

Computer Competency, Test Anxiety, and Perceived Ease of Use Profile Exploration of High School Students during Computer-Based Testing

Endah Mastuti¹, Seger Handoyo²

^{1,2} Faculty of Psychology Universitas Airlangga, Surabaya, Indonesia

In 2014 Indonesian government implemented computer-based testing in National Examination known as *Ujian Nasional Berbasis Komputer* (UNBK). In the implementation of computer-based testing, some things need to be taken into consideration, namely the discrepancy in computer literacy among test takers, including high school students. Literatures suggest that, in addition to mastery of the subjects being tested, individual differences and computer skill also affect one's performance in a computer-based test and the acceptance of the test itself. The aim of this research was to identify profiles of computer competency, test anxiety, and perceived ease of use during computer-based testing on students of two high schools which had recently implemented computer-based testing. Participants were 176 high school students who had had previous experience of computer-based test. K-means cluster analysis was employed. The result identifies three profiles out of N-176 research participants, namely the incompetence-ignore group (i.e. students who have low computer competency, low test anxiety, and perceived low ease of use) making up 21% of the participants, the competence-calm group (i.e. student with high computer competency, low test anxiety, and high perceived ease of use) making up 58.5% of the sample, and the incompetence-anxious group (i.e. students with low computer competency and high test anxiety, who perceive low ease of use) making up the rest 20.58%.

Keywords: computer-based test, high school student

The rapid advancement of information and communication technology (ICT) has affected individuals in various aspects, including education. In the last few decades, ICT advancement has been a part of teaching and learning process and also of the academic performance evaluation. Schools, as one of education institutions, have no choice but to keep up with and adopt to the technology advancement in all of their activities.

One example of ICT utilization is the implementation of Computer-Based Test (CBT) for evaluating academic performance. The implementation of CBT in Indonesia has started in the last few years. Some of its application include admission tests, final examination, and mid-term examination in universities and computer-based national examination or *Ujian Nasional Berbasis Komputer* (UNBK), school graduation test, and final examination in secondary schools. The development of CBT usage in secondary school was initiated by the implementation of UNBK, which has been effectuated on national level since 2014 in limited number of schools. In 2015, a pilot program of UNBK was implemented in a total of 556 schools, comprising 42 middle schools, 135 high schools, and 379 vocational schools from 29 provinces and overseas. The ministry of education and culture stated that UNBK is a form of computer-based test (CBT). In its administration, UNBK differs from the previous paper-based national exam (Ministry of Education and Culture, 2017). The policy governing the UNBK implementation has influenced the development of computer-based assessment on school level for mid-term and final examinations.

When computer-based testing is implemented widely in a community, digital divide should be within consideration. According to Wilson (2004 cited in Acilar, 2011), digital divide is "the inequality in access, distribution, and usage of information and communication technology between two or more populations." This digital divide issue generally compares the gap between those who have been familiar with access and usage of information technology and

those who are not used to access and utilize such technology. There are eight aspects of digital divide, namely physical access, financial access, cognitive access, design access, content access, production access, institutional access, and political access.

With regard to the UNBK policy by the government, digital divide should be taken into account especially given that Indonesia consists of various areas, ethics, cultures, and social-economical statuses. With various economic backgrounds, not all students have computer at home. This makes students differ in their readiness for taking CBT. In relation to living area, as reported by Jamiludin and associates (Jamiludin, dkk, 2017), students of secondary schools in Kendari, the farthest east area of Indonesia, prefer paper-based test (PBT) for national exam over the CBT form. Another research by Sofyan (2015) in a vocational high school in Yogyakarta showed that 33.62% of the students was ready,

According to an empirical data obtained from an initial survey by (Mastuti, 2017), there are still some issues related to students' individual differences, attitude, and perception toward CBT. CBT implementation in Indonesian schools is oftentimes mandatory which means students of those schools cannot refuse to take it (Mastuti, 2017). This might be accompanied by some potential psychological problems, such as anxiety and lack of self-efficacy. Also, students with psychological barriers in accepting CBT might not be able to complete the test optimally which in turn will affect the test result (Mastuti, 2017). Therefore, digital divide is a phenomenon of concern in the application of CBT for students in Indonesian schools.

