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A Latent Class Analysis Approach to Challenges Experienced by Faculty Members in Online Assessment in Higher Education

Yüksek Öğrenimde Çevrimiçi Değerlendirmede Fakülte Üyelerinin Yaşadığı Zorluklara Yönelik Gizli Sınıf Analizi Yaklaşımı

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Abstract: Online assessment is the use of computer technologies by faculty members to guide and check learning. Taking the advantage of technology, many universities have used online assessment applications to ensure sustainability in education due to the pandemic and natural disasters. The purpose of the current study is to explore challenges experienced by faculty members in online assessment, using latent class analysis. The descriptive design research was carried out with the participation of 105 faculty members. For the study, the number of latent classes was decided according to the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) and it was observed that the data structure was a good fit for a two-class model. According to the research results, the first class in online assessment applications was considered as the with-difficulty group (58.7 %) and the second as the without-difficulty group (41.3 %). When the conditional probabilities were examined, it was concluded that the observed variables that mostly contributed to the two-class model data structure were as follows, cheating, plagiarism and lack of education policies. It was found that the primary challenges in both groups (with or without difficulty) in online assessment applications were cheating, plagiarism and lack of education policies.

Keywords: Challenges in online assessment, latent class analysis, faculty members, higher education

Öz: Çevrim içi ölçme ve değerlendirme, öğretim elemanlarının öğrenmeyi yönlendirmek ve denetlemek için bilgisayar teknolojilerini kullanmasıdır. Pandemi ve doğal afetler nedeniyle eğitimde sürdürülebilirliğin sağlanması için birçok üniversite, teknolojinin getirdiği avantajlardan yararlanarak çevrim içi ölçme ve değerlendirme uygulamalarını kullanmışlardır. Betimsel türde tasarlanan bu araştırma 105 öğretim elemanı ile yürütülmüştür. Bu amaç ile geliştirilen ölçme ve değerlendirmeye yönelik zorlukları belirleyen ölçme aracı, öğretim elemanlarına uygulanmış ve sonuçlar örtük sınıf analizi ile incelenmiştir. Araştırmaya Akaike bilgi kriteri (AIC) ve Bayesyen bilgi kriteri (BIC) değerlerine göre örtük sınıf sayısının belirlenmesi ile başlanmış ve veri yapısının iki sınıflı model ile uyumlu olduğu belirlenmiştir. Sınıf sayısı belirlendikten sonra iki sınıflı yapı test edilerek maddelere ait koşullu olasılıklar hesaplanmış ve yorumlanmıştır. Araştırmanın sonuçlarına göre çevrim içi ölçme ve değerlendirme uygulamalarında oluşan sınıflardan birincisinin zorlanan gruba (%58.7) ikincisinin ise zorlanmayan guruba (% 41.3) ait olduğu tespit edilmiştir. Koşullu olasılıklar incelendiğinde, veri yapısının iki sınıflı olmasına en büyük katkıyı sağlayan gözlenen değişkenlerin: kopya çekme, intihal yapma ve eğitim politikalarının eksikliği olduğu sonucuna ulaşılmıştır. Her iki grupta (zorlanan veya zorlanmayan) da çevrim içi ölçme ve değerlendirme uygulamalarında zorlanılan konuların başında kopya çekme, intihal, eğitim politikalarının eksiklikleri olduğu bulunmuştur.

Anahtar Kelimeler: Çevrim içi değerlendirmenin zorlukları, gizli sınıf analizi, akademik personel, yüksek öğrenim

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Introduction

Online assessment applications have become indispensable tools that have long been employed in higher education, but more frequently used for academic assessment by many educational institutions, particularly since the COVID-19 pandemic outbreak. Many countries have started to introduce online education in order to prevent educationally backward systems and to ensure sustainability, which has brought the need for online academic assessment (Bozkurt & Sharma, 2020). Contrary to what is thought, the history of online education is rather recent. Queensland University in Australia and Columbia University had accessible educational programs off the campus in 1890 and the 1920s respectively. According to Williams & Pabrock (1999), online education on the global scale has three steps:

- written materials, radio and videos between 1860 and 1960,
- stereo audio and video podcasts, computer disks for educational purposes between 1960 and 1990,
- hybrid technologies, virtual classes and internet technologies as of 1990 to present

