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# The TIPS Quality Assurance Framework for Creating Open Educational Resources : Validation

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ABSTRACT :

This Paper presents the validation for the *TIPS quality assurance Framework* for creating open educational resources (OER). A total of 205 criteria were elicited from more than 60 OER experts around the world and then referred to participants at several international workshops on quality assurance. From these workshops, 65 criteria were identified as essential, and these were then put together to form a four-level framework covering the teaching and learning aspects (T), information and material content (I), presentation product and format (P), and system technical and technological aspects (S) : giving the acronym TIPS (see the pamphlet at http://www.open-ed.net/oer-quality/tips.pdf ). Here this *TIPS Framework* is validated in a Delphi-style referral back to OER experts to determine its content validity. Averaged *content validity ratios* were calculated for each of the 65 items, and the resulting *content validity index* was found to be above 0.80, after several items were rejected. The *TIPS Framework* was also referred to target end-users around the world for further validation. Most OER are authored by university faculty for reuse in universities, and relatively few are authored by school teachers for reuse in pre-tertiary education. The *TIPS Framework* is designed and intended for school teachers (and teachers not in schools) at the pre-primary, primary, secondary and vocational levels. Teachers were generally unfamiliar with OER initially, but nevertheless returned a high *construct validity index*, and expressed their personal intention to try out the *Framework* in their teaching, to introduce e-learning technologies into their traditional practice. A second improved version of the *TIPS Framework* is published and available online as an OER in itself. While the intention is to help teachers, a final validation is underway to examine the students to measure the learning improvements achieved from using OER and the *TIPS Framework*.

293 words

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The author thanks especially V.S. Prasad, Colin Latchem, Ebba Ossiannilson, Jane Park, Nan Yang, Robert Schuwer, and Junhong Xiao for valuable comments and conversations online. In most cases their comments are taken on board, clarifications were negotiated, and revisions are incorporated into the revised *TIPS Framework* version-2.0 produced here.

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## 1.1 INTRODUCTION : Overview

Open educational resources (OER) offer an unprecedented opportunity to develop learning materials for the developing world. While OER cover teaching, learning, and research content at every level, the type of OER concerned here are those produced by pre-tertiary teachers for their own reuse and for their sharing with other teachers. Included here are those OER co-created by teacher(s) and students. OER have been defined variously since 2002 (for a review see Kawachi, 2013a), and here OER are defined (see BOX 1) as free-of-cost, with an open licence attached, allowing adapting or adding into other resources, and derivatives to be created, and at some time in digital format. The various quality characteristics for OER depend on the context such as reuse in highly-mediated face-to-face classrooms or reuse in independent learning at a distance (CoL, 2011, p.25), and in consideration of this context continuum, it has been concluded that a universal characteristic criterion for quality OER would be being at some point in time in digital format to enhance storing, searching and retrieving, reusing and sharing - and thereby promote more efficiently the benefits of OER. Although the digital essence was not stipulated by UNESCO initially in 2002, it was clearly a theme in the 2011 UNESCO-CoL guidelines (CoL, 2011), and is now included here expressly in the current OER

definition given in BOX 1 below. As educational resources are more commonly being produced and shared in digitised format, the OER movement will be promoted (CoL, 2011, p.20) where these resources are published as OER. Indeed OER are recognised as being stored in online repositories (Williams, Kear & Rosewell, 2012, pp.41-42). Conole & McAndrew (2009) also support the definition of OER as digital resources.

BOX 1 : Definition of OER

An open educational resource (OER) is defined as a digital self-contained unit of self-assessable teaching with an explicit measurable learning objective, having an open licence clearly attached to allow adapting, and generally being free-of-cost to reuse.

The respective open licences include those produced by Creative Commons shown in FIGURE 1 where we recommend the BY-SA open licence to teachers, that says you keep the author's name on the work. The Creative Commons also offer the CCO zero-rights-retained licence and the CCPD in-the-public-domain licence, which are also OER licences. (PD itself is not a licence : anything in the public domain does not need a licence, it can be copied without a licence and without any permission).

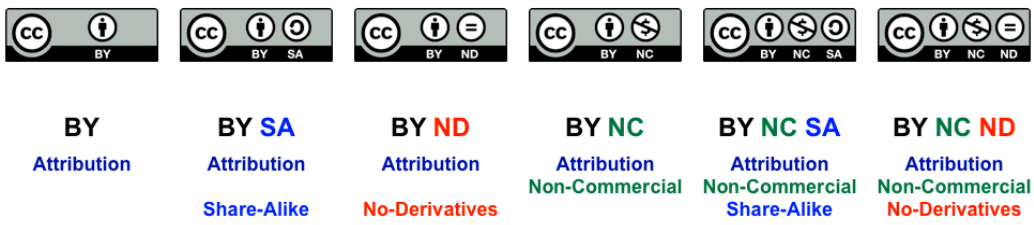


FIGURE 1 : The six open licences of the Creative Commons (from Kawachi, 2013b)

There are many definitions for OER. The Creative Commons organisation uses the Hewlett definition https://creativecommons.org/education#OER which says "Open Educational Resources (OER) are teaching, learning, and research materials in any medium that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others" which essentially says that an OER must allow free adaptation. Accordingly among their own six open licences, the two BY-ND and BY-NC-ND do not apply to OER since they do allow no derivatives ; in other words they do not allow any future adaptation. They confirm (personal correspondence) that the ND licences are not for OER - because ND resources are not adaptable.

In a similar way, we are aware that at the local level in rural developing regions there is a need for an entrepreneur to translate the OER into local ethnic language. To promote reaching the unreached, it is reasonable to allow the translator to charge some little repayment from reusers in order to stimulate the local economy and support the philanthropy of local experts : on simple economic grounds the entrepreneur will judiciously only chose those OER that are best suited to the local market, will work hard to promote the translated OER and ensure its sustainability with support mechanisms. Previous studies on costing (Robinson, 2008 ; Kawachi 2008) for rural social development found that the optimum balance is for public funding and international philanthropic funding to create the OER initially and then allow private enterprise to localise OER and deliver afterwards. Thus we would hope that the two NC licences (allowing no commercial future reuse) are not used for OER, and since we recommend this licence also be retained on future derivative work (Share-Alike SA) accordingly we recommend that OER be published as shown in Box 1b below with an attached Creative Commons Attribution Share-Alike CC-BY-SA licence. For further information and examples see http://wiki.creativecommons.org/Marking_your_work_with_a_CC_license .

Box 1b : Licensing Your OER

We recommend you add the following notice clearly onto your OER ;-



In order to expand the OER author base, guidelines may be helpful which offer suggestions to school teachers as potential authors. Guidelines which could be most helpful include examples of OER, demonstrations of OER in reuse, checklist of aspects to be consider when designing OER, and hands-on practice workshop. The current project deals with creating an instrument - the *TIPS Framework* - consisting of a checklist of aspects to be considered when designing OER. The other areas including examples, case studies, and workshops are also dealt with in due course within this project.

These other aspects are important to judge the efficiency or effectivenesss of the *Framework*. In particular, teacher and student satisfaction ratings can tell us about the effectiveness in practice - which is one (iv) of the five dimensions of quality presented by Harvey & Green (1993) given in Box 2 below. The three dimensions of most interest to us are (iii), (iv), and (v) described below. (With respect to (iii), it is recognised that OER users do not consume the resource.)

BOX 2 : Dimensions of Quality

(i) Achieving Exceptional Excellence : surpassing some pre-set criterion-referenced standard

(ii) Achieving Perfection : focusing on first making a machine that is successful 100% of the time, rather than trial-and-error or envisaging improving it later on

(iii) Achieving Fitness for Purpose : satisfying the aims or reasons for producing the item, according to the judgements of the various stakeholders - particularly the consumers

(iv) Achieving Value for Money : focusing on relative efficiency, and the (immediate output, mid-term outcome, and long-term impact) effectiveness

(v) Achieving Transformation : enhancing and empowering the consumer, eg equipping the student with the 21st-century knowledge-creative skills

The rationale for such our *TIPS Framework* lies in its effective support to individuals trying to create his or her own OER for later reuse. Educational resources produced within a university are essentially subjected to quality assurance mechanisms, in part to improve their students learning and in part to improve and protect the standing of the university in the eyes of accreditation agencies. Where OER are produced by individuals - and particularly by teachers - there are often no quality assurance mechanisms in effect. For individual teachers, whether in school or out of school, these *TIPS Framework* criteria can be a useful scaffold to support their endeavours. When teachers co-create OER in small teams then their collaborative discussions within the group can go a long way towards assuring situated quality.

One of the key characteristics of OER is their open licence allowing them to be adapted, revised, republished and shared (Williams, Kear & Rosewell, 2012), and this characteristic allows for quality development and evolution as reusers iteratively improve it and return it to share with others.

Producing OER for farway contexts is much more technically difficult, since the local context needs to be removed as far as possible and spaces made for future reusers to add their own context adaptation. The various types of OER include localised OER, globalised OER, internationalised OER, and world-ready OER, and these are briefly covered in a short document available at http://www.open-ed.net/oer-quality/localisation.pdf.

In their guidebook on *Quality in Post-Traditional* education, Butcher, Hoosen, Uvalić-Trumbić & Daniel (2014, p.14) simply suggest that "the quality criteria used to assess the quality of any educational materials can be applied to OER". However, individual teachers especially those without institutional support and in rural developing regions will find our *TIPS Framework* list of quality criteria relevant and useful. Butcher, Hoosen, Uvalić-Trumbić & Daniel (2014) do give a useful distinction (drawn from Kis, 2005, p10) between the two processes of QA ;- one of summative assessment based on institutional pre-set criteria for accountability, and the other of formative assessment for future quality improvement. The

present *TIPS Framework* gives new authors an insight into what institutional pre-set criteria might involve : in that pre-warned they may become pre-armed and indeed better capable of satisfying those criteria they consider relevant in their own context. The *TIPS Framework* goes further by adding into version-2.0 a rubric for self-improvement. This rubric is a set of five boxes alongside each criterion, for self-completion, self-reflection, action, and improvement.

The formative assessment process is an internal audit, and the TIPS Framework rubric will provide this function. Of noteworthy interest, Kis (2005) divides the summative QA process into *accreditation* and *assessment* (p.5). In our workshops we have learned from participants that they would be more inclined to author OER and publish these, if there was some accreditation awarded to the author (similar to rewards from publishing as ISSN or ISBN materials). The other sub-process of *assessment* is a binary judgement such as achieving 60% or more satisfaction rating by student consumers of the OER. The present *TIPS Framework* gives new authors an insight into what institutional pre-set criteria might involve : in that pre-warned they may become pre-armed, more aware and indeed better capable of satisfying those criteria they consider relevant in their own context. The *TIPS Framework* goes further by adding into version-2.0 a rubric for self-improvement. This rubric is a set of five boxes alongside each criterion, for self-completion, self-reflection, action, and improvement - intended for iterative reuse.

There is some concern that any set of QA criteria may demotivate a potential OER author. While rampant innovation without QA could lead to a vast jungle of resources, there should be a place for the *TIPS Framework* in the middle ground to help authors create good quality OER.

## 1.1 INTRODUCTION : The Instrument

The instrument is the quality assurance *TIPS Framework* for creating open educational resources (OER). This *Framework* is presented in a user-friendly format as a pamphlet at http://www.open-ed.net/oer-quality/tips.pdf . It consists of 7 suggestions on each of four levels. These four levels include the teaching and learning aspects (T), information and material content (I), presentation product and format (P), and system technical and technological aspects (S), giving the aconym TIPS. These 4x7 items group together similar points drawn from the 65 distinct points resulting from several international workshops and roundtable discussions on the essential criteria for quality assurance. The full set of 205 criteria are available at http://www.open-ed.net/oer-quality/criteria.pdf online (these might not be fully comprehensive, but is the most complete set of criteria to date available anywhere). These 205 criteria were gathered in turn last year from more than 60 OER experts around the world. In the present validation study, the 65 criteria are referred back to global OER experts to discover the *content validity index* of the instrument.

