PROCEEDING

INTERNATIONAL CONFERENCE ON
EDUCATIONAL RESEARCH AND EVALUATION (ICERE)

“Assessment for Improving Students’ Performance”

May 29 – 31 2016
Rectorate Hall and Graduate School
Yogyakarta State University
Indonesia
Organized by:
Study Program of Educational Research and Evaluation
Graduate School, Yogyakarta State University
in Cooperation with Indonesian Educational Evaluation Association (HEPI),
and Center for Educational Assessment (PUSPENDIK) Ministry of Education and Culture
Foreword of the Chairman

Assalamualaikum wr. wb.

Good morning ladies and gentlemen.

Praise be to Allah who has given abundant blessings so that we can hold this international conference.

This conference is aimed at improving the quality of assessment implemented in schools and other institutions. The quality of assessment determines students’ ways of learning, so that it is hoped that the quality of education improves. Besides, this conference is a means of information exchanges in the forms of seminars dealing with results of research in educational assessment and evaluation. The expectation is that there is always improvement in educational assessment and evaluation methods, including in it is the instrument – both cognitive and noncognitive instruments.

The participants of this conference are the lecturers and teachers who teach educational assessment and evaluation, practitioners of assessment and evaluation, and researchers of assessment and evaluation. This conference can be held in cooperation with the Graduate School, Yogyakarta State University, Association of Educational Evaluation of Indonesia (HEPI), and Centre for Educational Research, Ministry of Education and Culture of Indonesia, supported by the Australian Council for Educational Research (ACER), Intel, Intan Pariwara Publisher, and many other institutions. For this reason, on behalf of the Organizing Committee, I would like to thank the Rector of Yogyakarta State University, Prof. Dr. Rochmat Wahab, M.Pd., M.A., and the Director of Graduate School, Yogyakarta State University, Prof. Dr. Zuhdan Kun Prasetyo, M.Ed., and all other institutions for their assistance and contribution that have made this conference possible. I would like to thank HEPI’s Local Coordination Unit and all sponsors for supporting this conference and also all the audience for participating in this conference.

To the committee members, both in Jakarta and Yogyakarta, I would like to thank them for the hard work they have performed and for the togetherness so that this conference can be held.

Last but not least, we apologize for all the inconveniences you might encounter during this conference. Please enjoy the conference.

Wassalamu’alaikum wr. wb.

Prof. Djemari Mardapi, Ph.D.
Foreword of the Chairman of Himpunan Evaluasi Pendidikan Indonesia (HEPI)

Assalamu’alaikum Wr. Wb.

Indonesian Association for Educational Evaluation (HEPI) is a professional organization in education holding in the high esteem the principles of professionalism and knowledge development in the field of educational and psychological measurement, assessment, and evaluation. HEPI was established in November 19, 2000 in Yogyakarta, with a vision to become a professional organization that excels in the field of evaluation and measurement in education and psychology in Indonesia. Its mission is to develop up-to-date methodologies of evaluation, assessment, measurement, and data analysis in education and psychology, as well as studies of policies and technical implementation of the field for improving Indonesian education quality.

As a professional organization, HEPI brings together experts, practitioners and interested persons in the field of evaluation, assessment, and measurement of education, psychology and other social sciences. HEPI is open to anyone who has the interest the field with no restriction in terms of educational background and working experiences. Hopefully, through HEPI, members of the association can sustainably develop themselves as professionals. The existence of HEPI is also expected to contribute to the improvement of the quality of national education through research, consultancy, seminar, conference, publication, and training for members of the organization and for public audiences.

HEPI organizes annual workshop and conference in cooperation with the Regional Chapter of HEPI and universities. In 2016, for the first time HEPI organized International Conference on Educational Research and Evaluation: Assessment for Improving Student’s Performance in May 29-30 2016 in Yogyakarta. This conference is jointly organized by HEPI and Yogyakarta State University and supported by the Center for Educational Assessment the Ministry of Education and Culture, Australian Council for Educational Research (ACER), INTEL Indonesia, and Intan Pariwara Publisher.

It is important to note that the choice of the HEPI 2016 conference theme is driven by the fact that the quality of our national education is still under expectation as shown by the results from School National Exam and international surveys conducted by some international agencies. HEPI believes that a number of factors contribute to the low quality of national education, including low teacher’s knowledge and skills in classroom and school assessment. Therefore, improving the competence of teachers in classroom and school assessment is urgently required. In this context HEPI as a professional organization and individual members of the organization have to play an active role in improving teachers’ competence in quality learning assessment.