Literatures suggest that individual differences influence the reception of computer-based testing. How well students accept technology would in turn affect their academic performance. A research by Oktapiani and associates (2016) investigated students' acceptance of online examination system using Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) perspective and found that: 1) Perceived ease of use affected perceived benefits by 61.8%; 2) Perceived ease of use influenced attitude towards technology by 23.3%; 3) Perceived benefits affected attitude towards technology by 61.7%; and 4) perceived ease of use impacted interest to use technology by 45.5%. Similar research by Widodo and colleagues (2017) examined students' acceptance of Computer-Based School-Level Examination or *Ujian Sekolah berbasis Komputer* (USBK) using the Unified Theory of Acceptance and Use of Technology (UTAUT) approach and revealed that the implementation of USBK was acceptable for teachers and students as part of their support to the learning activities, indicated by high level of performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating condition (FC), and behavior intention user behavior (BIUB). This research also found that PE, SI, and FC significantly influenced BIUB, while EE did not. Further, in relation to performance, a study by Schneberger and associates (2007) revealed that attitudes toward the use of CBT affected test performance in the test. Lu and colleagues (2016) reported the remarkable negative effect of test anxiety on performance in computer adaptive test (CAT). In addition, (Wise, Barnes, Harvey, & Plake, 1989) found that students with high computer anxiety obtained lower score in an Algebra test.

Current research focused on the grouping of students based on three individual difference aspects, namely computer competency, test anxiety, and perceived ease of use. This is in line with the findings of the initial survey by the researcher (Mastuti, 2017) which revealed that CBT implementation oftentimes does not take individual differences into consideration. The aim of this grouping is to explore individuals' acceptance of CBT application based on those three aspects.

Du (2004) defines computer competency as individual's knowledge and ability related to computer. Such knowledge allows individuals to operate a computer, software, database, and others form of technology in order to complete various academic tasks, relevant jobs, and personal goals. Regarding computer competency, researchers relate it with a research by Schneberger and associates (2007) which found that skill of expertise level correlated with academic performance. Skill of expertise is defined as individual's skill to use technology based on the expertise level they have achieved previously. Therefore, researchers think that test takers of CBT should have high computer competency which will help them adapting with the test.

Meanwhile, test anxiety is defined as tense, fear, excessive worry, nerve, and physiological arousal prior to and during CBT (Balogun & Olanrewaju, 2016). Some researches concerning test anxiety in CBT reported its negative correlation with behavioral intention in accepting a technology and also its effect on test performance (Alkist, 2010; Cassady, et al., 2005), Lu, et al., 2010).

Perceived ease of use is the extent to which individuals believe that using a particular system is free of effort. It takes after the definition of "ease" which is "freedom of difficulties or effort" (Davis, 1989). Oktapiani and Ramdhani (2016) demonstrated that perceived ease of use affected perceived benefits by 61.8%, attitude towards technology usage by 23.3%, and also interest of using technology by 45.5%. Alkist (2010) found that perceived ease of use positively correlated with behavioral intention to use web-based assessment. It indicates that perceived ease of use is an important variable in determining whether an individual will use a technology or not.

This research aims to: 1) make a profiling of students based on three aspects, namely computer competency, test anxiety, and perceived ease of use; 2) investigate differences in demographic characteristics, which are gender and major, across groups resulting from the student profiling based on the three psychological variables (i.e. computer competency, test anxiety, and perceived ease of use). Olafare (2011) demonstrated stark differences in perceived of use between men and women during CBT.

The research questions of this study are:

1. What are the results from profile identification of test takers based on computer competency, test anxiety, and perceived ease of use?
2. Is there any gender and majoring difference across the constructed profiles?

METHOD

This research conducted a survey to high school students who had prior experience with Computer-Based Testing (CBT). The variables used as the bases for the clustering in this research are computer competency, test anxiety, and ease of use. Meanwhile, the demographic variables involved in this research are gender and study major.