"Determining criteria for assessing quality in higher education requires an understanding of [the potentially] different conceptions of quality that inform the preferences of stakeholders" according to Harvey & Green (1993, p9), where there are five conceptions that can be distinguished "as *exception*, as *perfection*, as *fitness*

*for purpose*, as *value for money* and as *transformative*". The *TIPS Framework* offers criteria within three of these five dimensions : achieving fitness for purpose in the eyes of the reusers, achieving efficiency and effectiveness as free-of-cost resources to support education-for-all, and achieving transformation through imbuing 21st-century skills in the student end-users.

The first two dimensions are not generally recognised as important in education : however, many universities do aspire to excellence, and indeed OER from world-class elite universities are generally in great demand inside developing regions. The *TIPS Framework* can offer ideas and suggestions to beginner-authors in developing regions especially in how to embed imported OER and how to suitably adapt OER for reuse : see also the illustrative graphics in the presentation on localisation at http://www.open-ed.net/oer-quality/localisation.ppt and Kawachi (2013a). Many respondents and workshop participants have remarked on their difficulty in judging the suitability of an untested OER found online. Indeed we urge potential reusers to meticulously test out any imported materials and localise them appropriately to fit the intended local context - at least until social tagging becomes more reliable (see Kawachi & Yin, 2012, for more discussion on accurately tagging OER for retrieval).

## 1.2 INTRODUCTION : Terminology

This Paper deals with the validity, reliability, and utility of the *TIPS Framework* instrument : in other words this Paper explores the extent it is fit for purpose. There are various sub-terms involved here, and these are defined briefly in BOX 3 in simple words for expediency. Some aspects of content validity are covered by construct validity. Moreover there is internal face validity decided by the end-users, as well as external face validity decided by outside experts. Here we explore the definition of content validity as it relates to quantifying in the validation process and the calculation of a *content validity ratio*, and an overall *content validity index* for the *TIPS Framework*. This Paper also involves both external face validity from referral to outside OER experts, and internal face validity using feedback from end-users.

BOX 3 : Definitions of Terms

| | |
|---|---|
| construct validity | achieves what it says it does |
| content validity | the items adequately cover the universe |
| internal face validity | the end-users believe it is good |
| external face validity | outside stakeholders believe it is good |
| internal reliability | reuse gives similar output |
| external reliability | results are similar to those from other instruments |
| utility | small enough to be efficient |

A comprehensive instrument of all 205 criteria would have the best content and construct validity, and best reliability. However an unwieldy massive instrument would have low utility. Accordingly we reduce the overall number of items and merge items similar in purpose to improve the utility, at some cost to and with some loss in validity and reliability. The objective is to produce an instrument of high utility for practical use in the field, and with validity and reliability within tolerable levels.

*Quality assurance* can be described as a cross-sectional evaluation. Quality assurance for OER is thus a checklist of aspects like the *TIPS Framework*. Beyond *quality assurance*, there is a need for *quality improvement* (Kawachi, 2013b) that aims to improve standards. This can be achieved by adding a rubric alongside the checklist items in the *TIPS Framework*, for a user to tick off on a scale of five boxes to indicate how much the item was adopted. Then future ticking off can show mechanically the changes over time longitudinally to self-reflect on the quality aspects.

*Content validity* is a term with an imprecise meaning : according to Fitzpatrick (1983) *content validity* can refer to (i) how well the items cover the whole field, (ii) how well the user's interpretations or responses to the items cover the whole field, (iii) the overall relevance of all the items, (iv) the overall relevance of the user's interpretations, (v) the clarity of the domain definity, and / or (vi) the technical quality of each and all the items. The first and second of these concern the adequacies of the sampling, and come under *construct validity*.

Notwithstanding that *content validity* is an imprecise term, it can be measured quantitatively by asking content experts to rank each item as (i) essential, (ii) not-essential but useful, or (iii) not necessary. Those items ranked as not necessary are likely to be discarded. Among a large number N of experts, the number who rank the item as essential $N_E$ is used to calculate the *content validity ratio* for each item as shown in FIGURE 2 below. This formula gives a *ratio* of zero if only half the experts rank the item as essential, and if more than half the experts rank the item as essential then a positive *ratio* between zero and one.

$$CVR = \frac{N_E - \frac{N}{2}}{\frac{N}{2}}$$

FIGURE 2 : The *content validity ratio* CVR (from Lawshe, 1975)

For relatively small groups of experts, the average *ratio* for each item retained in the instrument should be close to one to decide the specific item has content validity with a probability of $p<0.05$. For larger groups of experts, the likelihood decreases that co-agreement as essential occurred by chance, and the *ratio* value can be lower while still reaching a probability of $p<0.05$, with these values (corrected and extended from Lawshe, 1975) shown in TABLE 1 below for various group sizes. Items obtaining minimum value, or above, are retained in the

instrument. Then the average *content validity ratio* over all items is termed the *content validity index*. Generally the instrument should have an *index* of 0.80 or above to be judged as having content validity. Some outliers can be discarded on the basis of a low ranking by the experts, while others can be retained despite a low ranking provided there is some other procedure supporting their inclusion.

TABLE 1 : The Minimum Averaged Value CVR for an Item to be Retained at p<0.05

| N of experts | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|
| minimum CVR | .99 | .99 | .99 | .75 | .68 | .62 | .59 | .56 | .54 | .51 |
| N of experts | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| minimum CVR | .49 | .42 | .37 | .33 | .31 | .29 | .27 | .26 | .26 | .25 |

This method to calculate the content validity of the *TIPS Framework* instrument relies on using content OER experts. The method might not work if the respondents are not content experts. However while content experts are necessary to get a *content validity index*, actual end-users would be able to return data for an equivalent *construct validity index*. This eventuality is explored by referring the instrument to teachers around the world in developing regions who are the intended target end-users of the *TIPS Framework* instrument.

## 2. METHODS :

Of the 205 criteria given in http://www.open-ed.net/oer-quality/criteria.pdf, there were 65 items noted as essential by OER experts and other participants at workshops and roundtable discussions. These 65 items are given in TABLE 2a-d below, and are referred back to OER experts for content validation.

TABLE 2a : The T.I.P.S. Framework : Teaching and Learning Processes

| 1. Teaching and Learning Processes | | |
|---|---|---|
| Pedagogy | 1.1 | Consider giving a study guide for how to use your OER, with an advance organiser, and navigational aids |
| | 1.2 | Use a learner-centred approach |
| | 1.3 | Use up-to-date appropriate and authentic pedagogy |
| | 1.4 | Use methods that involve transfer to external situations, model future applications by the student and encourage further innovation |
| | 1.5 | Include schema activation cues wherever possible, bringing in the culture of the student |
| Rationale | 1.6 | You should clearly state the reason and purpose of the OER, its relevance and importance |

| | | |
|---|---|---|
| | 1.7 | It should be aligned to local wants and needs, and anticipate the current and future needs of the student |
| | 1.8 | Illustrate the intended benefits to the student and where possible relate these to employable skills. You could add comments from potential employers |
| Student | 1.9 | Clearly state the intended age and/or level of your intended student |
| | 1.10 | Bear in mind your aim to support learner autonomy, independence, learner resilience and self-reliance |
| | 1.11 | Aim to engender a sense of self-worth in the student |
| Language | 1.12 | You should adopt a gender-free and user-friendly conversational style in the active-voice |
| | 1.13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level |
| Interactivity | 1.14 | Include learning activities, which recycle new information and foster the skills of learning to learn |
| | 1.15 | Say why any task-work is needed, with real-world relevance to the student, keeping in mind the work needed to achieve the intended benefit |
| Motivational | 1.16 | Accurately express the study work-load |
| | 1.17 | Consider offering a badge to reward initial engagement, progression, and/or final completion. |
| | 1.18 | Stimulate the intrinsic motivation to learn, eg through arousing curiosity with surprising anecdotes |
| | 1.19 | Reveal the discipline through your own eyes, conveying a passion for the discipline |
| Assessing | 1.20 | Offer academic credit upon successful completion, and/or suggest examinations for credit |
| | 1.21 | Monitor the completion rate, student staisfaction and whether the student recommends your OER to others |
| | 1.22 | Try to positively influence the personality of the student. |
| | 1.23 | Include a variety of self-assessments such as multiple-choice, concept questions, and comprehension tests |
| | 1.24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve |
| Support | 1.25 | Link formative self-assessment to help-mechanisms |
| | 1.26 | Try to offer learning support |
| | 1.27 | Your OER should point users to community groups |

TABLE 2b : The T.I.P.S. Framework : Information and Material Content

| 2. Information and Material Content | | |
|---|---|---|
| Accuracy | 2.1 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice |
| | 2.2 | Your perspective should support equality and equity, promoting social harmony, and be socially inclusive, law abiding and non-discriminatory |
| Relevance | 2.3 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions |

| | | |
|---|---|---|
| | 2.4 | Consider linking with external examinations and/or national curriculum standards |
| | 2.5 | Your content should be authentic, internally consistent and appropriately localised |
| | 2.6 | To induce learning, include anecdotal misunderstandings and their consequences |
| | 2.7 | Encourage student input to create localised content for situated learning : draw on the student's prior learning and experience, and the student's empirical and indigenous knowledge |
| Content Load | 2.8 | Try to keep your OER compact in size, while allowing it to stand-alone as a unit for studying by itself. Consider whether it is small enough to reuse in other disciplines |
| | 2.9 | Add links to other materials to enrich your content |

TABLE 2c : The T.I.P.S. Framework : Presentation, Product and Format

| 3. Presentation, Product and Format | | |
|---|---|---|
| Openness | 3.1 | Be sure the open licence is clearly visible |
| | 3.2 | Try to reuse other OER as components |
| | 3.3 | Try to indicate if your OER is closed in any way eg if your OER is localized to a specific culture, or if content might be inappropriate for some unintended users |
| | 3.4 | Ensure your OER is easy to access and engage |
| | 3.5 | Clearly give the original author contact information |
| Multimedia | 3.6 | Multimedia should be limited to two or three types |
| | 3.7 | Try to serve a variety of learning styles - keeping in mind a student might have weak eyesight or hearing |
| | 3.8 | Present your material in a clear, concise, and coherent way, taking care with sound quality |
| | 3.9 | Avoid using a 'talking head' video of the lecturer |
| | 3.10 | If you use any theme music, try to make this appropriate to the local culture and context |
| Design | 3.11 | Put yourself in your student's position to design a pleasing attractive design, using white-space and colours effectively, to stimulate learning |
| | 3.12 | Have some space for adding moderated feedback later on from your students |
| Format | 3.13 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use |
| | 3.14 | Consider alternate fonts and font-sizes suited to the student, for inclusion eg to serve old-aged students |
| | 3.15 | Use open formats for delivery of OER to enable maximum reuse and re-mix |
| Pathways | 3.16 | Consider suggesting which OER could come before your OER, and which OER could come afterwards in a learning pathway |
| | 3.17 | Consider offering alternative OER to your presented OER to give choices in learning pathways |

TABLE 2d : The T.I.P.S. Framework : System, Technical and Technology

| 4. System, Technical and Technology | | |
|---|---|---|
| Discoverability | 4.1 | Consider adding metadata tags about the content to help you and others later on to find your OER |
| | 4.2 | Give metadata tags for expected study duration, for expected level of difficulty, format, and size |
| Technology | 4.3 | Try to use only free sourceware/software, and this should be easily transmissible across platforms |
| | 4.4 | Try to ensure your OER is easily adaptable, eg separate your computer code from your teaching content |
| | 4.5 | If using any voice or music, try to keep this separate from the computer code to allow easier translation or re-localisation |
| | 4.6 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy |
| | 4.7 | Your OER and the student's work should be easily transmitted to the student's own e-portfolio |
| | 4.8 | Give alternate ALT text for each image |
| Technical | 4.9 | Include a date of production, and date of next revision |
| | 4.10 | Point users to appropriate technical support groups |
| | 4.11 | Consider allowing social tags to allow any student or teacher to add a review |
| | 4.12 | Consider adding metadata tags to allow students to give feedback on the immediate output, short-term outcome, and long-term impact |

These 65 items presented in TABLE 2a-d were put into an off-line survey instrument for a pilot study http://www.open-ed.net/oer-quality/65items.pdf and after sample analysis these items were up-loaded to an online survey website http://www.open-ed.net/oer-quality/survey.pdf and the interactive version for data collection at https://www.surveymonkey.com/s/COL-QA-OER-survey . There were several layout-design concerns with this online interactive site, which seem unavoidable.

