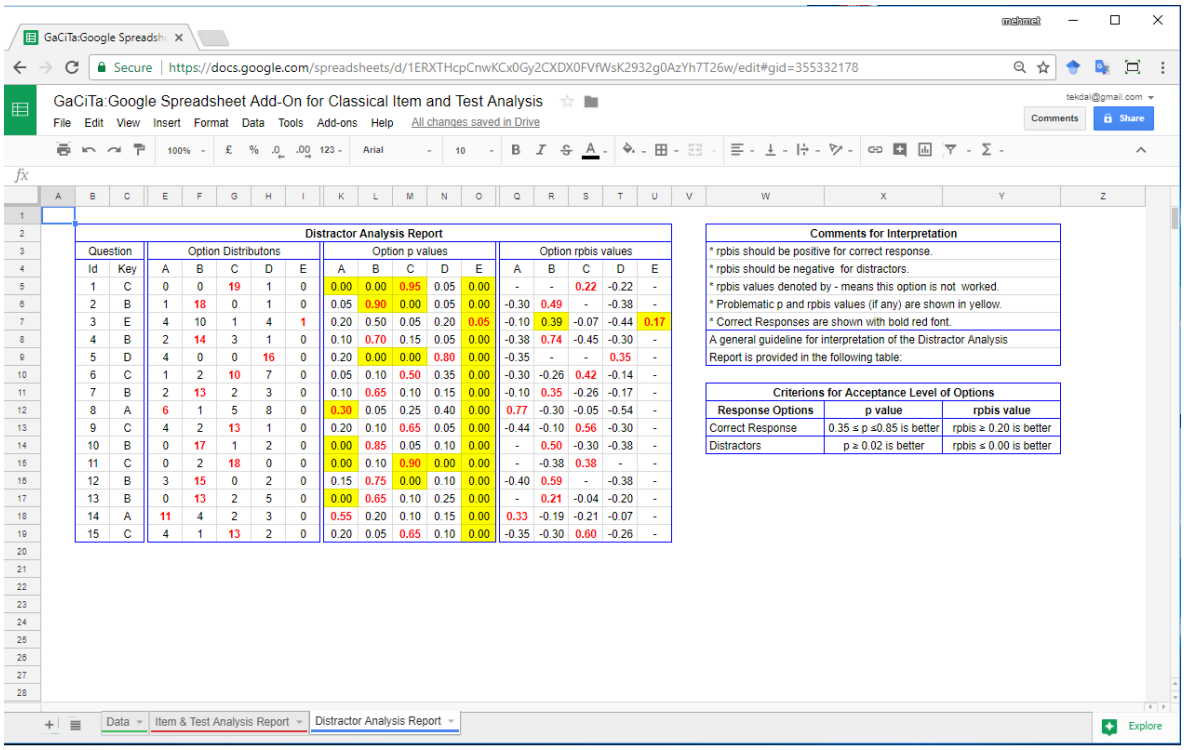

Figure 3. Distractors analysis report

Method

In this study, a case study model which is one of the qualitative research methods is used. The main purpose of such studies is the in-depth investigation of a case. This case can be an individual, group, site, class, policy, program, process, institution or community (Ary, Jacobs, Sorensen, & Razavieh, 2010). In this research, a case study was conducted in accordance with the opinions of pre-service teachers in order to determine the adequacy of the GaCiTa software to be used in the Measurement and Evaluation course.

Participants

The participants of this study consisted of 114 pre-service teachers who had previously taken Measurement and Evaluation course. For this reason, while creating the study group, criterion sampling was used from purposeful sampling methods. In this sense, the criteria in sampling were determined as students that taking Measurement and Evaluation course at Çukurova University, Faculty of Education in Turkey. The aim of this method is to ensure that the sample is formed from people with qualifications identified in relation to the problem (Johnson & Christensen, 2004). Demographic characteristics of the participants are shown in Table 1.

Table 1
Demographic Characteristics of the Participants

Demographic characteristics	N
Department	114
German	25
Biology	16
Geography	6
Philosophy	10
French	13
English	9
Chemistry	1
History	26
Turkish	8
Gender	114
Male	80
Female	34
Age range	114
-21	19
22-25	71
26-30	11
31-35	9
36+	4

Data Collection Instruments

In this study, interview form consisting of standardized open-ended questions was used as data collection tool. Standardized open-ended interview is a data collection tool that enables participants to fully express their views and experiences due to the nature of open-ended questions, and therefore is often used in qualitative research (Creswell, 2007; Gall, Gall, and Borg, 2003; Turner, 2010). Questions in the standardized interview form are asked in the same order to each individual interviewee. This situation is advantageous in studies with a large number of samples (Yildirim and Simsek, 2006).