Participants

Participants of current research were 176 high students from two different high schools which have implemented CBT for six to twelve months. The participants should have experience of taking CBT for once to three times. Participants from the two schools were selected using purposive sampling technique. Sixty-six (37.5%) participants were female, while the other 110 (62.5%) were male. In term of majoring, 68 participants were from social science major and 108 participants were from natural science major.

Procedure

Data was collected in high schools which have implemented CBT for six months to a year. The data was self-report of students who had taken CBT for at least once. Data collection was conducted by distributing the three measures.

Material

The materials of this research are three scales, as follow: 1) Computer Competency Survey by Du (2004) which had been translated to Indonesian, researchers only used 11 out of 12 items in the scale because the twelfth item was respondent’s subjective comment on their general computer ability; 2) Test Anxiety scale, was based on the Test Anxiety Inventory (TAI) by Taylor and Diane (2002) which had been translated into Indonesian and in which the term “test” had been changed into “computer-based test”. Details concerning the number of items, mean, SD, and Alpha of each measure can be located on Table 1.

TABLE 1. Research Measures

| Measure | No. of item | Mean | (SD) | Cronbach’s Alpha |
|------------------------------|-------------|---------|----------|------------------|
| <i>Computer Competency</i> | 11 | 53.4034 | 12.60212 | 0.858 |
| <i>Test Anxiety</i> | 20 | 40.8977 | 10.10068 | 0.901 |
| <i>Perceived Ease of Use</i> | 6 | 28.6307 | 8.38331 | 0.869 |

Data Analysis

Data was analyzed using cluster analysis with K-means method. This analysis is suggested by Arai & Ridho (2007) because of its ability to group big data with a relatively fast and efficient computation time. In this research, cluster analysis was used to classify individuals into groups or profiles based on their similarities. The aim of cluster analysis is to group observations by taking distances and similarities into consideration, so it will bring out differences between groups and similarities within groups onto the highest level. Aside from that, its aim is to make a model which will determine profiles or types among participants (Stenlund, et al., 2016).

RESULT

Based on cluster analysis using K-means method, the result shows that Cluster 1 consists of 37 (21%) participants, Cluster 2 of 103 (58.5%) participants, and Cluster 3 of the rest 36 (20.58%) participants. This result is shown on Table 2. Clusters were constructed based on shared similarities in responding the three scales measuring computer proficiency, test anxiety, and perceived ease of use. Figure 1 illustrates the description of the three clusters.

According to those three variables, Cluster 1 was labelled as the *incompetence-ignorance* group, Cluster 2 as the *competence-calm* group, and Cluster 3 as the *incompetence-anxious* group. The three clusters are markedly distinct in term of their computer competency, test anxiety, and perceived ease of use level. The differences across clusters are significant, in term of computer competency, $F(112.236)$, $p < 0.000$; in term of test anxiety, F -value of 99.618 with $p < 0.00$ and, in term of perceived ease of use, F -value (47.753) with $p < 0.000$. Details are provided in Table 3.

TABLE 2: Number of Cases in each Cluster

| Cluster | 1 | 37.00 |
|---------|---|-------|
|---------|---|-------|

| | | |
|---------|---|--------|
| | 2 | 103.00 |
| | 3 | 36.00 |
| Valid | | 176.00 |
| Missing | | .000 |