Moreover the items are numbered in order 1-65 according to TABLE 2a-d which groups the criteria under sub-headings. The subsequent clustering will shorten the time for a respondent to complete the survey (which is the purpose here), but being in close proximity could increase the likelihood that an item is discarded as not essential, given that other similar ones are nominated. This would open up the survey to being more rigorous as it puts the closely associated items in juxtaposition for one or other to be discarded as superfluous. In piloting, where a respondent recalls a similar item being accepted much earlier, there was a tendency to discard an item rather than go back to re-examine the wording, compare the wordings and potentially accept both. Given the pros and cons involved here, it was decided not to use random order, and to keep the original ordering by sub-headings.

All the items were presented online as compulsory, requiring a response before allowing to continue. This means each submitted survey was useable, although

forcing responses could have made some responder give up mid-way and not sumit the survey.

Four sets of this survey are deployed, and subjected to wave analysis (Leslie, 1972) modified for inter-group comparisons (Kawachi, 2002). These four sets are summarised in the rubric of FIGURE 3, and the sample (i)~(iv) populations are described here. The countries of origin of the anonymous respondents are not known ; however, the countries of the Online Discussants are knowable, and are given in the RESULTS Section. Respondents were invited from a wide range of countries ; including Australia, Austria, Bangladesh, Brazil, Canada, China, England, Finland, France, Georgia, Germany, Guam, Hong Kong, India, Indonesia, Israel, Italy, Japan, Kenya, Malaysia, Mauritius, Netherlands, New Zealand, Nigeria, Pakistan, Philippines, Singapore, South Africa, South Korea, Spain, Sri Lanka, Sweden, Taiwan, Tanzania, Trinidad & Tobago, Turkey, USA, and Vietnam.

There were 32 survey responses recovered from the online survey website and analysed offline individually.

The four sets of survey are identical except for the survey-title. Different titles were used in order to collect the data from the automated website into four discrete sets for analyses.

(i) global OER experts : An email template was prepared and used for one-to-one contact with each OER-expert individually. The personalised approach intends to value the expert's help, ensure compliance and response, and intends to avoid spurious or mischievous anonymous responses that might occur from mass-mailing. [COL-QA-OER-survey]

(ii) OER groups : An email template was prepared and posted in online discussion groups, and on OER regional websites. This mass-mailing approach may bring in some outlier responses which after individual inspection must be discarded. However, since the OER QA Framework is intended for unknown adopters, this may give some interesting results. [quality-OER-survey]

(iii) teachers being non-expert : An email template was prepared and used for one-to-one contact with intended target end-users who are teaching in schools or out-of-school, being non-expert in OER creation. The personalised approach intends to value the teacher's help, ensure compliance and response, and avoid spurious anonymous responses from mass-mailing. [kawachi-survey]

(iv) teacher groups : An email template was prepared and posted in online discussion groups, and on teacher regional websites. This mass-mailing approach may bring in some outlier responses which after individual inspection must be discarded. However, since the OER QA Framework is intended for unknown adopters, this may give some interesting results. [helping-teachers-survey]

| | individual | group |
|---|---|---|
| OER experts | set 1<br>COL-QA-OER-survey<br>'essential-points<br>worth keeping' | set 2<br>quality-OER-survey<br>'criteria worthwhile<br>keeping' |
| teacher non-experts | set 3<br>kawachi-survey<br>'list of ideas' | set 4<br>helping-teachers-survey<br>'full list of ideas' |

FIGURE 3 : Rubric of the four sets of population samples for the survey instrument

There is some reservation here about whether inexperienced persons know what they need - whether this survey should ask teachers about their own teaching or whether the survey should ask OER experts about OER content. Acceptance of the *TIPS Framework* by classroom teachers as the target end-users depends cognitively on their individual subjective judgements rather than on any belief in the inherent knowledge of unknown OER experts. Their subjective judgement or opinion is meaningful. If they are to take up the *Framework* as a tool to help their creating OER, then they will need to be intrinsically motivated to try out this *Framework* in their practice. As OER non-professionals, the target teachers can be consider as laypersons but nonetheless are of significant importance as they are the ones who award meaningfulness to the *Framework*.

Given that comparative analyses between laypersons and professionals could discover some interesting hitherto-unknown findings, all four population sets are surveyed. The four respective links to the online hosted surveys are as follows ;-

| | | |
|---|---|---|
| set 1 | (i) | https://www.surveymonkey.com/s/COL-QA-OER-survey |
| set 2 | (ii) | https://www.surveymonkey.com/s/quality-OER-survey |
| set 3 | (iii) | https://www.surveymonkey.com/s/kawachi-survey |
| set 4 | (iv) | https://www.surveymonkey.com/s/helping-teachers-survey |

The *content validity ratio* CVR calculated according to Lawshe (1975) requires determining two numbers for each criterion ;- the number of experts who tagged the criterion as being 'Essential' $N_E$ and the total number N of experts who tagged the criterion. Technically the question is phrased by Lawshe (1975) as being "Is this item 'Essential', 'Useful but not essential', or 'Not necessary' to the performance of a task ?", and for the present survey the task was given as creating a highest quality OER. The resulting analysis produces a minimum set of endorsed

essential criteria. BOX 4 below gives the introductory text given at the front of the survey.

BOX 4 : Survey Front Text

This very short survey takes about two minutes.

We want to increase the number of school teachers creating and reusing OER in their teaching. Many beginners find that a scaffold or guidelines can be helpful in designing their own OER. So we have elicited 205 criteria of good quality assurance, and in turn have now reduced these to only 65 items. Below are the 65 criteria as suggestions to authors for them to consider in helping them to create the highest-quality OER. We think this compilation is a full final list of suggestions to consider, but please tell us if you think any point is really not needed . . .

We want to know if any item is redundant and can be scrapped, or whether maybe we should keep all the items as essential just in case an author needs it.

Technically the question =
Is this item 'Essential', 'Useful but not essential', or 'Not necessary'
to the performance of creating a highest-quality OER ?

Thank you for your kind help.
You can email to us at . . . kawachi@opened.net
if you have any question or comments

The rationale for the *TIPS Framework* however is to produce a comprehensive set from which a prospective author can pick and choose, rather than a minimum prescriptive set. There is some concern that respondents might drift towards choosing 'Useful but not essential' without realising the seriousness of their option. The pilot study using the paper hardcopy version showed respondents choosing the middle option especially for the technical criteria that are difficult or challenging to comprehend. Accordingly two sets of calculations are undertaken to compare the results - firstly strictly according to Lawshe (1975), and then secondly combining both 'Essential' and 'Useful' tags together as $N_E$ , for each of the four population sets of survey data.

The four email introductory Cover Letters are different for each population set.

## 3. RESULTS :

This RESULTS Section is composed of seven sub-sections ;- one for each of the five sets of survey, one for the related online discussions, and one for summarising all these.

### 3.1 RESULTS : Pilot Study

A pilot study was performed using two methods : one (i) using a paper hardcopy print-out of the online survey, and the other (ii) using an online test version of the actual survey. Findings suggested the list of criteria be divided into six pages, and the English used for the instructions be simplified, so as to be unambiguous. The punctuation was revised for several criteria. The initial example on how to complete the survey was removed. The overall format of the survey was revised. The revised survey was then re-examined and found to be acceptable.

### 3.2 RESULTS : Set-1 of Individual OER Experts

A first cohort of 20 OER experts were individually invited by email with personalised invitations, and 9 responded within 2 days, and none in the subsequent few days. Given that forcing responses to each and every item could have induced a responder to give up mid-way and not submit the survey, the 50% response rate was deemed adequate. A further 40 OER experts were then invited using personalised invitations in a similar manner, and the total reached 50% within 1 day. Overall 26 (40%) OER experts from Set-1 engaged in online discussions. Further cohorts in this set will need to be completed before Set-2 is started. However these are postponed until Set-3 is set in motion.

There were reported 535 authors presenting 268 papers at the 2013 Seventh Pan-Commonwealth Forum on Open Learning PCF7 http://pcfpapers.colfinder.org. Among these there were 40 papers on promoting OER involving 94 authors (many duplicate), and after inspection 20 of these were added to the list of Set-1, and surveyed individually on a personal level.

Several OER experts suggested their colleagues who could offer expert opinions, and these were followed up with personalised invitations (and the referred expert name and email address were added to the directory).

There were 42 survey responses e1 ~ e42 recovered from the online survey website and analysed offline individually. Of these, 35 were usable. Reasons for discarding a response include incomplete return (the survey was cancelled after only a few items were ticked), and ticking the same column only - both options which would sabotage the overall statistics. Another outcome was ticking as 'Essential' only those relating to the narrowest definition of OER : these were not

discarded but served to identify those Criteria relating to educational resources generally and those relating to OER only. Those Criteria specific to OER are highlighted in the revised *TIPS Framework* version-2.0, and discussed in detail in the SUGGESTIONS Section-5 below.

The responses were analysed initially in chronological order of date returned, but this order was quickly seen to be in error. Since the OER Experts were surveyed individually over some time via personal emails, there were clusters *eg* those global experts previously surveyed, those experts at various open universities in turn, and those experts who had recently presented a relevant paper at PCF7-2013. As on 9th May, there were 38 responses recovered and 32 were usable, and these 32 underwent wave analysis. These 32 responses were re-ordered using standard statistical tables for random numbers http://www.rand.org/publications/classics/randomdigits and three groups of ten each were examined using wave analysis (Leslie, 972) to increase the confidence in these being sufficient in quantity that they can be assumed to represent a wider population. Then the first ten (e1 ~ e10) were assigned as wave-1, the next ten (e11 ~ e20) as wave-2, and a third ten (e21 ~ e30) were assigned as wave-3. Two responses were thus unassigned, while the survey collection process was still continuing (giving a possibility of a fourth ten as wave-4) : however, wave analysis does not need more than the three waves. The waves are presented in FIGURE 4 below, and the close matches increases confidence in the data, allowing all 32 responses to be analysed for Content Validity Ratio $CVR_E$ for those criteria items indicated as being 'Essential', and Content Validity Ratio $CVR_{E+U}$ for those criteria items indicated as either 'Essential' or 'Useful'. The purpose here is to explore whether any criterion can be discarded by not meeting the standard approval rating. TABLE 3 below gives a sample of the data, and all the data are presented in APPENDIX 1 at the end.