In Turkey, the reason for unaccelareted online education is the common belief that literacy is much more important and that it is unlikely to have teacher-free education. The first distance learning practice in higher education was at the Law Faculty of Ankara University in 1956. Bank staff were trained by letters and completed the distance education program (Demir, 2014). Technological advancements and requirements have shifted online assessment and evaluation process from the traditional pen and paper methods at many educational levels to online forms (Cavus, 2015; Diprose, 2013; Dube, at al., 2009; Stone & Zheng, 2014). With the outbreak of the Covid-19 pandemic, the Turkish universities started online education as of 2019-2020 spring semester. They carried out all courses online as there was no other option for both faculty members and undergraduates to continue courses. Today, online education is not completely ended, 100% of some university courses are performed online. According to Montenegro-Rueda et al. (2021), the management of exams is one of the most important difficulties in online assessment during the Covid-19 pandemic. Cheating, family problems, power outages, and serious problems in accessing technology are the problems encountered in online assessment. Another

difficulty in online assessment is ensuring student motivation and attitude. In the online education process, one of the greatest challenges is undoubtedly the online assessment applications. Online assessment means academic assessment by faculty members or teachers, using various Internet-based measurement tools. It might be described as the distant (online) version of common face-to-face activities used for academic achievement assessment and feedback. The term online assessment is generally confronted together with certain concepts such as electronic assessment (Jordan, 2013) or computer-based assessment (Bull & McKenna, 2003; Sim, at al., 2004). It enables undergraduates to improve their prospective knowledge and skills in distance education systems (Weleschuk, at al., 2019). However, faculty members need training, and they must improve their own assessment systems for the integration of online assessment with distance education system (Bearman, at al., 2020). Online assessment can range from online or electronic assignment submission, test question submission to scoring or individualized testing (Collares & Cecilio-Fernandes, 2019; Wang & Kingston, 2019). It is frequently preferred by undergraduates and faculty members for several reasons. For example, its user-friendly interface provides academic assessment through games and simulations similar to recreational activities in the learning environment (Ridgway, at al., 2004). According to the research by Glamorgan University and Leeds Metropolitan University (Gilbert, at al., 2011), online assessment is also demanded for fast and efficient use (Peterson, 2013; Eljinini & Alsamarai 2012), effective and instant feedback it offers, as well as increased student performances. In a study, Şenel & Şenel (2021) measured the students' perceptions about assessment quality and concluded that those who were involved in online assessment applications were mostly satisfied with the quality. Despite the above-mentioned benefits, online assessment is reported to have several drawbacks. Many researchers express that, in online assessment, analysis of practical skills, measurement of technical areas and the assessment of the obtained results are challenging (Osman, 2020; Bensaid & Brahimi, 2020). It is clear that online assessment leads to particular problems such as incompetencies of both undergraduates and faculty members in information and communication technologies and Internet and computer inaccessibility of certain groups. However, it also brings numerous benefits such as the display of different types of assignments or assessment and convenient, systematic response by students in exams (Alruwais, at al., 2018). In their study, Elsalem, et al. (2020) reported that 32% of the undergraduates suffered from more stress in exams because of online application. Similarly, it is widely known that faculty members have some difficulties as well. In a study in which the distant assessment perceptions of the faculty member in Faculty of Education were examined, Mirza (2021) found that the faculty members were lacking information on the online application of many assessment methods and did not prefer to use online exams for reasons like validity and reliability. In another study in which the data gathered from 50 different faculties, Guangul, at al. (2020) showed that the greatest challenges in online assessment process were academic dishonesty, technical infrastructure, and learning outcomes content. Some other main problems were the undergraduates' unfamiliarity with the computer, Internet and computer inaccessibility, difficulty in group project assessment and unfamiliarity of the faculty member with technology (Jordan & Mitchell, 2009; Mitchell, at al., 2003).

The previous studies on distant assessment and evaluation applications have largely focused on undergraduates and instructional practices. In addition, influential factors on technology-based assessment tools usage by faculty members have been studied (Schneberger, at al., 2008; Terzis & Economides, 2011; Terzis, at al., 2013a, 2013b). It is seen that studies on online assessment are mostly those which have shown positive student attitudes (Dermo, 2009; Deutsch, at al., 2012; Fageeh, 2015; Jawaid, at al., 2014; Kumar, at al., 2013). These research, altogether, revealed that despite students' favorable attitudes towards online assessment, faculty members mainly prefer pen and paper assessment. One of the factors to have caused such a difference is considered as faculty member's hesitant behavior in online assessment applications, hence, limited or inadequate use of the applications (Amante, at al., 2019; Bloom, at al., 2018; Fageeh, 2015; Hamsatu, at al., 2016; Jamil, at al., 2012; Rolim & Isaias, 2018).

Although online assessment is a good method for academic assessment, it has led to new concerns about fairness, justice, test security, and test integrity. According to the previous research, there appears to be a need to study the influence of changes on undergraduates and faculty members. Providing online assessment in a safe, fair and valid fashion needs to be comprehensively examined (Middleton, 2022). According to Stiggins (1992), faculty members spend a third of their time on online assessment applications in teaching process. Considering the above-mentioned situation today, it requires spending a lot of time. The applications need to stimulate student motivation for learning. Additionally, assessment applications by faculty members are critical, not only for scoring, but also for permanent learning. When faculty members perform assessment applications online, the amount of time may double. Therefore, they are the ones to experience considerable difficulty in online assessment. The purpose of this study is to classify the challenges that faculty members experience in online assessment.