In line with 2016 conference theme, HEPI invited two respected guest speakers, namely, Professor Geoffrey Masters, Ph.D., Director of the Australian Council for Educational Research (ACER), who presented a paper on Assessment to Improve Student Competency and Professor Frederick Leung, Ph.D., from the University of Hong Kong, who delivered a paper on the International Assessment for Improving Classroom Assessment.

As a tradition, in 2016 conference HEPI organized two pre-conference workshops. The first workshop is on the conceptual introduction of Rasch model by Jahja Umar, Ph.D., senior lecturer at the Faculty of Psychology, State Islamic University Jakarta and the second workshop was delivered by Heru Widiatmo, Ph.D., researcher at American College Testing (ACT) Iowa, United States on Measuring Higher Order Thinking Skills (HOTS).

On behalf of HEPI, I would like to express my heartfelt gratitude to Rector of the Yogyakarta State University, invited speakers, resource persons, HEPI regional chapters, sponsors, speakers, participants, invited guests, and organizing committee who have worked hard in making this international conference a success. Thank you very much for your participation and support and we are looking forward to seeing you in the next conference.

Last but not least, we hope that all of us get much benefit from this conference for enhancing Indonesian quality education through quality assessment.

Wassalamualaikum wr. wb.

Chairman,

BAHRUL HAYAT, Ph.D.
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Developing Science Process Skill Instrument of Islamic Senior High Schools

Kadir $^1$ Sri Wahyuningsih $^2$, Abd. Rahman A. Ghani $^3$

$^1$ \textit{kadir@uinjkt.ac.id}, Dosen UIN Syarif Hidayatullan Jakarta
$^2$ \textit{umifathur.18@gmail.com}, Guru Biologi MAN 17 Jakarta
$^3$ \textit{abdulrahman.ghani@yahoo.co.id}, Direktur dan Dosen SPs. UHAMKA

Abstract - The objective of this study was to develop a reliable and valid instrument for students’ science process skill in biology subject at Islamic Senior High Schools in DKI Jakarta. Five Islamic Senior High Schools in DKI Jakarta was selected by random sampling technique from 22 Islamic Senior High Schools in DKI Jakarta which focused on twelfth grade. This study used a research and development method. The result of study reveals that (1) From 48 items representing every dimension and the indicator showed that only 46 items are categorized valid after assessed by 20 panelist based on the value of CVR, which obtained the highest CVR value of 1.00 and the lowest was 0.30. (2) From the 46 items which had been tested and showed that only 41 items were categorized as valid based on item analysis ‘ITEMAN’ program, it was founded that items were valid which have pointbiserial coefficient $>0.20$ and reliability coefficient of 0.867 which means that the reliability of the instrument science process skills are very good. (3) From the 41 items assessed for compliance which is valid between the instrument models and the data in the field using CFA, with construct realliability 0.986 and obtained minimum value Function Fit Chi-Square = 744.06 ($P = 0.06$) which indicates that the instrument developed a new appropriate approaches. Based on the result above, it can be drawn conclusion that observing, classifying, measuring, inferring, predicting, and communicating can measure the students’ science process skill.

Keywords: validity, realiability, science process skill, confirmatory factor analysis.

I. INTRODUCTION

Achieving of the n Japanese children in TIMSS 2011 on the rank 40 and at the position 38 from 42 countries shows the low of learning achievement in learning science and mathematics in our country. Instruction or learning has not ... between hands-on and minds-on, which is not give any impact and benefit to the science teachers because testing system that only measuring the concept mastery and definitions. (Rustaman, 2007: 818). Another resemble opinion as stated by Elin Driana (Kompas, December 12, 2012) that “instruction in top countries rank in PISA is more focuses on higher reasoning level has changed instruction which material mastery oriented for preparation to test and memorizing and drills. The changing of focus on instruction needs the teachers who have ability in creating learning atmosphere which supporting it”

The main cause of the low science process skill is lack of thinking skill because of the lack of and less of tests which measure the achievement about thinking. process skill involves intellectual skill, manual, ans social. Intellectual skill is process skill which involving thinking, manual skill involves using tools and equipments, and social skill involves social interaction in teaching and learning and discussing based on the result of observation.