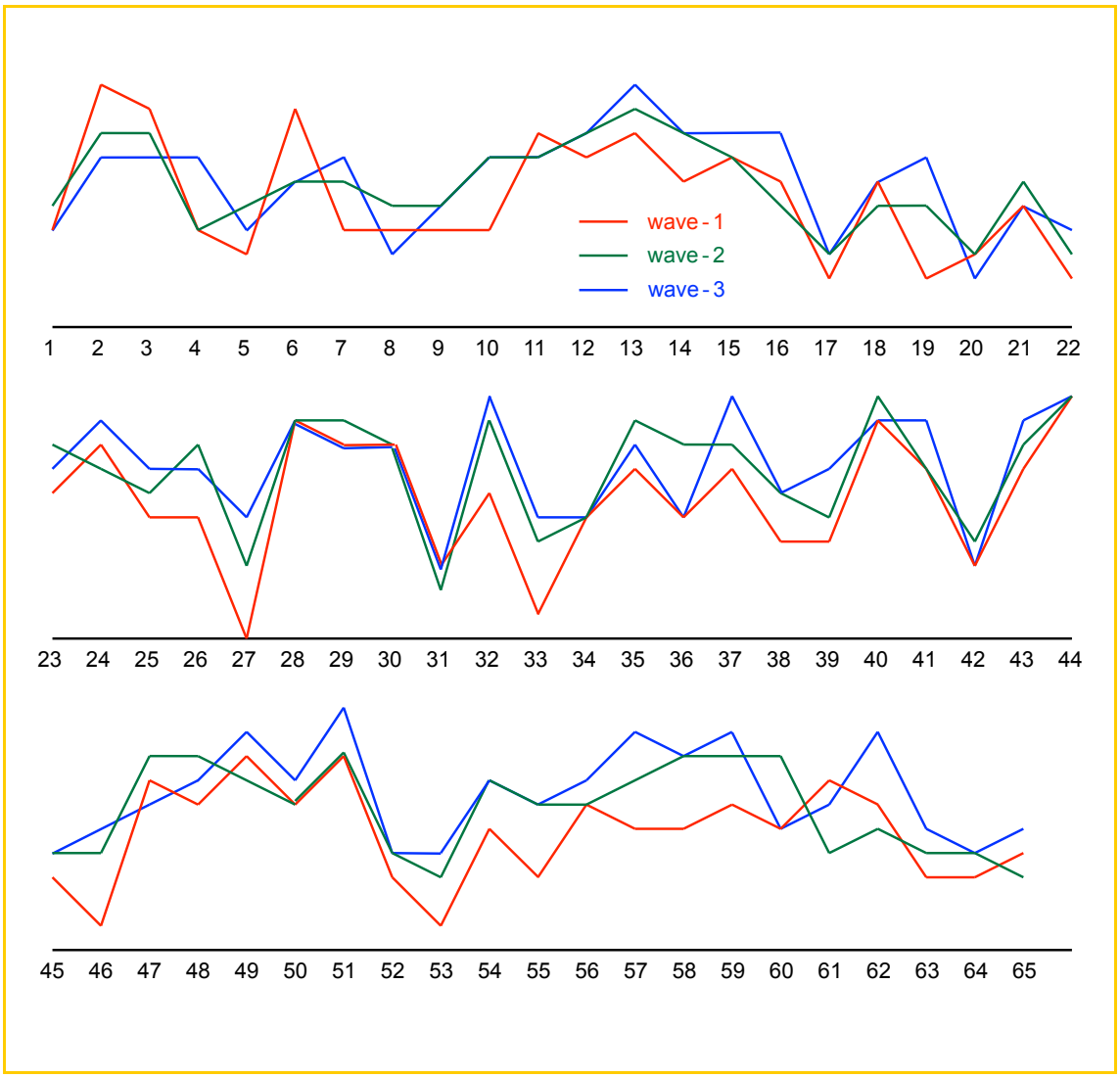


FIGURE 4 : Wave analysis on the three sets of responses by individual OER experts

TABLE 3-1 : The CVR for each Criterion Item C-1 to C-65
Set-1 : Individual OER Experts, N = 35
Subscript E : scored as Essential, Subscript U : scored as Useful, Subscript E+U : scored as Essential or Useful

| Set-1 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 16 | 29 | 28 | 16 | 13 | 24 | 18 | 13 | 16 | 22 |
| $N_U$ | 18 | 5 | 5 | 17 | 19 | 8 | 13 | 18 | 17 | 11 |
| $N_{E+U}$ | 34 | 34 | 33 | 33 | 32 | 32 | 31 | 31 | 33 | 33 |
| $CVR_E$ | -.09 | .66 | .60 | -.09 | -.26 | .37 | .03 | -.26 | -.09 | .26 |
| $CVR_{E+U}$ | .94 | .94 | .89 | .89 | .83 | .83 | .77 | .77 | .89 | .89 |

| Set-1 | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 24 | 27 | 29 | 25 | 23 | 22 | 9 | 19 | 16 | 8 |
| $N_U$ | 8 | 7 | 6 | 9 | 11 | 12 | 19 | 12 | 18 | 21 |
| $N_{E+U}$ | 32 | 34 | 35 | 34 | 34 | 34 | 28 | 31 | 34 | 29 |
| $CVR_E$ | .37 | .54 | .66 | .43 | .31 | .26 | -.49 | .09 | -.09 | -.54 |
| $CVR_{E+U}$ | .83 | .94 | 1.0 | .94 | .94 | .94 | .60 | .77 | .94 | .66 |

| Set-1 | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 19 | 9 | 23 | 25 | 19 | 22 | 9 | 32 | 28 | 28 |
| $N_U$ | 13 | 13 | 12 | 10 | 15 | 11 | 18 | 2 | 6 | 7 |
| $N_{E+U}$ | 32 | 22 | 35 | 35 | 34 | 33 | 27 | 34 | 34 | 35 |
| $CVR_E$ | .09 | -.49 | .31 | .43 | .09 | .26 | -.49 | .83 | .60 | .60 |
| $CVR_{E+U}$ | .83 | .26 | 1.0 | 1.0 | .94 | .89 | .54 | .94 | .94 | 1.0 |

| Set-1 | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 9 | 28 | 10 | 17 | 26 | 20 | 30 | 18 | 19 | 33 |
| $N_U$ | 21 | 6 | 19 | 15 | 7 | 14 | 5 | 16 | 11 | 2 |
| $N_{E+U}$ | 30 | 34 | 29 | 32 | 33 | 34 | 35 | 34 | 30 | 35 |
| $CVR_E$ | -.49 | .60 | -.43 | -.03 | .49 | .14 | .71 | .03 | .09 | .89 |
| $CVR_{E+U}$ | .71 | .94 | .66 | .83 | .89 | .94 | 1.0 | .94 | .71 | 1.0 |

| Set-1 | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 28 | 12 | 26 | 34 | 12 | 11 | 22 | 23 | 29 | 23 |
| $N_U$ | 6 | 14 | 9 | 1 | 17 | 16 | 12 | 8 | 6 | 12 |
| $N_{E+U}$ | 34 | 26 | 35 | 35 | 29 | 27 | 34 | 31 | 35 | 35 |
| $CVR_E$ | .60 | -.31 | .49 | .94 | -.31 | -.37 | .26 | .31 | .66 | .31 |
| $CVR_{E+U}$ | .94 | .49 | 1.0 | 1.0 | .66 | .54 | .71 | .77 | 1.0 | 1.0 |

| Set-1 | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 29 | 13 | 8 | 23 | 19 | 21 | 24 | 23 | 27 | 20 |
| $N_U$ | 6 | 19 | 22 | 10 | 11 | 12 | 10 | 11 | 7 | 15 |
| $N_{E+U}$ | 35 | 32 | 30 | 33 | 30 | 33 | 34 | 34 | 34 | 35 |
| $CVR_E$ | .66 | -.26 | -.54 | .31 | .09 | .20 | .37 | .31 | .54 | .14 |
| $CVR_{E+U}$ | 1.0 | .83 | .71 | .89 | .71 | .89 | .94 | .94 | .94 | 1.0 |

| Set-1 | C-61 | C-62 | C-63 | C-64 | C-65 |
|---|---|---|---|---|---|
| $N_E$ | 21 | 23 | 13 | 13 | 14 |
| $N_U$ | 14 | 12 | 20 | 18 | 18 |
| $N_{E+U}$ | 35 | 35 | 33 | 32 | 32 |
| $CVR_E$ | .20 | .31 | -.26 | -.26 | -.20 |
| $CVR_{E+U}$ | 1.0 | 1.0 | .89 | .83 | .83 |

(The number scored as 'Not necessary' $N_N$ can be deduced as ($N - N_E - N_{E+U}$), from TABLE 3.1 and in APPENDIX 1 at the end. These data $N_N$ are not of any interest.)

The average CVR must be > .31 for a criterion item to be retained at $p < 0.05$, as shown in TABLE 1 for a group of 35 respondents. There are 28 items at $CVR_E \geq .32$ to be retained, and these are presented in TABLE 4 below.

TABLE 4a : The Retained Criteria each at $CVR_E \geq .31$ by Set-1 OER Experts

| item | |
|---|---|
| C-2 | Use a learner-centred approach |
| C-3 | Use up-to-date appropriate and authentic pedagogy |
| C-6 | You should clearly state the reason and purpose of the OER, its relevance and importance |
| C-11 | Aim to engender a sense of self-worth in the student |
| C-12 | You should adopt a gender-free and user-friendly conversational style in the active-voice |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level |
| C-14 | Include learning activities, which recycle new information and foster the skills of learning to learn |
| C-15 | Say why any task-work is needed, with real-world relevance to the student, keeping in mind the work needed to achieve the intended benefit |
| C-23 | Include a variety of self-assessments such as multiple-choice, concept questions, and comprehension tests |
| C-24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice |
| C-29 | Your perspective should support equality and equity, promoting social |

| | |
|---|---|
| | harmony, and be socially inclusive, law abiding and non-discriminatory |
| C-30 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions |
| C-32 | Your content should be authentic, internally consistent and appropriately localised |
| C-35 | Try to keep your OER compact in size, while allowing it to stand-alone as a unit for studying by itself. Consider whether it is small enough to reuse in other disciplines |
| C-37 | Be sure the open licence is clearly visible |
| C-40 | Ensure your OER is easy to access and engage |
| C-41 | Clearly give the original author contact information |
| C-43 | Try to serve a variety of learning styles - keeping in mind a student might have weak eyesight or hearing |
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality |
| C-48 | Have some space for adding moderated feedback later on from your students |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use |
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix |
| C-54 | Consider adding metadata tags about the content to help you and others later on to find your OER |
| C-57 | Try to ensure your OER is easily adaptable, eg separate your computer code from your teaching content |
| C-58 | If using any voice or music, try to keep this separate from the computer code to allow easier translation or re-localisation |
| C-59 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy |
| C-62 | Include a date of production, and date of next revision |

As of 9th May there were only 38 responses collected of which 32 were usable and analysed. However another 4 responses were submitted by 5th June when the survey collection was closed. Of these 4 only 3 were usable, making 35 usable responses ananalysed above in TABLE 3.1. Of brief note the only differences in results from analysis are C-26 (Try to offer learner support) and C-47 (Put yourself in your student's position to design a pleasing attractive design, using white-space and colours effectively, to stimulate learning) each narrowly failed to reach the threshold of $\geq$.031, while C-54 (Consider adding metadata tags about the content to help you and others later on to find your OER) and C-62 (Include a date of production, and date of next revision) each narrowly passed the threshold.