Methods

The current research is a descriptive survey model as it aims to classify faculty members according to the challenges they experience in online assessment and to reveal the real conditions (Büyüköztürk, at al., 2012). Survey model studies are to identify actual conditions. In such studies, researchers do not attempt to influence and change conditions (Karasar, 2015). This research was carried out with the participation of 105 faculty members from Hakkari University, with at least one-semester online assessment experience.

Data Collection

A 25-item measurement tool was designed to explore challenges in online assessment experienced by the faculty members. First, the literature was reviewed, and the greatest relevant challenges were defined. The measurement tool was sent to 3 measurement and evaluation experts and finalized after various editing in the light of the expert feedback. Following this, it was sent to 10 faculty members (four of them work in instructional technologies, three of them work in educational sciences, and three of them are field education) and rearranged in the light of their feedback. As a result, the 25-item questionnaire, which was initially designed and applied in the form of a 5-point Likert scale, was changed into

a 3-point scale, as needed, to have a better latent class analysis interpretation. An online platform was created for survey applications, and the survey link was sent to all participants via e-mail via the university network. Necessary security procedures have been created in the system so that each faculty member can apply the survey only once.

Data Analysis

Validity and Reliability of Measurement Tool

Data validity and reliability was examined before data analysis. Before the explanatory factor analysis (EFA), data suitability for factor analysis was examined using Kaiser-Meyer-Olkin Measure (KMO) and Barlett test. The obtained results strongly suggested that the data was a good fit for EFA (χ2:1448.450, p<0.00 ve KMO: .863). It was seen that the 25-item online assessment questionnaire was grouped under two factors, with a rate of 43% explained variance. When the items listed under the relevant factors were examined, the first factor was defined as the faculty member's personal challenges (25%), and the others as those of the undergraduates (22%). The Cronbach's Alpha reliability coefficient of the scale was found as 0.93.

The scale, which was prepared and applied as a 5-point Likert scale, was transformed into a 3-point scale to control the number of calculated parameters and to clearly reveal the number of classes. In order to reveal whether the validity and reliability of the scale was affected by both forms, factor analysis and reliability were recalculated while the scale was in a 3-point structure. For the transformed form, data validity and reliability was examined before data analysis. Before the exploratory factor analysis (EFA), data suitability for factor analysis was examined using Kaiser-Meyer-Olkin Measure (KMO) and Barlett test. The obtained results indicated that the data was a good fit for EFA (χ2:1235.216, p<0.00 ve KMO: .821). It was seen that the 25-item online assessment questionnaire was grouped under two factors with a rate of 47% explained variance. When the items listed under the relevant factors were examined, the first factor was defined as the faculty member's personal challenges (22%), and the others as those of the undergraduates (21 %). The Cronbach's Alpha reliability coefficient of the scale was found as 0.91. As a result, the construct validity and reliability of the scale were found to be similar in both cases.

Latent class analysis was employed to classify faculty members according to the challenges they experience in online assessment and to interpret the obtained results. When the definition of a challenge is considered, it is described as facing a difficulty that requires a great mental or physical effort and thus tests one's skills to successfully achieve a task (Cambridge Dictionary, 2023). The term challenge is expressed with the help of resulting observed variables. When such structures are considered in education and psychology, observed variables, discrete variables and error variances are used. The variables are mostly employed when both discrete variable and observed variable are continuous or assumed as such. However, such structures may not be always continuous. According to Bartholomew, at al. (2011) discrete variable models are grouped under four main categories; factor analysis with continuous discrete and observed variable (1), latent profile analysis with continuous discrete variable, discontinuous observed variable (2), item response theory with continuous discrete variable, and discontinuous observed variable (3) and latent class analysis with discontinuous discrete and observed variables. In the study, the results were interpreted, using latent class analysis because of its benefits and the right data structure for the analysis.

Latent Class Analysis

Latent class analysis first used by Lazerfeld (1950), particularly to explore the latent structure in attitude scales, aims to show the underlying discrete variables for the data obtained by categorical variables. It is seen in the literature that multi-group latent class analysis is mostly employed in measurement invariance studies (Altıntaş & Kutlu, 2020; Eid, at al., 2003; Moors & Wennekers, 2003; Kankaras & Moors, 2009; Kankaras, at al., 2010; Güngör-Çulha, 2012; Güngör, at al., 2013; Finch, 2015; Yandı, at al., 2017; Doğan-Gül, 2022). In this research, it was used to assess challenges experienced by the faculty members, with the help of the resulting number of classes and response probabilities to each category. In latent class analysis, when the discrete structure is examined, the observed variables are supposed to be conditionally independent (Vermunt & Magidson, 2004). Goodman (1974) explains latent class analysis in equity 1 as follows:

$$\pi_{xyz}^{ABC} = \sum_{t=1}^{T} \pi_t^X \pi_{xt}^{AIX} \pi_{yt}^{BIX} \pi_{zt}^{CIX} \qquad (1)$$

In Equity 1, for a three-category measurement tool for the three observed variables (A, B and C), it is meant to have categories as many as t number and discrete variables as many as X. If the number of latent classes is found as 2 or t equals to 2 (t=2), it is represented as π_1^x and π_2^x. π_1^x and π_2^x refer to the categorical likelihood in the latent class. For example, when there is a two-class measurement tool, then, in the scale, the responses to each item in class 1 or class 2 list the following options: "I agree", "I am undecided" and "I disagree". In the formula mentioned above, the number of latent classes (t) is supposed to be at least two. When the number of latent classes is 1, it means that observed variables are independent.