The interview form that used for data collection instrument was developed by the researchers. For this, firstly, in order to develop the interview form, the related literature was reviewed and then interview questions were constructed in draft form. Then, the two researchers decided the interview questions together by discussing one by one. Afterwards, the interview form was finalized in line with the opinions of two experts in the field of educational sciences. Finally, the interview form consisting of 7 questions was determined as a data collection instrument. The questions on the interview form are listed below:

1. When you work as a teacher, do you prefer to do the statistical calculations in your measurement and evaluation process with GaCiTa application or by yourself? Why?
2. What are your views on GaCiTa application in general?
3. What are the positive aspects and advantages of GaCiTa in the context of statistical operations and interpretations for item and test analysis?
4. What kind of contributions did you make using GaCiTa application?

5. How did you find the process of learning GaCiTa? Can you explain your opinions with the reasons?
6. Have you had trouble or difficulty learning GaCiTa? If yes, what are your problems and challenges?
7. What are your suggestions for improving the GaCiTa application?

Data Analysis

Data were collected online by using a Google Form. Then, with the software developed by the researchers, each participant's opinions were transferred to a separate Word document file. Afterwards, the Word files were loaded to Nvivo 12, qualitative data analysis software, and the codes were created based on the interviewers' responses to the questions. Finally, the code names were tried to be determined as close to the statements of the participants as possible, thus ensuring that their views were reflected in the best way.

Furthermore, in order to ensure the reliability and validity of data analysis, two researchers coded separately. Then, the compatibility percentage of codes of two separate analyses calculated by Miles & Huberman (1994) formula and the inter-coder reliability was found to be 83.2%. According to Yildirim and Simsek (2006), if the percentage of compatibility is higher than 70%, then the data analysis can be accepted as reliable.

Findings

Responses Regarding to Whether Participants Preferred GaCiTa

Based on responses regarding to whether participants prefer to do the statistical calculations in their measurement and evaluation process with GaCiTa, ten different codes were obtained. These codes and their frequencies were presented in Table 2.

Table 2
The Responses of Participants Regarding to Whether They Prefer GaCiTa

Codes	f
Saves time	31
Prefer	21
Easy to use	25
Gives accurate and reliable results	11
Provides help for interpreting results	6
Free software	5
Not prefer	4
Complex software	2
User interface in English	1
Difficult to use	1

Of these ten codes, the first six of them are positive (prefer) and the last four are negative (not prefer). Participants who prefer the software are mostly concentrated around these views: Saves time (f=31), Easy to use (f=25), I prefer (f=21), Gives accurate and reliable results (f=11), Provides help for interpreting results (f=6), and Free software (f=5). On the other hand, participants who do not prefer the software are mostly concentrated around these views: I don't prefer (f=4), Complex software (f=2), User interface is not native (f=1) and Difficult to use (f=1).

As a result, it can be said that the participants were mostly satisfied with the GaCiTa application.

Responses Regarding to General Views of Participants About GaCiTa

According to the general opinions of the prospective teachers about the GaCiTa application, six different codes were obtained and these codes are listed in Table 3. Table 3 indicates that most of the participants taking part in this study have stated that the application is Simple and convenient (f=32). There were also some participants argues that the GaCiTa application Saves time (f=13), Successful (f=12), Practical and economical (f=9), Facilitating Measurement and evaluation process (f=9) and Useful for education (f=8). So, it can be concluding that general views of participants about GaCiTa are positive.

Table 3
The Responses of Participants Regarding to General Views About GaCiTa

Codes	f
Simple and convenient	32
Saves time	13
Successful	12
Practical and economical	9
Facilitating Measurement and evaluation process	9
Useful for education	8

Responses Regarding to Positive Aspects and Advantages of GaCiTa

Six codes were obtained in accordance with the opinions of participants about the positive aspects and advantage of GaCiTa application within the scope of statistical operations and the results presented in Table 4. From these codes, Doing calculations fast (f=30) has been the most repeated code. This code was followed by Simplification of statistical operations (f=27), Performing Calculations Correctly (f=21), Presenting results with Charts and tables (f=8), Providing Interpretation and feedback support (f=7) and Working with large size data (f=4) codes.

Table 4
The Responses of Participants Regarding to Positive Aspects and Advantages of GaCiTa

Codes	f
Doing calculations fast	30
Simplification of statistical operations	27
Performing Calculations Correctly	21
Presenting results with Charts and tables	8
Providing Interpretation and feedback support	7
Working with large size data	4

Responses Regarding to Contributions of GaCiTa

With the participant's responses regarding to the contributions of GaCiTa application, six different codes were obtained and these codes are listed in Table 5. As shown from Table 5, participants states that the greatest contribution of the application has been to Save time (f=49). The other contributions of the application

are listed as follows: Reducing calculation errors (f=13), Application to the theoretical topics (f=12), Facilitating test and item analysis (f=10), Increase motivation (f=6) and Provide data analysis on the Internet (f=5).