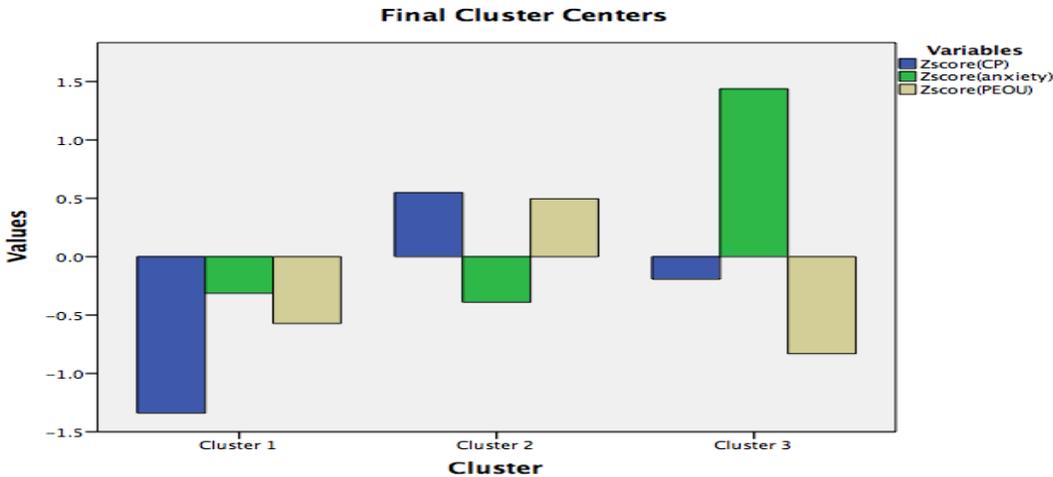


Figure 1.
Final Cluster Centers

TABLE 3: ANOVA analysis

| ANOVA | | | | | | |
|--------------------------------|-------------|----|-------------|-----|---------|------|
| | Cluster | | Error | | F | Sig. |
| | Mean Square | df | Mean Square | df | | |
| Zscore (Computer Competency) | 49.416 | 2 | .440 | 173 | 112.236 | .000 |
| Zscore (Test anxiety) | 46.834 | 2 | .470 | 173 | 99.618 | .000 |
| Zscore (Perceived Ease of Use) | 31.123 | 2 | .652 | 173 | 47.753 | .000 |

As illustrated in Figure 1, Cluster 1, the incompetence-ignorance, is a group of students who have low computer competency, low test anxiety, and perceived low ease of use. Cluster 2, the competence-calm is a group comprising students with high computer competency and low level of test anxiety, who perceived high ease of use. Cluster 3, the incompetence-anxious, is a group of those who have low computer competency, high test anxiety, and low level of perceived ease of use. Each cluster are elaborated in more details below.

Cluster 1, the incompetence-ignore group

Among 176 participants in this research, 21% of them are included in this cluster. Out of the 21 percent, the 8.5% is male participants and the 12.5% is females. Among the male sample, this cluster have the second biggest percentage, which is 22.7%. Meanwhile, it has smallest percentage of the total female participants, which is 20%. The details are shown in Table 5. In term of study major, out of 21% of total participants, the 12.5% of it is students of social science major, while the rest 8.5% is of natural science major. Compared with the total social science

students, this cluster has the second biggest percentage of them, that is 32.4%. Meanwhile, among the natural science major, it has the smallest percentage among the three clusters, which is 13.9%. This result is located in Table 6.

Cluster 2, the competence-calm group

In this group, 58.5% of the total sample is included. Out of the 58.5 percent, the 21.6% is males and the 36.9% is females. It has 57.6% of the total male participants and also the biggest percentage of total female participants, which is 59.1%. It implies that this cluster is the biggest group of all, both within the male and female sample. Detail result is shown in Table 5. In term of the majoring, out of the 58.5% sample in this cluster, the 19.9% is students of social science major and the rest 38.5% is of natural science major. Among all of the social science students, this cluster has the biggest percentage of them, which is 51.5%. Meanwhile, in the natural science student sample, also the biggest percentage (63%) is classified into this cluster. This result is provided in Table 6.

Cluster 3, the incompetence-anxious group

Individuals who are categorized in this group makes up 20.5 percent of the total participants, in which the 7.4% of it is males and the other 13.1% is females. In this cluster, male students make up the smallest percentage of the total male participant, which is 19.7%, while the female counterparts make up the second biggest percentage of the female sample which is 20.9 percent. In general, this group is the smallest of the three, with a slight difference in number from Cluster 1. Detailed result is shown in Table 5. In term of majoring, out of 20.5% participants included in this group, the 6.3% is students from social science major and the remaining 1.2% is from the natural science. Among the social science majoring alone, this cluster makes up the smallest percentage, which is 16.2%. Meanwhile, among all of the natural science major students, this group has the second biggest percentage, which is 23.1%. This result can be located on Table 6.