In the study, software R (R Development CoreTeam, 2007) was used for the latent class analysis. In this open resource software, latent class analysis is performed with the help of pre-structured packages. In the research, packages, poLCA, dplyr and plyr, were used for the latent class analysis. Package poLCA is employed for latent class model and latent class regression model estimation, with multi-scored items (Linzer & Lewis, 2007; R Development CoreTeam, 2007). Package poLCA uses Expectation-Maximization-EM for maximizing the Likelihood function of latent class model parameter estimation (Kankaras, et al. 2010). The algorithm starts with an initial value and continues parameter estimation until it reaches the defined criteria equals (McCutheon, 1987). The open resource software R defines probabilistic parameter estimation for conditional probabilities and latent class probabilities. It enables interpretations through conditional probabilities of the relevant item response distributions concerning the number of classes, class sizes, and membership in given data. In latent class analysis, the low number of observed and discrete variables offers a clearer interpretation. According to Lin (2006), a measurement model with the lower number of parameters must be preferred for an easy interpretation of the relevant model. When the best model for data is decided, certain statistical treatments might be employed as well as simplicity and uncomplicated interpretability (Collins & Lanza, 2010; Silvia, et al., 2009). It

is for this reason; the research data was applied as designed a 3-point scale for an easier interpretation of the number of estimated parameters.

Results

In the research, first, the number of classes was decided. When the class number is 1, it means that observed variables are independent. A one-class local independence model was initially employed, and the number of classes was added 1 more in each sequence to have parameter estimations up to a six-class model, and this process is presented in Table 1.

When all models are examined, the first thing that stands out is the negative degree of freedom. The negative degree of freedom makes it difficult to define the model (McCutcheon, 1987). Therefore, other suggested factors were evaluated in defining the model. In the literature, the Bayesian Information Criterion (BIC)value is the reference for the assessment of the number of classes, as it is not influenced by population size (Kankaras, et al. 2010). The Akaike Information Criterion (AIC), BIC, and the versions of these two criteria are used as the best model indicators. In the research, the model with the minimum value information criterion was chosen and the relevant parameter estimations were interpreted. When Table 1 is examined, it is seen that the minimum BIC value was obtained in the two-class model. In this case, the data was decided to be a good fit for the two-class model. According to Wang et al. (2017), the Entropy value shows how accurately the established model defines the classes. This value is generally expected to be close to 1. This value of 0.8 and above is stated as an acceptable value (Celeux & Soromenho, 1996). The entropy value calculated for the two-class model in this research is 0.954. This value shows that the classification is appropriate for the two-class model.

Following this step, the two-class model was applied for parameter estimations and the parameters were interpreted. When the latent class probabilities for the two-class model are considered, it is seen that the distributions of the participant faculty members were 58% for Class 1 and 41% for Class 2. When the item contents are considered, it is clear that Class 1 was the group relatively with more difficulty in online assessment applications compared to Class 2. This is more clearly shown in figure 1.

When figure 1 is examined, it is seen in the difficulty items that the more likely probability response was “I agree” for the group in Class 1 and “I disagree” for the group in Class 2. It is clear that the majority of the group in the research (58%) had difficulty with online assessment applications. When the conditional probabilities of Class 1 are examined, it is seen that the faculty members in this group had negative attitudes towards online assessment applications. The reason why this group with the percentage of 58 was independently classified was the observed variable, particularly for plagiarism and cheating. The second group with the percentage of 41 was perceptively found to have more difficulty with the same issues, although it was the one with less difficulty in online assessment applications. On item basis, the two-class models were independently examined for conditional probabilities.

Findings of the With-difficulty group (Class 1) in Online Assessment Applications

When the results of the with-difficulty group in online assessment applications are examined, it is clear that student cheating behavior and disposition towards plagiarism were found the most challenging. In Table 2, the conditional probabilities of Class 1 are listed.

When Table 2 is examined, it is seen that cheating and plagiarism were the two compelling situations for the faculty members. When the conditional probabilities of cheating are considered, it is clear that 97% of the group in Class 1 had the highest probability to choosing the “I agree” option for cheating and the same applied for 92% of the same group for plagiarism. In a study of the data collected from 50 faculties, Guangul et al. (2020) suggested that the greatest challenge in online assessment process was academic dishonesty. In a study, Momeni (2022) showed the participant faculty member had hesitant or negative attitudes towards online assessment. Another research result here was that the faculty members had the greatest challenges with cheating, plagiarism, Internet access issues, and poor technology-related knowledge. Hence, the above-mentioned research result is parallel to the findings obtained by this study. Figure 2 was designed to present detailed information on the resulting greatest challenges.