Rustaman (2007) states that science process skill is scientific inquiry, procedure that guides to gain knowledge and to give definition which more meaningful to the students. Through developing science process skill can be given the opportunity to develop the concept and process simultaneously. According to Rezba, et al. (Patta Bundu, 2006: 24), there are some types of science process skill, namely: observing, classifying, measuring, inferring, predicting, and communicating.
Based on the problems above, it indicates that lack of empowering the test property which measuring the achievement about thinking as one of the cause of low science process skill in science education. So that it is needed an instrument which objective, valid, reliable to assess students’ science skill. Based on some problems elucidated above, the objective of the research are to develop scienee process skill in Islamic Senior high school in Biology subject.

The results of this research are expected to give some significant contributions not only theoretically but also practically as follows: (1) Academically, can enrich the measurement theory, especially science process skill; (2) Practically, can be used to analyze a profile of mastery of science process skill for students.

II. METHOD

This research method used in this investigation was Research and Development. Nest, this research adapted Borg & Gall (Sugiyono, 2010: 271) which are consist of 10 stages to be 5 stages, namely: (1) product analysis which will be developed; (2) developeing of initial product; (3) product validation; (4) field try-out; and (5) product revision.

There are some stages in developing science process skill instrument, they are as follows:
1. Developing blue print.
2. Constructing item thorough discussion among Biology teachers.
3. Revising instrument based on expert judgement.
4. Trying-out stage one to know the essential indicator and readability.
5. Trying-out empirically to know validity and reliability.
6. Testing Fit Model through conformatory factor analysis.

A. Validity Testing

In developing instrument to measure the science process skill, the content validity, theoretically conducted by an expert and 20 Biology teachers to make sure that the test items are relevant and represent all domain are measured. Content validity is measured by using Content Validity Ratio (CVR) with Lawshe formula as follows:

\[
CVR = \frac{(Ne - N)}{N} \frac{2}{\pi}
\]

Keterangan:
Ne: total number of pannelist who assess esensial, N: total of panelist

Valid item if CVR ≥ minimum value CVR for 20 raters as 0.42. empirical stage one with ITEMAN program. Coefficient validity stated as a good category if coefficient is higher than 0.20.

Furthermore conducted parameter estimated testing on loading factor (λ) by using CFA. The criteria which using was valid items if \( \lambda > 0.5 \) or t-statistical testing of parameter \( \lambda \) higher than 1.96.

B. Reliabilitas

The concept of reliability in this respect meant that reliability of measurement tool related to the problem of measurement error. According to Menurut Sudaryono (2012: 155), reliability related to the error in choosing sample which refers to inconsistency of the measurement result if the measurement reconducted on different group.

The level of reliability in this research estimating based on the score of reliability coefficient calculated by using formula (Wijanto, 2008: 175):

\[
\text{Construct reliability (CR)} = \frac{\left(\sum \text{loading}\right)^2}{\left(\sum \text{loading}\right)^2 + \sum \varepsilon_i}
\]

\[
\text{Variance extracted (VE)} = \frac{\sum \text{loading}^2}{N}
\]

Model reliability estimation regarded good if CR ≥ 0.70 dan VE ≥ 0.50.
III. RESULT

The findings of each stage of instrument development of science process skill is presented as follows.

A. Theoretical Validation (Tried-out stage 1)

Tried-out rationally by expert on the property of instrument of science process skill was conducted to expert teacher and some Biology teachers and so as expert teacher. The panelists perused each of the basic science process skill based on the indicators which were designed, and confirmed the fitness of test items with the way of giving score for essential items (E) and inessential test items (IE). The results of grading given by the panelists on test items of science process skill, show that there are 6 dimensions which are consist of 48 items have been validated and there were 46 items considered valid and 2 items not valid, with the scale score of CVR from 0.30 up to 1.00.

B. Empirical validation (The Second Stage Try-out)

The result of empirical testing of the instrument of students' science process skill to 397 grade XII of Islamic senior high school in DKI Jakarta. Meanwhile, the results based on ITEMAN program, reveals that there are 5 test item were not valid (score of Point Biserial < 0.20) they are number 1, 5, 8, 10, and 26. So, the total number of valid items are 41 with reliability coefficient (KR-20) is 0.867, this value or score can be inferred that the test items high are developed have high reliability.