TABLE 4: Mean and SD of Each Cluster

| Variable | Cluster 1 (n= 37, 21%) M (SD) | Cluster 2 (n=103, 58.5%) M (SD) | Cluster 3 (n=36, 20.5%) M (SD) |
|------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|
| <i>Computer Competency</i> | 36.51 (10) | 60.32 (6.9) | 50.97 (9.9) |
| <i>Test Anxiety</i> | 37.72 (5.9) | 36.96 (7.1) | 55.41 (7.1) |
| <i>Perceived Ease of Use</i> | 23.83 (7.4) | 32.78 (5.8) | 28.63 (8.4) |

TABLE 5: Clustering Percentage based on Gender

| Cluster Number of Case * gender Crosstabulation | | | | | |
|---|---|-----------------|--------|-------|-------|
| | | gender | | | |
| | | Male | Female | Total | |
| Cluster Number of Case | 1 | Count | 15 | 22 | 37 |
| | | % within gender | 22.7% | 20.0% | 21.0% |
| | | % of Total | 8.5% | 12.5% | 21.0% |
| | 2 | Count | 38 | 65 | 103 |

| | | | | | |
|-------|---|-----------------|--------|--------|--------|
| | | % within gender | 57.6% | 59.1% | 58.5% |
| | | % of Total | 21.6% | 36.9% | 58.5% |
| | 3 | Count | 13 | 23 | 36 |
| | | % within gender | 19.7% | 20.9% | 20.5% |
| | | % of Total | 7.4% | 13.1% | 20.5% |
| Total | | Count | 66 | 110 | 176 |
| | | % within gender | 100.0% | 100.0% | 100.0% |
| | | % of Total | 37.5% | 62.5% | 100.0% |

TABLE 6: Clustering Percentage based on Majoring

| | | Cluster Number of Case * Majoring Crosstabulation | | | |
|------------------------|-------------------|---|-----------------|--------|-------|
| | | Majoring | | | Total |
| Cluster Number of Case | | Social Science | Natural Science | | |
| | | Cluster Number of Case | 1 | Count | 22 |
| % within Majoring | 32.4% | | | 13.9% | 21.0% |
| % of Total | 12.5% | | | 8.5% | 21.0% |
| 2 | Count | | 35 | 68 | 103 |
| | % within Majoring | | 51.5% | 63.0% | 58.5% |
| | % of Total | | 19.9% | 38.6% | 58.5% |
| 3 | Count | | 11 | 25 | 36 |
| | % within Majoring | | 16.2% | 23.1% | 20.5% |
| | % of Total | | 6.3% | 14.2% | 20.5% |
| Total | Count | 68 | 108 | 176 | |
| | % within Majoring | 100.0% | 100.0% | 100.0% | |
| | % of Total | 38.6% | 61.4% | 100.0% | |

DISCUSSION

Profiling based on three variables, i.e. computer competency, test anxiety, perceived ease of use, resulted in three groups, namely incompetence-ignore, competence-calm, and incompetence-anxious. Among 176 students, 21 percent of them are classified into the incompetence-ignorance group, 58.5% in the competence-calm group, and the rest 20.58% in the incompetence-anxious.

The competence-calm group, whose profile includes high computer competency, low test anxiety, and high perceived ease of use, is an ideal profile. According to a research by Du (2004), individuals with computer competency will be more likely to enjoy and not to find difficulties with web-based distance learning (Du, 2004). Schneberger et al (2007) found that skill of expertise level correlated with academic performance in web-based assessments. The low level of test anxiety in this group indicates high intention to use technology. Alkist (2010) showed that anxiety correlated inversely with behavioral intention to use web-based assessments. If an individual experiences high anxiety, they will have low level of academic performance (Lu et al, 2016). In term of perceived ease of use, according to previous researches, perceived ease of use affects behavioral interest or intention to use technology (Oktapiani, et al., 2016, Alkist,

2010). It implies that if individuals perceive technology as easy, they will also have high intention to use it.