When figure 2 is examined, it is seen that the following were some of the greatest challenges in online assessment applications for the participant faculty members; lack of education policies, underinvestment, assignments taken from the Internet, lack of feedback, lack of training, Internet inaccessibility, software and security issues, operating system issues, student motivation, time spent, student adaptation and confusion. In their study, Whitelock, et al., (2006) identified student motivation as the first step in the online assessment cycle, which is in congruent with our research findings. Unfamiliarity with computers, Internet and computer inaccessibility, group project assessment challenges and faculty members' unfamiliarity with technology are known to be the difficulties shown in studies by many researchers (Jordan & Mitchell, 2009; Mitchell, et al., 2003).

Table 1. Latent Class Model Estimation in Data Set from One-class Model to Six-class Model

Number of Classes	LL	Res.df	BIC	aBIC	cAIC	Entropi	Error
One-class model	-2371.99	53	4975.73	4817.79	5025.73	-	-
Two-class model	-2107.69	2	4683.48	4364.44	4784.48	0.95	0.15
Three-class model	-1987.30	-49	4684.09	4198.95	4831.09	0.97	0.70
Four-class model	-1949.91	-100	4840.67	4199.43	5043.67	NaN	0.23
Five-class model	-1930.54	-151	5038.31	4235.97	5292.31	NaN	0.14
Six-class model	-1897.08	-202	5207.77	4244.32	5512.77	NaN	0.16