Table 5
The Responses of Participants Regarding to Contribution of GaCiTa

Codes	f
Saves time	49
Reducing calculation errors	13
Application to the theoretical topics	12
Facilitating test and item analysis	10
Increase motivation	6
Provide data analysis on the Internet	5

Responses Regarding to Process of Learning GaCiTa

With the participant's responses regarding to the process of learning GaCiTa application, seven different codes were obtained and these codes with their frequencies are listed in Table 6. From these seven codes, the first four of them include process of learning was easy and the last three of them include process of learning was difficult. Participants who states that the process of learning GaCiTa application was easy are mostly concentrated around these views: Interface is simple and straightforward (f=29), Learning process is easy (f=24), It is fun and practical to use (f=17) and the learning process takes a short time (f=5). On the other hand, Participants who states that the process of learning GaCiTa application was difficult are mostly concentrated around these views: Difficult to use for the first time (f=12), Difficult to use (f=8) and The interface is a little complicated (f=5). In summary, based on these results it can be said that the GaCiTa application is easy to learn.

Table 6
The Responses of Participants Regarding to Process of Learning GaCiTa

Codes	f
Interface is simple and straightforward	29
Learning process is easy	24
It is fun and practical to use	17
The learning process takes a short time	5
Difficult to use for the first time	12
Difficult to use	8

Responses Regarding to Learning Difficulties of GaCiTa

Five different codes for the difficulties in the learning process of GaCiTa were obtained and listed in Table 7. One of these codes includes views (f=75) that there are no difficulties in the learning process, but other four of them have opinions about various difficulties. Among the participants who had difficulty in the learning process, the opinion that User interface is not native (f=18) was the most common among the participants, while the other reasons were the interface is complex (f=3), Difficult to use for the first time (f=3) and, The instructions are not clear (f=2).

According to these results, it can be said that the vast majority of students have no difficulty in learning process of the GaCiTa application.

Table 7
The Responses of Participants Regarding to Learning Difficulties of GaCiTa

Codes	f
No difficulties in the learning process	75
User interface is not native	18
The interface is complex	3
Difficult to use for the first time	3
The instructions are not clear	2

Responses Regarding to Suggestions for Improving GaCiTa

According to the suggestions made by the prospective teachers regarding to suggestions for improving GaCiTa application, 6 codes were obtained. These codes and their frequencies presented in Table 8. Of these codes, User interface may be in Turkish (f=45) was the most suggested opinion, followed by The interface may be simpler (f=8), Learning video of the application may be prepared (f=4), Interface may be improved with different colors (f=3), Offline version may be done (f=2) and, Mobile version may be prepared (f=1) respectively.

Table 8
The Responses of Participants Regarding to Suggestions for Improving GaCiTa

Codes	f
User interface may be in Turkish	45
The interface may be simpler	8
Learning video of the application may be prepared	4
Interface may be improved with different colors	3
Offline version may be done	2

Discussion and Conclusion

A significant number of studies conducted in the field of measurement and evaluation reported that in general teachers and/or teacher candidates did not have sufficient knowledge and skills about measurement and evaluation subject and found themselves insufficient. The fact that the GaCiTa application developed to contribute to the solution of this problem is preferred by almost all teacher candidates, and they declare that they will use this application for statistical procedures related to the test and item analysis which should be done during the measurement and evaluation process, show that the application has a high potential to contribute to the field. In addition, this potential is supported by the fact that pre-service teachers' views on the GaCiTa application are mostly focused on themes such as simple and practical application, saving time, practical and economical, facilitating the measurement and evaluation process and useful for education.

Responses to the question "What are the positive aspects and benefits of the application in the context of statistical procedures and interpretations for testing and item analysis? are concentrated around these views: perform calculations fast and

error-free, simplify statistical calculations and give results in the form of graphs and tables. It is important that these are the views that contribute to the solution of the problems such as mathematics and statistical calculations difficult, complex and time-consuming which are the most frequent experiences of the students in the measurement and evaluation course. In addition, this satisfaction is also supported by teachers' opinions such as time saving, reducing calculation errors and the possibility of application to the theoretical topics covered in the course.

Also it is important that 75% of the participants who expressed their opinions about the learning process of the GaCiTa application stated that they found the application easy and did not experience any problems. On the other hand, the most important opinion highlighted by the difficulties of the learning process was that user interface is not native, followed by interface is a bit complicated and it was difficult to use in the first time. According to these results, it can be said that GaCiTa application is user friendly. However, adding these features/functions such as Turkish language support, making the promotional video, and making the interface slightly more clear and simple will make the application more useful.

In conclusion, in this study, GaCiTa software which supports measurement and evaluation courses has been developed and evaluated according to pre-service teacher's opinions. Key features of this software include being cloud based, developing psychometric tests, providing 100% compatible results with SPSS and similar software, providing support for interpreting results and more important it is free of charge. As with most newly developed software, this software also has some shortcomings. In this context, especially in the case of deficiencies reported by the participants, these features will be added in the new version of the software: (a) native language support, (b) creating sample tests with different difficulty level and dimensions, (c) e-exam creation and evaluation, and (d) working with data from different sources.

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Authors' Biodata/ Yazar Bilgileri

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Mehmet Tekdal, is works as an Assistant Professor at Cukurova University, Department of Computer and Instructional Technologies Education.