The incompetence-ignore group is the test takers with low computer competency, but whose test anxiety and perceived ease of use are low. This group includes students who do not feel anxious despite having low level of computer competency and perceived ease of use.

In the incompetence-anxious group, students have low computer-competency, low perceived ease of use, and high level of test anxiety. Such condition is unideal condition for students because of the low level of competency and they find technology as difficult and feel anxious while using it.

Two clusters, the incompetence-ignorance and the incompetence-anxious group, have similar percentages of students, which are 21% for the incompetence-ignorance group and 20.58% for the incompetence-anxious. This means that 41.58 percent of the students were not in the ideal profile, suggesting a need for attention.

Gender-wise, the majority of female participants was included in the competence-calm group, followed by the incompetence-anxious and the incompetence-ignorance consecutively. Meanwhile, among the male participants, the majority was categorized in the competence-calm, followed by the incompetence-ignorance, then the incompetence-anxious with the smallest number of male students. Both genders are predominantly classified into the competence-calm group. However, there are more male students in the incompetence-ignorance group than in the incompetence-anxious, while there are more female participants in the incompetence-anxious than in the incompetence-ignorance.

In term of the majoring, there are two concentrations in high school, which are natural science and social science. Both natural science and social science major are predominantly included in the competence-calm, which is the ideal cluster. In more detail, there are more students of natural science major in the incompetence-anxious group than in the incompetence-ignorance, while there are more social science students in the incompetence-ignorance group than in the incompetence-anxious. Considering the similarities between the frequency distribution, the profile order of natural science students is similar to that of the male students, while the profile order of the social science is similar to that of the female participants.

This research has its limitations. First of all, this research is based on between-group analysis. It makes the effect of the differences between group on academic performance unclear, because the researchers did not measure it. We suggest future studies to measure academic performance as well, so that comparison to find out which group has the highest academic performance is possible. The self-report measures in this research also have their limitation which allows response bias to happen, such as self-representation bias in which testees report what might be expected from them, instead of the actual condition (Bradburn et al. 2004, cited in Stenlund, 2016). The measures also rely on participants' memory about their experience of taking CBT. Such recalling protocol might make the response inaccurate. Data collection in future researches should be conducted right away after the administration of CBT.

Acknowledgements: Rahkman Ardi for the feedbacks and suggestion.

REFERENCES

Acilar, A. (2011) Exploring the Aspects of Digital Divide in a Developing Country . Issues in Informing Science and Information Technology Volume 8.