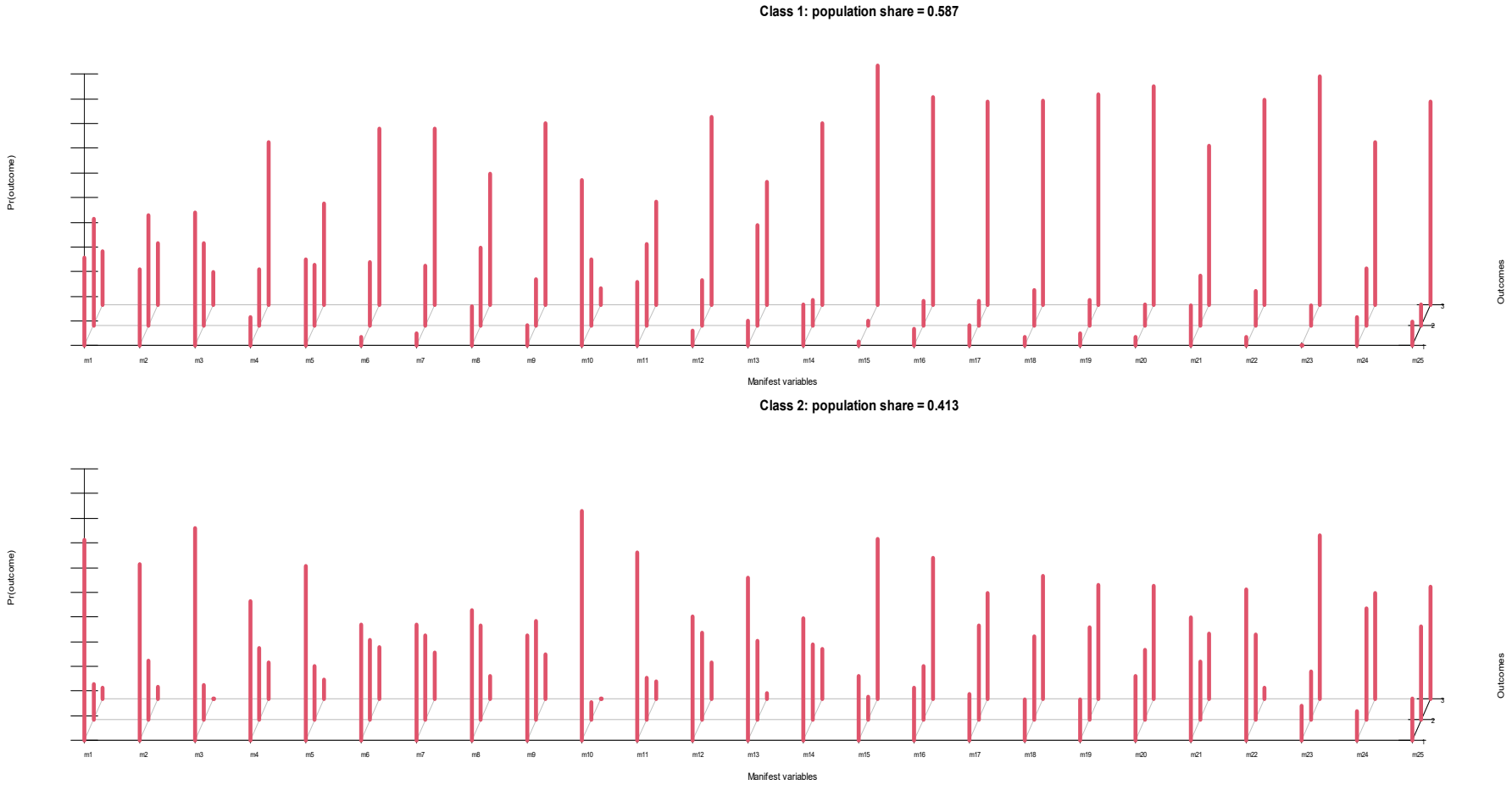

Figure 1. Conditional response probabilites of the obtained two-class model

Table 2. Conditional probabilities of item responses of class 1 (with-difficulty group)

Challenges	**I Disagree**	**I am Undecided**	**I Agree**
In Online Assessment;	**Conditional Probabilities (π_t^x)**		
Cheating	0.0165	0.0165	0.9669
Plagiarism	0.0000	0.0780	0.9220
Lack of Education Policies	0.0333	0.0827	0.8840
Underinvestment	0.0498	0.0998	0.8504
Assignments Taken from the Internet	0.0659	0.0954	0.8387
Lack of Feedback	0.0332	0.1389	0.8278
Lack of Training	0.0331	0.1423	0.8246
Internet Inaccessibility	0.0955	0.0824	0.8221
Software and Security Issues	0.0826	0.0956	0.8218
Operating System Issues	0.0606	0.1822	0.7573
Student Motivation	0.0828	0.1831	0.7341
Time Spent	0.1653	0.1008	0.7340
Student Adaptation	0.0348	0.2537	0.7115
Student Confusion	0.0497	0.2397	0.7105
Limitation of Techniques	0.1161	0.2264	0.6574
Technological Incompetence	0.1160	0.2276	0.6564
Security of Records	0.1618	0.1978	0.6404
Loss of Motivation Over Time	0.1588	0.3119	0.5293
Multiple Exams	0.1002	0.4033	0.4965
Restriction of Faculty Member Freedom	0.2588	0.3273	0.4139
Inflexibility in Scoring	0.3479	0.2448	0.4073
Scoring	0.3086	0.4439	0.2474
Assessment Information	0.3553	0.4296	0.2151
Transparency	0.5366	0.3310	0.1324
Board Pressure	0.6699	0.2639	0.0662

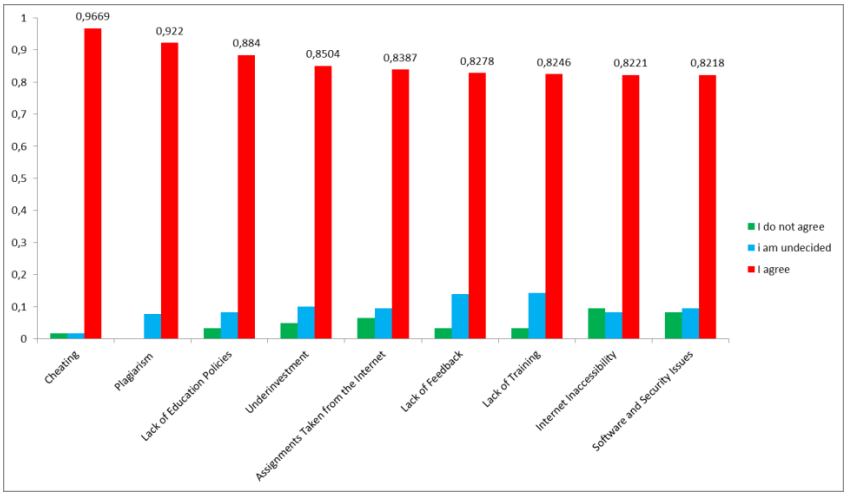

Figure 2. Greatest challenges for with-difficulty group

One of the benefits of latent class analysis is that probable reasons are explored by the interpretation of other response options. When the relevant questionnaire items are examined, it is seen that the faculty member was likely to choose the "I am undecided" option in many items, although the chances for the "I agree" option in some items were low. For example, when "scoring" and "assessment information" are examined, despite the low difficulty level, it is seen that the probability response to the "I am undecided" option was high. It is also observed that the conditional probability of the participants in Class 1 in "scoring" was 44% for the "I am undecided" option. This means the faculty members in this group had difficulty in scoring. On the other hand, the same applies to the conditional probabilities of (43%) the responses to "assessment information". The other items with a high probability of response to the "I am undecided" option were "loss of motivation over time" and "multiple exams". In a study, Flavin (2021) concluded that the participant faculty members had negative views on online assessment tools due to the new, multiple approaches towards online assessment, although they used such applications.