C. Confirmatory Factor Analysis (CFA)

The result of parameter analysis $\lambda$ (loading factors) used CFA reveals that all item has value or score $\lambda > 0.5$ or statistical value/score based on t-test $> 1.96$, with scale score $\lambda$: observation dimension consist of 13 test item, was (0.75–2.75), classification dimension consists of 5 items (0.56–2.17), measure 2 items (1.00), inference 5 items (1.00–1.13), prediction 4 items (0.08–1.00), and communication dimension consist of 5 items (0.52–1.00). This results show that there are 41 items have good validity to measure 6 dimension of science process skill.

Next, the result of Construct Reliability analysis (CR) and variance extracted (VE), shows that observation (CR=0.99; VE= 0.93), classification dimension (CR=0.97; VE= 0.88), measure (CR=1.00; VE= 1.00), inference (CR=0.98; VE= 0.92), predict (CR=0.87; VE= 0.77), and communication dimension (CR=0.87; VE= 0.78). The reliability testing shows that the score CR > 0.70 dan VE > 0.50. So that the reliability estimation both all dimension and individual one based on dimension and factor shows that the instrument of science process skill has a very good internal consistency.

The result as depicted through the path diagram below shows that the instrument of science process skill based on dimensions, covers classification observation, measure, inference, predict, and communicate (Figure 2).
Furthermore, the testing of the model appropriateness meant to measure about to what extent is the measurement model which is proposed fit or appropriate with the research data. The following statistical testing is to test which is the fit/appropriate indicator. The statistical formulas used were Chi-Square, RMSEA, ECVI, AIC, CAIC, NFI, NNFI, PNFI, CFI, IFI, RFI, GFI, CN, RMR, and AGFI. The result based on analysis through using Fit Model can be presented in the following table.
Table 1. Summary of fit model

<table>
<thead>
<tr>
<th>GOF Criteria</th>
<th>Fit Indikator</th>
<th>Estimation</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square (p)</td>
<td>Small score p &gt; 0.05</td>
<td>(\chi^2 = 744.06) ((p = 0.06))</td>
<td>good</td>
</tr>
<tr>
<td>NCP Interval</td>
<td>Small interval score that narrow</td>
<td>352.82</td>
<td>Fairly good</td>
</tr>
<tr>
<td>RMSEA</td>
<td>RMSEA ≤ 0.08 P ≥ 0.05</td>
<td>0.049</td>
<td>good fit</td>
</tr>
<tr>
<td>ECVI</td>
<td>Small score and near to ECVI Saturated</td>
<td>M* = 2.14</td>
<td>good fit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S* = 2.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I* = 2.98</td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>Small score and close to AIC Saturated</td>
<td>M* = 846.82</td>
<td>good fit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S* = 870.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I* = 1323.11</td>
<td></td>
</tr>
<tr>
<td>CAIC</td>
<td>Small score and close to CAIC Saturated</td>
<td>M* = 1140.87</td>
<td>(good fit)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S* = 3038.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I* = 1323.11</td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>NFI ≥ 0.90</td>
<td>0.34</td>
<td>Fairly good</td>
</tr>
<tr>
<td>NNFI</td>
<td>NNFI ≥ 0.90</td>
<td>0.44</td>
<td>Fairly good</td>
</tr>
<tr>
<td>CFI</td>
<td>CFI ≥ 0.90</td>
<td>0.48</td>
<td>Fairly good</td>
</tr>
<tr>
<td>IFI</td>
<td>IFI ≥ 0.90</td>
<td>0.51</td>
<td>Fairly good</td>
</tr>
<tr>
<td>RFI</td>
<td>RFI ≥ 0.90</td>
<td>0.28</td>
<td>Fairly good</td>
</tr>
<tr>
<td>CN</td>
<td>CN ≥ 200</td>
<td>236.62</td>
<td>(good fit)</td>
</tr>
<tr>
<td>RMR</td>
<td>Stand RMR ≤ 0.05</td>
<td>0.012</td>
<td>Fairly good</td>
</tr>
<tr>
<td>GFI</td>
<td>GFI ≥ 0.90</td>
<td>0.89</td>
<td>Marginal fit</td>
</tr>
<tr>
<td>AGFI</td>
<td>AGFI ≥ 0.90</td>
<td>0.87</td>
<td>Marginal fit</td>
</tr>
</tbody>
</table>

\(M^* = \text{Model}; S^* = \text{Saturated}; I^* = \text{Independence}\)

Based on the result as seen in the table above, the main fit indicator has the Goodness of Fit and it is categorized ‘good’. This means that the result of conceptual model of science process skill testing which is proposed is ‘fit’ or appropriate with the data.