There were eight criteria items that were indicated as 'Essential' by 29 or more individual OER experts among the 35 OER experts of Set-1 : these eight together have an average $CVR_E$ of only 0.75. Of these there were 4 indicated by only 29 experts : when these four are removed the remaining four criteria C-28, C-37, C-40 and C-44 reach an average $CVR_E$ of 0.84, and these Content Validity Index $\geq$ 0.80 threshold as valid at the probability level of $p < 0.05$, and these are given in TABLE 5 below, suggesting these are the key criteria to promote to OER authors. Strictly only the four criteria should be retained, but let's hold these to see how the other groups respond.

TABLE 5 : The Key Criteria according to Set-1 *for* CVI $\geq$ 0.80

| | Criterion | $N_E$ | N | $CVR_E$ |
|---|---|---|---|---|
| C-2 | Use a learner-centred approach | 29 | 35 | (.66) |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level | 29 | 35 | (.66) |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice | 32 | 35 | .83 |
| C-37 | Be sure the open licence is clearly visible | 30 | 35 | .71 |
| C-40 | Ensure your OER is easy to access and engage | 33 | 35 | .89 |
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality | 34 | 35 | .94 |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use | 29 | 35 | (.66) |
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix. | 29 | 35 | (.66) |
| | average of those by 29 persons or more | | | (.75) |
| | average of those by 30 persons or more<br>Content Validity Index = average $CVR_E$ = | | | .84 |

Accepting that most respondents do not know that items scored as 'Useful' according to Lawshe (1975) are discarded, the analysis is re-performed using all the items scored as either 'Essential' or 'Useful' to give CVR $_{E+U}$ as shown in TABLE 3.1 above and in APPENDIX 1 in full. The CVR $_{E+U}$ is high for each criterion, and the average CVR $_{E+U}$ , over all the criteria items C-1 to C-65 without discarding the lower scoring items, which is the overall Content Validity Index CVI $_{E+U}$ for the instrument, is 0.94 which is > 0.80 and indicates the original *TIPS Framework* is valid at $p < 0.05$.

## 3.3 RESULTS : Set-2 of Groups of OER Experts

There are online communities of OER experts for regional discussions and others for global discussions. The list of OER expert groups is given in the ACKNOWLEDGEMENTS Section at the beginning of this Report.

There were 18 survey responses g1 ~ g18 (the return rate % cannot be deduced) recovered from the online survey website and analysed offline individually. (There were 10 responses within a few hours.) Of these, 14 were usable. Reasons for discarding a response include incomplete return (the survey was cancelled after only a few items were ticked g7, g11, and g12), and ticking the same column only (g14) - both options which would sabotage the overall statistics. These 13 responses are too few to perform a meaningful wave analysis which would need three waves then of only 4 responses each. Instead the first ten in random-order sequence are inspected as a fourth wave-4 against the three waves of Set-1 to see whether these anonymous results are similar to those from individual named experts. Statistical tables are used to put these 13 responses into random order, and the sequence of their occurrences is g13, g10, g08, g06, g16, g03, g09, g04, g01, g02, g05, g15, and g17 (so g05, g15 and g17 are put aside here). The data of 'Essential' N $_{E}$ scores are given in APPENDIX 1 at the end. These ten from the anonymous Set-2 are drawn as wave-4 in FIGURE 5 below, showing good fit with the other three waves - suggesting that Set-1 and Set-2 could reasonably be combined.

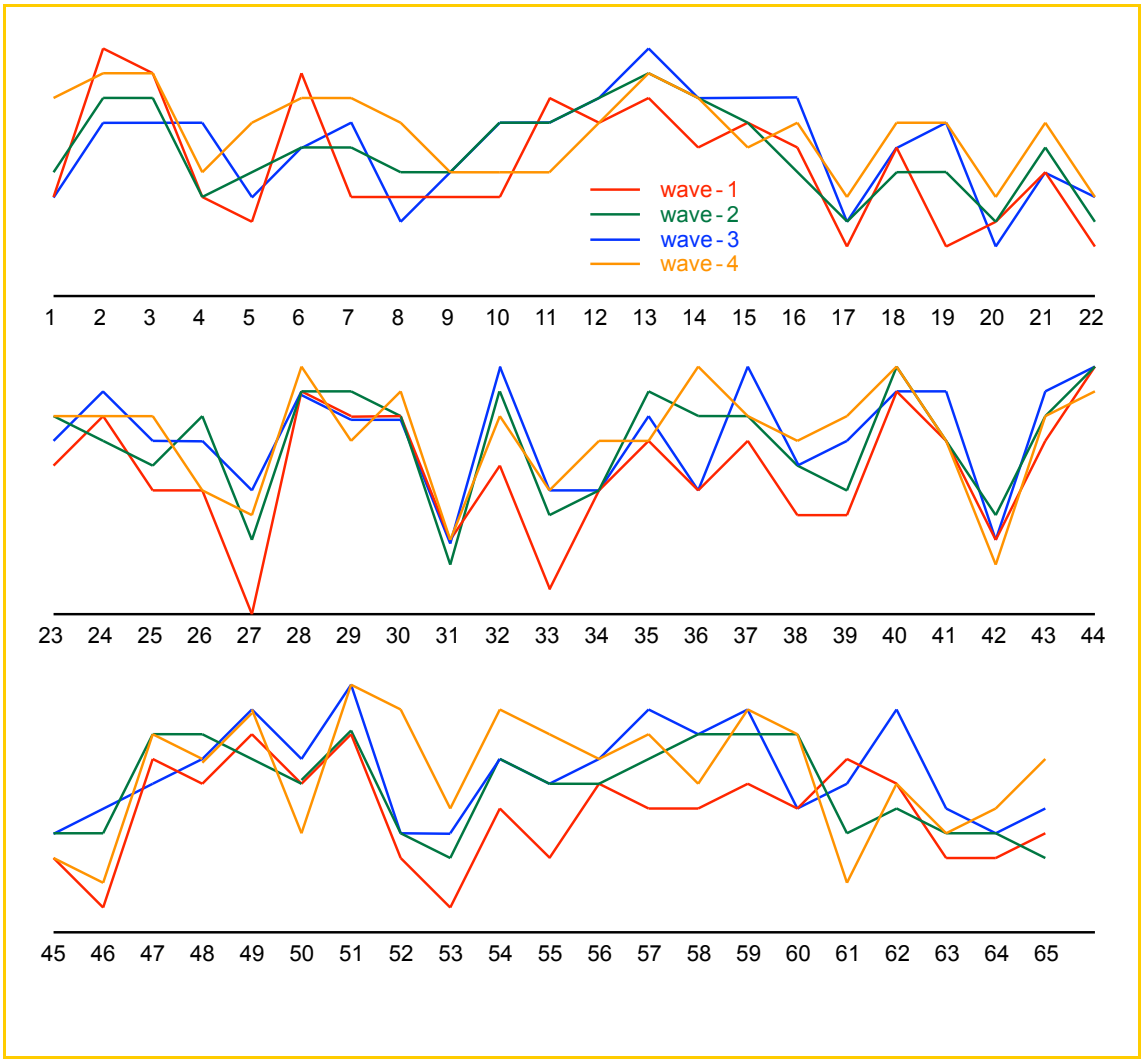


FIGURE 5 : Wave analysis compared anonymous Set-2 responses as wave-4, with the other waves by individual OER experts

Wave-4 shows reasonable match with the other three waves, and so the data from the 13 anonymous responses of Set-2 are usable. The data of 'Essential' $N_E$ scores from all 13 group members here are given in full in APPENDIX 1 at the end.

Again accepting that most respondents do not know that items scored as 'Useful' according to Lawshe (1975) are discarded, the analysis is re-performed using all the items scored as either 'Essential' or 'Useful' to give $CVR_{E+U}$ as shown in TABLE 3-2 in APPENDIX 1. The $CVR_{E+U}$ is high for each criterion except C-12, C-16, C-17, C-22, C-42, and C-46, but nonetheless the average $CVR_{E+U}$, over all the criteria items C-1 to C-65 without discarding the lower scoring items, which is the overall Content Validity Index $CVI_{E+U}$ for the instrument, is 0.89 which is > 0.80 and indicates the original *TIPS Framework* is valid at $p < 0.05$.

### 3.4 RESULTS : Set-3 of Individual Teachers

The TIPS Framework was developed through workshops and negotiations in the past two years. At the regional workshop at Maulana Azad National Urdu University on the 13th-15th March 2013, in Hyderabad, India and at the international workshop at Allama Iqbal Open University on the 1st October 2013, in Islamabad, Pakistan, there were present and participating both OER experts and local teachers. The OER experts are included into Set-1, and the teachers are included here into Set-3.

In order to ensure that individuals respond to their specific survey, Set-1 and Set-3 are done prior to Set-2 and Set-4. Here in Set-3 a total of 36 named teachers were individually invited by personalised email, and 7 responded within 3 hours. Among these first 7 responders, 5 (70%) Individual Teachers from Set-3 engaged in online discussions.

Most respondents in this Set-3 are expected to know about open learning and online education, but not know anything about OER. Accordingly they are expected to be more eclectic, empathic, and generous in their critique and so select all or nearly all criteria as being essential - if not for themselves then in consideration of other teachers who might need those criteria as suggestions. Since this Set-3 of Individual Teachers are known personally by the author, they are also expected to complete the survey - more so than any other set, and to engage in Online Discussions on anything they feel relevant, of interest or which they do not themselves fully understand.

There were 22 survey responses n1 ~ n22 recovered (60%) from the online survey website and analysed offline individually. Among these, there were 3 discarded as being incomplete - this ratio is a similar to that with the OER experts. However in this Set-3, incomplete returns were perhaps due to these teachers being almost all non-native-English-speakers, and the language of the survey being complex and technically specific to a field with which they are unfamiliar. With only 19 responses, and the desire for wave analysis, one was selected n18 by random number tables and duplicated to become n23, thus making possible two waves each of ten responses. The 20 responses were then reordered by random number tables as n21, n03, n11, n07, n13, n23, n20, n08, n17, n09, n01, n15, n16, n12, n04, n02, n18, n10, n06, and n05. The first ten in this sequence are put into wave-5, and the next ten into wave-6, for inspection in FIGURE 6 by wave analysis. The numerical data for these two waves are given in APPENDIX 1 for reference. Considering the responses are from non-experts, appreciating their various backgrounds, and particularly noting that as teachers in practice they may be more generous than academic researcher experts, these two waves show sufficiently good fit with each other - increasing confidence in the data.

Accordingly the duplicate response n23 is removed, and the collected data N=19 are subjected to Content Validity Ratio analysis. The average CVR must be > .43 for a criterion item to be retained at $p < 0.05$, as shown in TABLE 1 for a group of 19 respondents. All criteria items are at $CVR_E > .43$ and can be retained, except for four criteria C-33, C-38, C-42, and C-45 ; described in TABLE 10. While these four

were also given low scores by the OER Experts of Set-1, these particular four may be explained somewhat noting C-33 uses complex language and is widely reported as difficult to understand, C-38 to-reuse-OER-by-others may reflect the not-invented-here opinion and traditional autonomy for their own classrooms - similarly both C-42 and C-45 also suggest preserving their own teaching autonomy.