Findings of Class 2 (without-difficulty group) in Online Assessment Applications

When the results of the without-difficulty group in online assessment applications are examined, it is seen that the greatest challenges were the disposition towards "plagiarism in assignments" and "student cheating behavior". In Table 3, the conditional probabilities of Class 2 are listed.

Table 3. Conditional probabilities of item responses in class 2 (without-difficulty group)

Challenges	**I Disagree**	**I am Undecided**	**I Agree**
In Online Assessment;	**Conditional Probabilities (π_t^x)**		
Plagiarism	0.1409	0.1946	0.6645
Cheating	0.2584	0.0940	0.6477
Assignments Taken from the Internet	0.2118	0.2169	0.5713
Lack of Training	0.1644	0.3383	0.4973
Underinvestment	0.1642	0.3751	0.4607
Lack of Education Policies	0.2581	0.2819	0.4599
Internet Inaccessibility	0.1698	0.3763	0.4539
Software and Security Issues	0.1881	0.3811	0.4309
Technological Incompetence	0.1173	0.4521	0.4307
Security of Records	0.4986	0.2360	0.2654
Student Adaptation	0.4673	0.3212	0.2115
Time Spent	0.4936	0.3033	0.2031
Student Confusion	0.4697	0.3409	0.1894
Student Motivation	0.4228	0.3978	0.1794
Limitation of Techniques	0.5634	0.2893	0.1473
Operating System Issues	0.5013	0.3522	0.1465
Loss of Motivation Over Time	0.5262	0.3795	0.0943
Inflexibility in Scoring	0.7042	0.2162	0.0796
Restriction of Faculty Member Freedom	0.7601	0.1696	0.0703
Scoring	0.7129	0.2390	0.0481
Assessment Information	0.8111	0.1418	0.0470
Lack of Feedback	0.6105	0.3431	0.0464
Multiple Exams	0.6564	0.3201	0.0235
Transparency	0.8591	0.1409	0.0000
Board Pressure	0.9283	0.0717	0.0000

When Table 3 is examined, it is seen that the two most challenging behaviors for the faculty member were "plagiarism" and "cheating". When the conditional probabilities for plagiarism are considered, it is clear that 66% of the group in Class 2 had a probability to choose the "I agree" option, whereas the rest (65%) had a probability to choose the "I agree" option for cheating. On the other hand, the responses to the items such as "assignments taken from the Internet", "lack of training", "underinvestment" and "lack of education policies", which were among the most difficult areas for the faculty members, were found to have high conditional probabilities. When compared to the other group (with-difficulty), the low conditional probabilities mean the group had less difficulty in online assessment applications. When the responses to certain items are examined in detail, it is seen that the responses to the following items focused on both categories: software and security issues (38% I am undecided - 43% I agree) and technological incompetence (45% I am undecided - 43% I agree). This appears to be another finding of the research that shows the participants mostly preferred the "I am undecided" option, despite generally being without-difficulty in online assessment applications. The greatest challenges seemed to be transparency (86%) and board pressure (93%). Figure 3 was designed to present detailed information on the resulting greatest challenges.

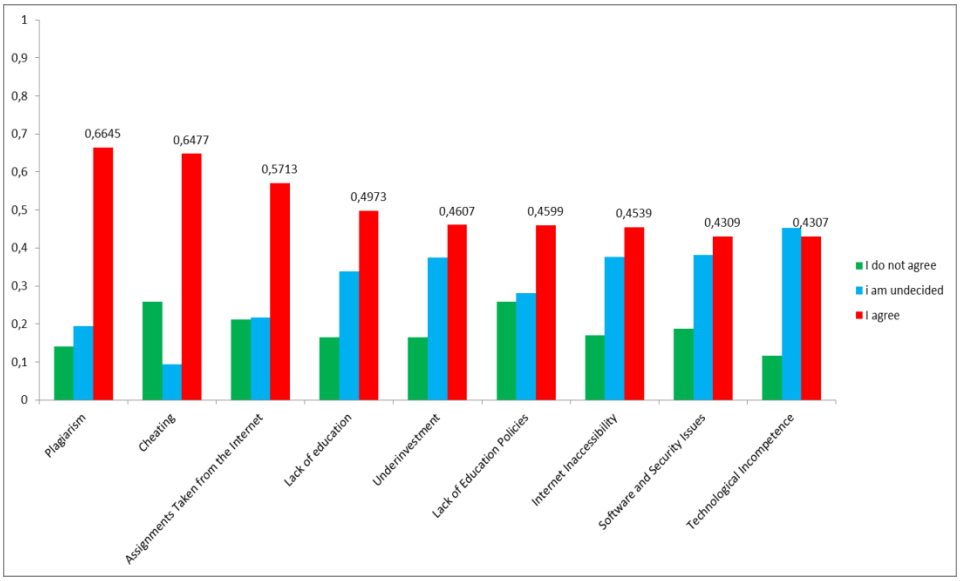

Figure 3. Greatest challenges for without-difficulty group

When figure 3 is examined, in consideration with the conditional probabilities to the following items, despite the high probability of response to the "I disagree" option, the participants mostly considered the "I am undecided" option; security of records (I disagree: 50% - I am undecided: 24%), student adaptation (I disagree: 50% - I am undecided: 24 %), time spent (I disagree: 49% - I am undecided: 30%), student confusion (I disagree: 47% - I am undecided: 34 %) and student motivation (I disagree: 42% - I am undecided: 40 %). This shows certain confusion in relevant areas.