IV. DISCUSSION

The instrument of students’ science process skill of Islamic senior high school in Biology subject which is developed based on theoretical analysis and expert investigation then followed by trying-out empirically that has been developed can be used for measuring science process skill.

Research finding reveals that, observed from the average factor load, basic science process skill, in the sequence of the lowest-higest validity the skill in succession, namely: (a) predict, (b) communicate, (c) inference, (d) classify, (e) observe, and (f) measure. Inference skill is the skill to draw conclusion and description from the observation result. If the observation is an experience which is achieved through one or two human senses, so inference is interpretation or description on the observation result. This skill is the most important science process because the correctness of the acience or knowledge achieved is depend on appropriateness and accurateness of the observation result. The ability to conduct an observation the ability to think is the basis skill in science, and including the skill dimension which is categorized as a hard aspect in this research. The finding of this research in line with Subadi’s research result (2009), which reported that the ability to think divergent in respect of data/information recording skill is the basic skill which is the most difficult, meanwhile the easiest is observation skill. The ability to think divergence in the respect of inference making skill and process skill is the most difficult skill, while the easiest skill is making prediction. Divergent thinking ability in doing investigation shows the lowest score up to the highest one in designing, doing, reporting, and investigating.

The finding of this research support the theory and concept of science process skill which was founded by Rustaman (2007) that the science process skill was the science inquiry doman, procedure which guides in achieving knowledge and giving definition that is more meaningful for students. Furthermore Rezba, et al. (1995) gives more detail description between basic science process skill and integrated science process skill with the six basic science process skill, shich covers: observing, classifying, measuring, inferring, predicting, dan communicating.

Referring to the result of model testing, both wholeness and individually and learning number of loading factor and construct reliability and the result of testing fit model and relevant findings
can be summed up that the model of instrument measurement which is developed can be accepted as the assessor of instrument for science process skill in Islamic Senior high School, especially in Biology subject.

V. CONCLUSIONS

Based on finding and discussion of the research results, it can be drawn some conclusions as follows.

1. Developing instrument for science process skill for Islamic Senior high School, especially in Biology subject. Pengembangan instrument keterampilan proses sains siswa di Madrasah Aliyah dalam mata pelajaran Biologi conducted through 5 stages, namely (a) product analysis which is developed which covers: theoretical analysis and discuss the previous related research result; (b) developing prior product; (c) product validity, covers the content validity through expert judgement and pannellist; (d) field try-out, consist of empirically tested on the first stage and second stage with CFA technique; and (e) product revision, including improvement post-try-out by paying attention to the expert consideration.

2. Dimension or factor which basis the science process skill of the Islamic Senior high School, especially in Biology subject. achieved as many 6 dimension, namely: observing, classifying, measuring, inferring, predicting, and communicating which are measured by 41 items which have excellent validity.

3. Empirical validity on the item of science process skill which is on excellent category. So that, it can be used in teaching and learning Biology subject.

4. The instrument of science process skill for Islamic Senior high School, especially in Biology subject has composite reliability as 0.986 or excellent, which comprises of doing observing 0.99, classifying 0.97, measuring 1.00, inferring 0.98, predicting 0.87, and communicating skill 0.87. Besides that, the result of conceptual model testing science process skill which is proposed is fit with the data.

A. Suggestions

Based on the research conclusion, it can be delivered some suggestions as follows:

1. The indicator of science process skill on the blueprint of instrument need to be developed more variety. This respect can be rearrange the relevant items.

2. Developing the instrument need to be expanded its population not only to scope of area but also the level of education.

3. Considering that science process skill has an important role in learing successfulness, especially on Biology subject, so it is suggested to the teachers in conducting the teaching and assessment with problem based learning dan project based learning approach.

4. Sciences and mathematics teacher should be given about science process training and constructing higher order thinking test (HOT).

REFERENCES