TABLE 10 : Four Criteria given Lowest Ranking by Individual Teachers Set-3

| | Criterion | | | CVR E |
|---|---|---|---|---|
| C-33 | To induce learning, include anecdotal misunderstandings and their consequences | | | .37 |
| C-38 | Try to reuse other OER as components | | | .26 |
| C-42 | Multimedia should be limited to two or three types | | | .26 |
| C-45 | Avoid using a 'talking head' video of the lecturer | | | .37 |

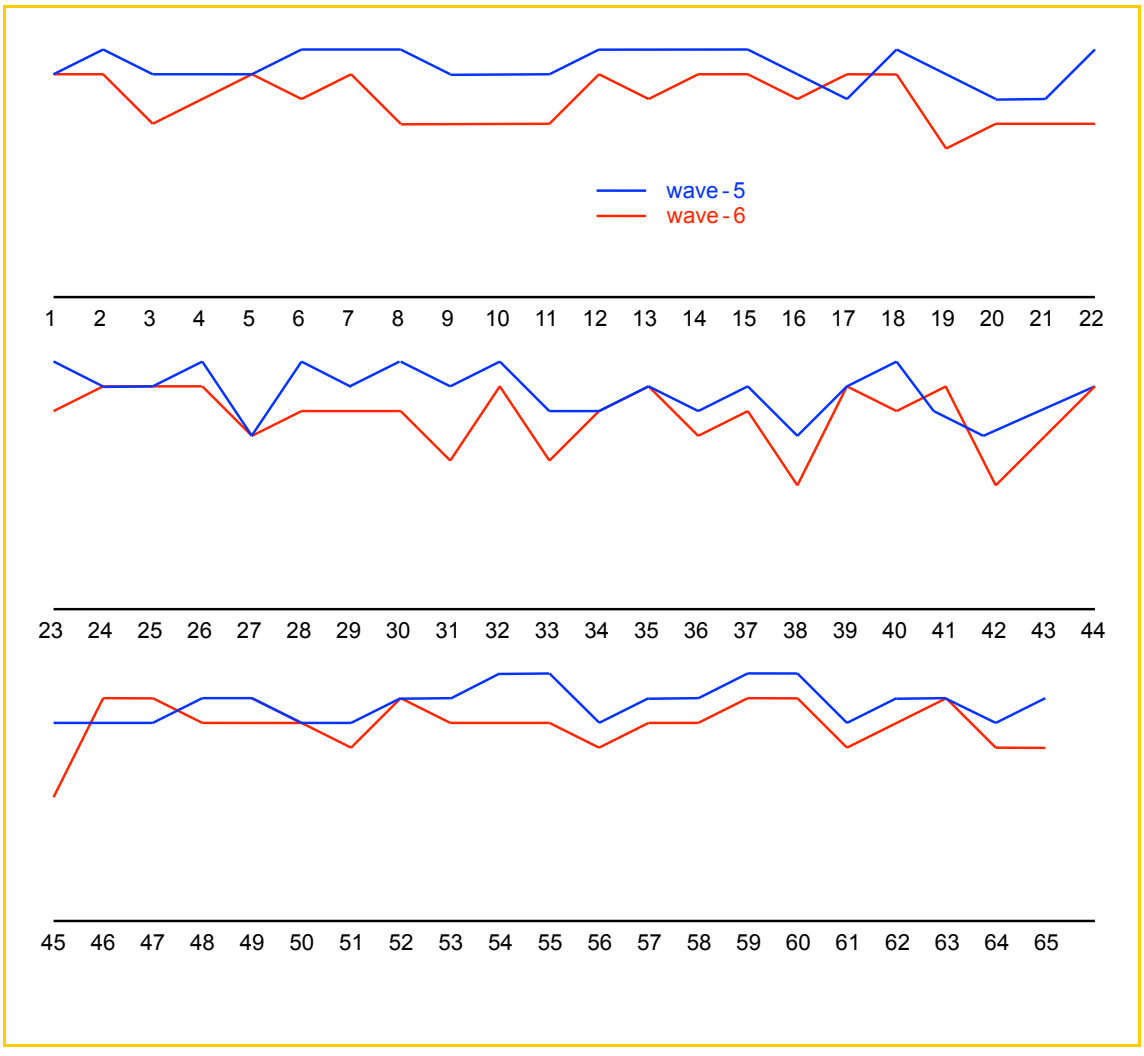


FIGURE 6 : Wave analysis of wave-5 and wave-6 for Set-3 of Individual Teachers

Again accepting that most respondents do not know that items scored as 'Useful' according to Lawshe (1975) are discarded, the analysis is re-performed using all the items scored as either 'Essential' or 'Useful' to give $CVR_{E+U}$ as shown in TABLE 3-3 in APPENDIX 1. The average $CVR_{E+U}$, over all the criteria items C-1 to C-65 without discarding the lower scoring items, which is the overall Content Validity Index $CVI_{E+U}$ for the instrument, is 0.87 which is > 0.80 and indicates the original *TIPS Framework* is valid at $p < 0.05$.

## 3.5 RESULTS : Set-4 of Groups of Teachers

Online discussion groups of teachers are difficult to get into sufficiently well for group members to respond. Even DEOS-L at Penn State University needed two submissions to get posted in the discussion forum. It seems that OER is not a popular topic for teachers, and/or is not seen as popular by the group moderator. The British Council sidelined the invitation not into the Discussions section but into their Promotions section - and there are no responses.

There were zero survey responses recovered from the online survey website and this set are abandoned.

## 3.6 RESULTS : Online Discussions

An interesting exchange of ideas was afforded through emailing to individuals by name in personalised requests to complete the survey online. In particular comments were suggested to divide our comprehensive coverage into two lots ;- one of criteria for general online resources, and the other of criteria for only OER. Those criteria that relate to only OER and not to any other educational resources are now highlighted in the *TIPS Framework* version-2.0.

A survey respondent particularly one who is an OER expert will find some confusion whether to indicate a criterion of general pedagogical good practice is to be scored as 'Essential' to an OER. This is not controversial to an outsider since OER should be educational, but an OER expert might feel that the qualities of an OER are in certain ways unique and different from any other educational material, and that OER special characteristics were being diluted or smothered by including general good design practice among the criteria. The first two experts surveyed at Creative Commons (Paul Stacey and Wayne Mackintosh) both commented that the

educational good pedagogy criteria should be separated from the OER criteria. However OER remain inherently as open (licensed, no cost, digital) and educational resources - what special extra qualities such as capacity for remixing do not seem so important as good pedagogical design for most practising teachers - but remixing, revisable etc aspects are at the heart of the Creative Commons organisation. All the OER experts at Creative Commons gave useful comments.

The qualities of remixing are given in the TABLE 9 and TABLE 9b below showing compatibility between the new OER and the component OERs. These tables have been re-drawn from data given by WikiEducator (2012).

TABLE 9 : Choosing Your Licence depending on the Reused Component(s)

| | | Licence(s) of any Reused Component(s) | | | | | |
|---|---|---|---|---|---|---|---|
| | | BY | BY-SA | BY-ND | BY-NC | BY-NC-SA | BY-NC-ND |
| Choose Your Licence | BY | O | | | | | |
| | BY-SA | O | O | | | | |
| | BY-ND | O | | | | | |
| | BY-NC | O | | | O | | |
| | BY-NC-SA | O | | | O | O | |
| | BY-NC-ND | O | | | O | | |

data from WikiEducator 2012

If any component has an SA licence then you must reuse the exact same licence (either BY-SA, or BY-NC-SA). If any component has an NC licence then your new OER must be NC too (BY-NC, BY-NC-SA, or BY-NC-ND) ; in other words the licence could stay the same (BY-NC) or be changed (to either BY-NC-SA, or BY-NC-ND). You can reuse an ND resource exactly, but cannot adapt it or incorporate it into anything under your own name (BY) authored by yourself. Adding ND to anything effectively takes it out of the OER realm, as it cannot be adapted. Since ND resources are not OER, the (re)licensing of OER is re-drawn in TABLE 9b below.

TABLE 9b : Choosing Your OER Licence depending on the OER Component(s)

| | | Licence(s) of any OER Component(s) | | | |
|---|---|---|---|---|---|
| | | BY | BY-SA | BY-NC | BY-NC-SA |
| Choose Your Own OER Licence | BY | O | | | |
| | BY-SA | O | O | | |
| | BY-NC | O | | O | |
| | BY-NC-SA | O | | O | O |

data from WikiEducator 2012

Another respondent (Jay Shinde) suggested that criteria be somehow weighted, so that restrictive criteria (eg meta tag according to culture, or to age) are less prominent than others eg about content quality.

In the course of exchanges, some respondents commented that various criteria be made clearer. For example, Criterion-40 'Ensure your OER is easy to access and engage' is expanded to clarify that 'access' here means comprehend, specifically using a clear voice, clear images, clear text for the student. Criterion-57 ' Try to ensure your OER is easily adaptable, eg separate your computer code from your teaching content' is technically complex, so it is rewritten and examples are given (this point is addressed in a new section on how to use the *TIPS Framework* in http://www.open-ed.net/oer-quality/tips-guide.pdf ).

One respondent (Pam Miller) reported that some teachers in South Africa had developed some textbooks for mathematics and science, funded by the Shuttleworth Foundation http://www.shuttleworthfoundation.org. The main challenge in those projects was getting teachers to create OER. Some follow-up here is proposed to add into the (separate) report on how to use the *TIPS Framework* at http://www.open-ed.net/oer-quality/tips-guide.pdf, and into the report on case studies at http://www.open-ed.net/oer-quality/tips-case-studies.pdf .

### 3.7 RESULTS : Summary

While respondents from more than 30 countries were surveyed, online discussions were conducted with those from 15 countries ; including Australia, Canada, China, England, India, Japan, South Korea, Malaysia, Netherlands, Pakistan, Singapore, South Africa, Sri Lanka, Sweden, and USA. While not comprehensive, this coverage is acceptable given the small size of this study.

Gender data were collected for each response, and after noting those responses discarded as incmplete, the following population characteristics are determined. The characteristics of the survey population are given in BOX 5 for each set. One individual OER expert declined to give a response to gender. However, the gender ratio is acceptable at M/F = 38/31 (no datum given by 1 respondent) over all three sets.

BOX 5 : Population Characteristics

| | N | Male | Female |
|---|---|---|---|
| Set-1 : Individual OER Experts | 35 | 21 | 13 |
| Set-2 : Group OER Experts | 14 | 7 | 7 |
| Set-3 : Individual Teachers | 21 | 10 | 11 |

The age distribution over all 70 responses is given in FIGURE 7, showing no clear normal distribution, but suggesting a tendency for the Set-1 OER experts to be older, the Set-2 OER group participants to be younger, and the Set-3 teachers also to be relatively young. The geographic distribution is shown in FIGURE 8 (no data given by 2 respondents) and suggests a broad global distribution with emphasis on the developing world.