Results and Discussion

Online assessment applications have appeared as requirements of the era both in the past and future. According to Stiggins (1992), faculty members spend a third of their time on online assessment applications for teaching, which makes up a great deal of time at work. Contrary to what is thought, online assessment is not a new, but a long-practiced method (Demir, 2014). In this research, challenges in online assessment applications experienced by the faculty members were examined. To this end, the greatest challenges in the literature were defined, and a measurement tool was designed as a result of the expert views and pretesting. Due to the nature of the measured structure, the observed-discrete variables are assumed to be continuous, which can make data interpretation difficult by using the well-known methods. However, they do not always have the continuous structure. As a result, latent class analysis was used to explore challenges experienced by the faculty member and to interpret the obtained data.

For the research, first, the number of latent classes was decided, and the data structure was considered to be a good fit for the two-class model. Following the decision on the number of classes, the two-class model was tested, and the item conditional probabilities were identified and interpreted. According to the obtained results, Class 1 was the with-difficulty group in online assessment applications, whereas Class 2 was the without-difficulty group. The former consisted of 59% of the participant faculty member. According to the result, a majority of the staff had difficulty in online assessment applications. When the conditional probabilities were examined, it was concluded that the observed variables to contribute most to the two-class data structure were as follows; cheating, plagiarism and lack of education policies. In a study, Guangul, et al. (2020) concluded that academic dishonesty was the most critical issue in online assessment. In their qualitative study, Vurdien & Puranen (2022) explored the perceptions of 34 faculty members about online assessment process and the experienced challenges. They pointed out that the most significant drawback, as taught by the faculty members, was the trust issues. For a more-detailed interpretation of the research results, the conditional probabilities of the classes were independently examined. In the groups with or without difficulty, the greatest challenges were similar, but the with-difficulty group highlighted lack of education policies and underinvestment in online assessment, whereas the without-difficulty group emphasized the assignments taken from the Internet and lack of training. According to Oosterhof (2008), if the expected performance and the purpose of evaluation and assessment are clearly expressed, dishonesty level could be minimized. Motivating students for assessment and learning prevents undesired behaviors. It is also ensured by guidance and feedback from faculty members. Khare & Lam (2008) associates dishonesty level with student' academic level. For instance, post-graduate students, compared to undergraduates, are asserted to have lower dishonesty levels, which is explained by the fact that post-graduates (at least in ideal cases) are mainly motivated by specialization in their relevant study fields and their commitment to meaningful usage in context. Supporting the idea, Khare and Lam (2008) observed that adult students generally prefer to improve their education on their own initiatives and have high chances to deep learning approaches to ensure minimum cheating. In addition, they suggested that whether constructive or summative, online assessment was more suitable for those assuming with autonomy and self-regulation dispositions. Another significant finding of the research is student adaptation and motivation. It is seen that when student motivation increases, the emerging challenges might be easily overcome. In the suggested online assessment cycle, Whitelock et al. (2006) suggests that the first step is motivation. The greatest challenge for undergraduates can be the unfamiliarity with computers or online assessment systems (Way, 2012). The current research has also shown that this problem is one of the greatest challenges. Sa'di, et al., (2021) point out that final exams given by faculty members are not "the beginning and the end of everything". However, many faculty members believe they cannot "electronically evaluate exams". For most of them, the reason is that the majority of students might be able to cheat during final exams and receive low scores despite all e-monitoring precautions. The failure to demonstrate real performance and especially undeserved high scores mean students are going to graduate with plenty of professional incompetencies. It can be suggested that online exams should be given in careful consideration with short, scientific methods, and that every student must be assigned a random question set in exams (Zhai, et al., 2020). Undergraduates will avoid plagiarism when given further information on academic honesty and on course syllabuses in detail (Lockman & Schirmer, 2020). Various assessment tools will also considerably decrease cheating (Darling-Aduana, 2021). Thus, faculty members and undergraduates must be well-informed about technological infrastructure and employed methods and provided with a sense of trust in systems in related areas.

Author Contributions

The author declares that no other author has contributed to the study and that he has read and approved the final version of the study.

Ethical Declaration

This research received approval from the Hakkari University's research ethics committee with the reference number: 20.12.2022-43035.

Conflict of Interest

The author(s) declare that there is no conflict of interest with any institution or person within the scope of the study.

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