- Alkist (2010) Identifying Factors That Affect Students' Acceptance Of Web-Based Assessment Tools Within The Context Of Higher Education. *Master Dissertation*, Middle East Technical University.
- Arai, K., & Ridho, A. (2007). Hierarchical K-means: an algorithm for centroids initialization for K-means. Reports of the Faculty of Science and Engineering, Saga University, Vol. 36(1), 25–31, No.1, 2007
- Balogun, A. G., & Olanrewaju, A. S. (2016). Role of computer self-efficacy and gender in computer-based test anxiety among undergraduates in Nigeria. *Psychological Thought*, 9(1), 58–66. <https://doi.org/10.5964/psyc.v9i1.160>
- Cassady, J. C. & Gridley, B. E. (2005). The effects of online formative and summative assessment on test anxiety and performance. *Journal of Technology, Learning, and Assessment*, 4(1). Available from <http://www.jtla.org>
- Davis, F. D. (1989). Perceived Usefulness , Perceived Ease Of Use , And User Acceptance. *MIS Quarterly*, 13(), 319–339. <https://doi.org/10.2307/249008>
- Du (2004). The Relationship Between Students' Computer Competency and Perception of Enjoyment and Difficulty Level in Web-based Distance Learning. *Education Libraries* Volume 27, No. 2 Winter 2004 5
- Jamiludin, Darnawati, Uke, W. A. . (2017). Students' Perception Towards National Examination 2017 : Computer-Based Test or Paper-Based Test, 8(4), 139–144.
- Kemendikbud (2017). <https://unbk.kemdikbud.go.id/tentang> , diakses 17 Juli 2017
- Lu, H., Hu, Y. P., Gao, J. J., & Kinshuk. (2016). The effects of computer self-efficacy, training satisfaction and test anxiety on attitude and performance in computerized adaptive testing. *Computers and Education*, 100, 45–55. <https://doi.org/10.1016/j.compedu.2016.04.012>
- Mastuti, E. (2017) Manuscript in preparation, unpublised
- McDonald, A. S. (2002). The impact of individual differences on the equivalence of computer-based and paper-and-pencil educational assessments. *Computers and Education*, 39(3), 299–312. [https://doi.org/10.1016/S0360-1315\(02\)00032-5](https://doi.org/10.1016/S0360-1315(02)00032-5)
- Olafare, F. O. (2011). Students' Characteristics As Predictors Of Their Perceptions On The Effectiveness Of Computer-Based Test In Nigerian. *Pakistan Journal Of Education*.
- Oktapiani dan Ramdhani (2016). *Kajian Penerimaan Sistem Ujian Online Menggunakan Technology Acceptance Model (TAM) Dan Theory Of Plan Behavior (TPB) Di SMK Pasim Plus Kota Sukabumi*. Seminar Nasional Ilmu Pengetahuan dan Teknologi Komputer, [S.l.], p. INF.103-INF.112, dec. 2016.
- Osika, E. R., & Sharp, D. P. (2002). Minimum Technical Competencies for Distance Learning Students. *Journal of Research on Technology in Education*, 34(3), 318-325.
- Schneberger, S., Amoroso, D. L., & Durfee, A. (2007). Factors That Influence the Performance of Computer-Based Assessments: an Extension of the Technology Acceptance Model. *The Journal of Computer Information Systems*, 48(2), 74–90.
- Shermis, M. D., & Lombard, D. (1998). Effects of computer-based test administrations on test anxiety and performance. *Computers in Human Behavior*, 14(1), 111–123. [https://doi.org/10.1016/S0747-5632\(97\)00035-6](https://doi.org/10.1016/S0747-5632(97)00035-6)
- Sofyan, E. M. (2015). Kesiapan Pelaksanaan Ujian Nasional Berbasis Komputer bagi Siswa Program Keahlian Teknik Instalasi Tenaga Listrik SMKN 2 Yogyakarta.
- Stenlund, (2016). *The Successful Test Taker: Exploring Test-Taking Behavior Profiles Through Cluster Analysis* . Eur J Psychol Educ (2018) 33:403–417
- Terzis, V., & Economides, A. a. (2011). The acceptance and use of computer based assessment. *Computers & Education*, 56(4), 1032–1044. <https://doi.org/10.1016/j.compedu.2010.11.017>
- Taylor, J & Diane.F.P (2002) Development of a Short Form of the Test Anxiety Inventory (TAI). *The Journal of General Psychology* vol 129.
- Vispoel, W. P., Rocklin, T. R., & Wang, T. (1994). Individual Differences and Test Administration Procedures : A Comparison of Fixed- Item, Computerized-Adaptive , and Self-Adapted Testing. *Applied Measurement in Education*, 7(1), 53–79. <https://doi.org/10.1207/s15324818ame0701>
- Wise, S. L., Barnes, L. B., Harvey, A. L., & Plake, B. S. (1989). Applied Measurement in Education Based Achievement Test Performance of College Students Effects of Computer Anxiety and Computer Experience on the Computer-Based Achievement Test ~ ertormance of College Students. *Applied Measurement in Education*, 2(3), 235–241. <https://doi.org/10.1207/s15324818ame0203>
- Widodo, A.P, Gernowo, R (2017) Hubungan Faktor Penerimaan Aplikasi Ujian Sekolah Berbasis Komputermenggunakan Model Utaut. Seminar Nasional Pendidikan, Sains dan Teknologi ISBN : 978-602-61599-6-0 Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Muhammadiyah Semarang