FIGURE 7 : Age distribution for each Set of Responses

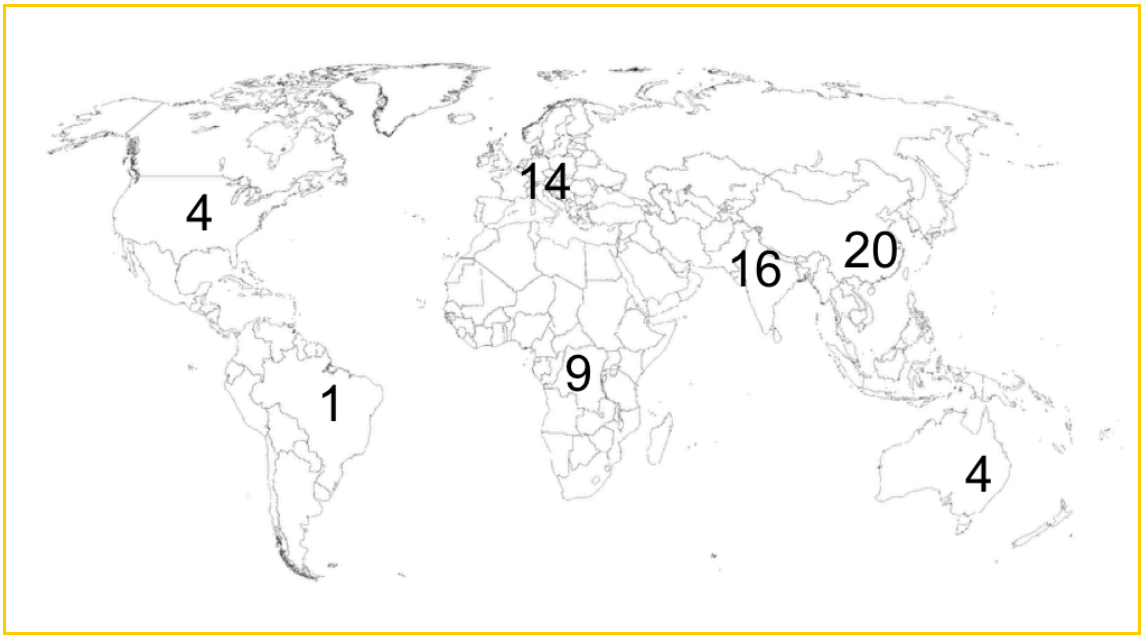


FIGURE 8 : Geographic distribution for all Responses

TABLE 11 : The 21 Criteria according to each Set *for* CVI ≥ 0.80

| | Key Criterion | Set-1 N=32 | Set-2 N=13 | Set-3 N=19 |
|---|---|---|---|---|
| C-1 | Consider giving a study guide for how to use your OER, with an advance organiser, and navigational aids | | .69 | .79 |
| C-2 | Use a learner-centred approach | (.66) | .69 | .89 |
| C-3 | Use up-to-date appropriate and authentic pedagogy | | .69 | .68 |
| C-7 | It should be aligned to local wants and needs, and anticipate the current and future needs of the student | | .69 | .89 |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level | (.66) | .85 | .79 |
| C-24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve | | .69 | .79 |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice | .83 | 1.0 | .79 |
| C-29 | Your perspective should support equality and equity, promoting social harmony, and be socially inclusive, law abiding and non-discriminatory | | | (.79) |
| C-30 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions | | .85 | .79 |
| C-32 | Your content should be authentic, internally consistent and appropriately localised | | .69 | .89 |
| C-36 | Add links to other materials to enrich your content | | .85 | .58 |
| C-37 | Be sure the open licence is clearly visible | .71 | .69 | .68 |
| C-40 | Ensure your OER is easy to access and engage | .89 | 1.0 | .79 |
| C-41 | Clearly give the original author contact information | | | (.68) |

| | | | | |
|---|---|---|---|---|
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality | .94 | .85 | .79 |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use | (.66) | .85 | .68 |
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix. | (.66) | 1.0 | .47 |
| C-52 | Consider suggesting which OER could come before your OER, and which OER could come afterwards in a learning pathway | | .69 | .79 |
| C-54 | Consider adding metadata tags about the content to help you and others later on to find your OER | | .85 | .79 |
| C-55 | Give metadata tags for expected study duration, for expected level of difficulty, format, and size | | .69 | .68 |
| C-59 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy | | .69 | .89 |
| | Content Validity Index CVI = average $CVR_E$ = | .84 | .79 | .76 |

From TABLE 3.1, data show that the individual OER-Experts Set-1 support those item indicated by the other sets ; with C-3at 0.60, C-29 at 0.60, C-30 at 0.60, C-32 at 0.60, and C-41 at 0.60, C-59 at 0.54. The two C-29 and C-41 are added here since they were fairly highly indicated by the OER-Experts Set-1 and by the Individual Teachers Set-3, although not by the anonymous OER-Groups Set-2.

The Teachers Set-3 give an average $CVR_E$ for all 18 criteria of TABLE 11 as CVI of 0.76, and after C-36 and C-51 are removed this average increases to 0.79 comparable with that by Set-2 and Set-1 OER Experts.

The Teachers Set-3 support the list in TABLE 11 above generally, except for C-36 to-crosslink-to-other-materials which is common online but largely absent in traditional classrooms, and except for C-51 to-reuse-other-materials reflecting teacher autonomy and the not-invented-here opinion. However, the Teachers also gave highest $CVR_E$ to six additional criteria (C-12, C-14, C-15, C-18, C-19, and C-60) which should be retrospectively explored, to look at how the OER experts scored these, and TABLE 12 presents this larger listing as perhaps those criteria for the revised *TIPS Framework* version-2.0. Taking the teachers' perspective in the light that they are the intended target users for the TIPS Framework, the added six reflect professional good practice, and should if at al possible be retained. Lawshe (1975) states clearly that while the statistical approach is sound, that some leeway is granted to add or subtract items irrespective of the statistical analysis. Adding in these extra six from the Teachers Set-3 each at 0.89 happens to raise the average over all 24 item (including the C-36 and C-51) to $CVR_E$ at .83 which confirms this list as the 24 leading criteria.

The following TABLE 12 gives data collected from 67 respondents.

TABLE 12 : List of 24 Criteria according to each Set *for* CVI ≥ 0.80
(data in parentheses are for discussion and NOT included into the final averages)

| | Key Criterion | Set-1 N=35 | Set-2 N=13 | Set-3 N=19 |
|---|---|---|---|---|
| C-1 | Consider giving a study guide for how to use your OER, with an advance organiser, and navigational aids | | .69 | .79 |
| C-2 | Use a learner-centred approach | (.66) | .69 | .89 |
| C-3 | Use up-to-date appropriate and authentic pedagogy | (.60) | .69 | .68 |
| C-7 | It should be aligned to local wants and needs, and anticipate the current and future needs of the student | | .69 | .89 |
| C-12 | You should adopt a gender-free and user-friendly conversational style in the active-voice | (.54) | | .89 |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level | (.66) | .85 | .79 |
| C-14 | Include learning activities, which recycle new information and foster the skills of learning to learn | | | .89 |
| C-15 | Say why any task-work is needed, with real-world relevance to the student, keeping in mind the work needed to achieve the intended benefit | | | .89 |
| C-18 | Stimulate the intrinsic motivation to learn, eg through arousing curiosity with surprising anecdotes | | | .89 |
| C-24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve | | .69 | .79 |
| C-26 | Try to offer learning support | | | .89 |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice | .83 | 1.0 | .79 |
| C-29 | Your perspective should support equality and equity, promoting social harmony, and be socially inclusive, law abiding and non-discriminatory | (.60) | | (.79) |
| C-30 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions | (.60) | .85 | .79 |
| C-32 | Your content should be authentic, internally consistent and appropriately localised | (.60) | .69 | .89 |
| C-36 | Add links to other materials to enrich your content | | .85 | .58 |
| C-37 | Be sure the open licence is clearly visible | .71 | .69 | .68 |
| C-40 | Ensure your OER is easy to access and engage | .89 | 1.0 | .79 |
| C-41 | Clearly give the original author contact information | (.60) | | (.68) |
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality | .94 | .85 | .79 |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use | (.66) | .85 | .68 |
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix. | (.66) | 1.0 | .47 |

| | | | | |
|---|---|---|---|---|
| C-52 | Consider suggesting which OER could come before your OER, and which OER could come afterwards in a learning pathway | | .69 | .79 |
| C-54 | Consider adding metadata tags about the content to help you and others later on to find your OER | | .85 | .79 |
| C-55 | Give metadata tags for expected study duration, for expected level of difficulty, format, and size | | .69 | .68 |
| C-59 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy | (.54) | .69 | .89 |
| C-60 | Your OER and the student's work should be easily transmitted to the student's own e-portfolio | | | .89 |
| | Content Validity Index CVI = average $CVR_E$ = | .84 | .79 | .79 |

The survey was finally closed on 5th June with a total of 70 respondents, and all the analyses were re-computed. The basic effect from having larger numbers is that according to TABLE 1 the cut-off level for $CVR_E$ is lower and the number of retained items may be more. The following data below gives the 38 criteria that can be reasonably retained.

The Content Validity Ratio CVR for only those criteria marked as 'Essential' is given as $CVR_E$ in TABLE 13 below, where Set-1 has 35 respondents and $CVR_E$ must be $\geq$ 0.31 for the criterion to be retained strictly according to Lawshe (1975), where Set-2 has 14 respondents and the $CVR_E$ must be $\geq$ 0.51 for the criterion to be retained, and where Set-3 has 21 respondents and the $CVR_E$ must be $\geq$ 0.41 for the criterion to be retained. These data suggest which criteria could be omitted from the a shorter form *TIPS Framework* version-2.0.

TABLE 13 : The $CVR_E$ for each Criterion Item C-1 to C-65

| Criterion | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Set-1, ≥.31 | | .66 | .60 | | | .37 | | | | .26 |
| Set-2, ≥.51 | .71 | .57 | .71 | | | .43 | .71 | | | |
| Set-3, ≥.41 | .81 | .81 | .62 | .71 | .71 | .81 | .90 | .52 | .62 | .71 |
| Criterion | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
| Set-1, ≥.31 | .37 | .54 | .66 | .43 | .31 | .26 | | | | |
| Set-2, ≥.51 | | .43 | .86 | .43 | | .43 | | | | |
| Set-3, ≥.41 | .71 | .90 | .81 | .81 | .81 | .62 | .52 | .81 | .52 | .62 |
| Criterion | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
| Set-1, ≥.31 | | | .31 | .43 | | .26 | | .83 | .60 | .60 |
| Set-2, ≥.51 | .43 | | .43 | .57 | .57 | | | 1.0 | .29 | .86 |
| Set-3, ≥.41 | .71 | .71 | .71 | .81 | .81 | .81 | .43 | .71 | .71 | .81 |
| Criterion | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
| Set-1, ≥.31 | | .60 | | | .49 | | .71 | | | .89 |
| Set-2, ≥.51 | | .71 | | .29 | .43 | .71 | .71 | .57 | .57 | 1.0 |
| Set-3, ≥.41 | .52 | .90 | | .52 | .81 | .62 | .71 | | .62 | .71 |
| Criterion | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
| Set-1, ≥.31 | .60 | | .49 | .94 | | | .26 | .31 | .66 | .31 |
| Set-2, ≥.51 | .43 | | .29 | .86 | | | .43 | .29 | .86 | |
| Set-3, ≥.41 | .52 | | .52 | .71 | | .62 | .71 | .71 | .71 | .62 |
| Criterion | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
| Set-1, ≥.31 | .66 | | | .31 | | | .37 | .31 | .54 | |
| Set-2, ≥.51 | 1.0 | .71 | | .86 | .71 | .57 | .57 | .29 | .71 | .43 |
| Set-3, ≥.41 | .52 | .81 | .71 | .71 | .62 | .52 | .71 | .62 | .90 | .90 |
| Criterion | C-61 | C-62 | C-63 | C-64 | C-65 | | | | | |
| Set-1, ≥.31 | | .31 | | | | | | | | |
| Set-2, ≥.51 | | .29 | | | | | | | | |
| Set-3, ≥.41 | .43 | .62 | .71 | .52 | .52 | | | | | |

Accepting that most respondents do not know that items scored as 'Useful' according to Lawshe (1975) are discarded, the analysis is re-performed using all the items scored as either 'Essential' or 'Useful' to give $CVR_{E+U}$ as shown in TABLES 3-1 ~ 3-3 given in APPENDIX 1 in full. The $CVR_{E+U}$ is high for each criterion, and the average $CVR_{E+U}$, over all the criteria items C-1 to C-65 without discarding the lower scoring items, which is the overall Content Validity Index $CVI_{E+U}$ for the whole instrument is 0.94 by Set-1, 0.89 by Set-2, and 0.87 for Set-3. Each of these is > 0.80 and indicates the original *TIPS Framework* is valid at $p < 0.05$.

Some reports have argued that Lawshe (1975) only intended for the unnecessary items to be discarded, adopting $CVR_{E+U}$ rather than $CVR_{E}$ to suggest which items are retained. However, taking a very narrow strict interpretation, all those criteria that together give an average $CVR_{E} \geq 0.80$ are inspected in TABLE 14 next to see which criteria might be highlighted as especially noteworthy. The average $CVR_{E}$ is the Content Validity Index CVI for the whole Instrument. Those criteria that can be included at $CVR_{E} \geq 0.70$ but not at $CVR_{E} \geq 0.80$ are given in parentheses. Lawshe (1975) states that despite the statistical data indicating an item is discarded, the item can be retained where there is some other reason for keeping it (such as indicated here as 'Essential' by some other group).

TABLE 14 : Suggested Criteria according to each Set *for* CVI $\geq$ 0.80

| | Key Criterion | Set-1 N=35 | Set-2 N=14 | Set-3 N=21 |
|---|---|---|---|---|
| C-1 | Consider giving a study guide for how to use your OER, with an advance organiser, and navigational aids | | .71 | .81 |
| C-2 | Use a learner-centred approach | (.66) | (.57) | .81 |
| C-3 | Use up-to-date appropriate and authentic pedagogy | (.60) | .71 | (.62) |
| C-6 | You should clearly state the reason and purpose of the OER, its relevance and importance | | | .81 |
| C-7 | It should be aligned to local wants and needs, and anticipate the current and future needs of the student | | .71 | .90 |
| C-10 | Bear in mind your aim to support learner autonomy, independence, learner resilience and self-reliance | | | .71 |
| C-12 | You should adopt a gender-free and user-friendly conversational style in the activevoice | | | .90 |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level | (.66) | .86 | .81 |
| C-14 | Include learning activities, which recycle new information and foster the skills of learning to learn | | | .81 |
| C-15 | Say why any task-work is needed, with real-world relevance to the student, keeping in mind the work needed to achieve the intended benefit | | | .81 |
| C-18 | Stimulate the intrinsic motivation to learn, eg through arousing curiosity with surprising anecdotes | | | .81 |
| C-21 | Monitor the completion rate, student satisfaction and whether the student recommends your OER to others | | | .71 |

| | | | | |
|---|---|---|---|---|
| C-23 | Include a variety of self-assessments such as multiple-choice, concept questions, and comprehension tests | | | .71 |
| C-24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve | | (.57) | .81 |
| C-25 | Link formative self-assessment to help-mechanisms | | (.57) | .81 |
| C-26 | Try to offer learning support | | | .81 |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice | .83 | 1.0 | .71 |
| C-29 | Your perspective should support equality and equity, promoting social harmony, and be socially inclusive, law abiding and non-discriminatory | (.60) | | .71 |
| C-30 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions | (.60) | .86 | .81 |
| C-32 | Your content should be authentic, internally consistent and appropriately localised | (.60) | .71 | .90 |
| C-34 | Encourage student input to create localised content for situated learning : draw on their prior learning and experience, their empirical and indigenous knowledge | | | (.52) |
| C-35 | Try to keep your OER compact in size, while allowing it to stand-alone as a unit for studying by itself. Consider whether it is small enough to reuse in other disciplines | | | .81 |
| C-36 | Add links to other materials to enrich your content | | .71 | (.62) |
| C-37 | Be sure the open licence is clearly visible | .71 | .71 | .71 |
| C-40 | Ensure your OER is easy to access and engage | .89 | 1.0 | .71 |
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality | .94 | .86 | .71 |
| C-47 | Put yourself in your student's position to design a pleasing attractive design, using white-space and colours effectively, to stimulate learning | | | (.71) |
| C-48 | Have some space for adding moderated feedback later on from your students | | | (.71) |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use | (.66) | .86 | .71 |
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix. | (.66) | 1.0 | (.52) |
| C-52 | Consider suggesting which OER could come before your OER, and which OER could come afterwards in a learning pathway | | .71 | .81 |
| C-54 | Consider adding metadata tags about the content to help you and others later on to find your OER | | .86 | .71 |
| C-55 | Give metadata tags for expected study duration, for expected level of difficulty, format, and size | | .71 | (.62) |
| C-56 | Try to use only free sourceware/software, and this should be easily transmissible across platforms | | (.57) | (.52) |
| C-57 | Try to ensure your OER is easily adaptable, eg separate your computer code from your teaching content | | (.57) | .71 |
| C-59 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy | | .71 | .90 |

| | | | | |
|---|---|---|---|---|
| C-60 | Your OER and the student's work should be easily transmitted to the student's own e-portfolio | | | .90 |
| C-62 | Include a date of production, and date of next revision | | | (.62) |
| | *Content Validity Index* CVI = average $CVR_E$ = | .84 | .81 | .79 |
| | (and when including data in parentheses) | (.70) | (.75) | (.75) |

TABLE 15 : Suggested Criteria in each TIPS Section

| | |
|---|---|
| **T teaching and learning processes** | |
| C-1 | Consider giving a study guide for how to use your OER, with an advance organiser, and navigational aids |
| C-2 | Use a learner-centred approach |
| C-3 | Use up-to-date appropriate and authentic pedagogy |
| C-6 | You should clearly state the reason and purpose of the OER, its relevance and importance |
| C-7 | It should be aligned to local wants and needs, and anticipate the current and future needs of the student |
| C-10 | Bear in mind your aim to support learner autonomy, independence, learner resilience and self-reliance |
| C-12 | You should adopt a gender-free and user-friendly conversational style in the activevoice |
| C-13 | Don't use difficult or complex language, and do check the readability to ensure it is appropriate to age/level |
| C-14 | Include learning activities, which recycle new information and foster the skills of learning to learn |
| C-15 | Say why any task-work is needed, with real-world relevance to the student, keeping in mind the work needed to achieve the intended benefit |
| C-18 | Stimulate the intrinsic motivation to learn, eg through arousing curiosity with surprising anecdotes |
| C-21 | Monitor the completion rate, student satisfaction and whether the student recommends your OER to others |
| C-23 | Include a variety of self-assessments such as multiple-choice, concept questions, and comprehension tests |
| C-24 | Provide a way for the student and other teachers to give you feedback and suggestions on how to improve |
| C-25 | Link formative self-assessment to help-mechanisms |
| C-26 | Try to offer learning support |
| **I information and material content** | |
| C-28 | Make sure that the knowledge and skills you want the student to learn are up-to-date, accurate and reliable. Consider asking a subject-matter expert for advice |
| C-29 | Your perspective should support equality and equity, promoting social harmony, and be socially inclusive, law abiding and non-discriminatory |
| C-30 | All your content should be relevant and appropriate to purpose. Avoid superfluous material and distractions |
| C-32 | Your content should be authentic, internally consistent and appropriately localised |
| C-34 | Encourage student input to create localised content for situated learning : draw on their prior learning and experience, their empirical and indigenous knowledge |
| C-35 | Try to keep your OER compact in size, while allowing it to stand-alone as a unit for studying by itself. Consider whether it is small enough to reuse in other disciplines |
| C-36 | Add links to other materials to enrich your content |
| **P presentation product and format** | |
| C-37 | Be sure the open licence is clearly visible |
| C-40 | Ensure your OER is easy to access and engage |
| C-44 | Present your material in a clear, concise, and coherent way, taking care with sound quality |
| C-47 | Put yourself in your student's position to design a pleasing attractive design, using white-space and colours effectively, to stimulate learning |
| C-48 | Have some space for adding moderated feedback later on from your students |
| C-49 | Consider whether your OER will be printed out, usable off-line, or is suitable for mobile use |

| | |
|---|---|
| C-51 | Use open formats for delivery of OER to enable maximum reuse and re-mix. |
| C-52 | Consider suggesting which OER could come before your OER, and which OER could come afterwards in a learning pathway |
| S | system technical and technology |
| C-54 | Consider adding metadata tags about the content to help you and others later on to find your OER |
| C-55 | Give metadata tags for expected study duration, for expected level of difficulty, format, and size |
| C-56 | Try to use only free sourceware/software, and this should be easily transmissible across platforms |
| C-57 | Try to ensure your OER is easily adaptable, eg separate your computer code from your teaching content |
| C-59 | Your OER should be easily portable and transmissible, and you should be able to keep an off-line copy |
| C-60 | Your OER and the student's work should be easily transmitted to the student's own e-portfolio |
| C-62 | Include a date of production, and date of next revision |

The criteria with highest scores of $CVR_E$ are highlighted in TABLE 14 and TABLE 15 by grey-colour fill. These should be highlighted in the *TIPS Framework* version-2.0.

Some criteria at $CVR_E = 0.71$ by Set-3 need to be discarded to bring the average of Set-3 to around 0.80, and C-47, and C-48 with low $CVR_E$ by Set-1 and Set-2 are therefore removed (C-47 at $CVR_E = 0.26$ by Set-1, and 0.43 by Set-2 ; and C-48 at $CVR_E = 0.31$ by Set-1, and 0.29 by Set-2. These are relatively low for achieving the average $CVR_E \geq 0.80$, but nevertheless are still worthwhile considering as they each (TABLE 13) around 0.30 for being retained. Moreover, C-47 *'Put yourself in your student's position to design a pleasing attractive design, using white-space and colours effectively, to stimulate learning'* is pedagogically an important aspect of a learner-centred approach. Elsewhere, C-62 *'Include a date of production, and date of next revision'* was also discarded based on statistics, but entails good methodological practice and involves little extra effort : the expected lifetime duration of a resource is reported as essential by Freeman (2005, p.245) to be included in any course specification. These C-47, C-48 and C-62 were identified in the first surveys performed in 2013, and there are reasonable arguments to carry them over into version-2.0.

## 4. SUGGESTIONS :

The 38 criteria found by Content Validity analysis are shown in TABLE 15 above. Each of these items are expressed in the *TIPS Framework* which consists of 4 levels each with seven points to consider. Correlation between the 38 items of TABLE 15 and the 28 points of the *TIPS Framework* finds that some phrases can be omitted, such as parts of T-2 "Where you describe them, say any special cultural or local characteristics about them. Help them develop there own identities and sense of own worth, by asking them to reflect on benefits and by emphasising that their efforts bring them rewards in achieved learning, increased capabilities, and more

independence and autonomy", T-4 "Check the readability of your texts to make sure your use of language is most suitable to the level of your students", and most of S-6 "Where to store your OER".

However the remarkable finding is that very little revision is needed to adopt in full the recommendations from the Content Validity surveys. Some discussions gave useful suggestions for example to put all points into the imperative mood rather than the subjunctive, and some other issues of grammar standardisation.

According to Harvey & Green (1993, pp.19-20) "Quality assurance is about ensuring that there are mechanisms, procedures and processes in place to ensure that the desired quality, however defined and measured, is delivered... The assumption implicit in the development of quality assurance is that if mechanisms exist, quality can be assured". In this respect the *TIPS Framework* offers a quality control mechanism, to build in quality from the start - rather than quality assurance that hopes to develop and improve the quality iteratively through reflection and gradual modification. For the quality assurance iterative process, a self-assessment rubric is added into the *Framework* version-2.0. Thus the quality can be adapted to meet the changing culture and local context where the OER is reused.

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## APPENDIX 1 : Survey Data

TABLE 3-1 : The CVR for each Criterion Item C-1 to C-65
Set-1 : Individual OER Experts, N = 35
Subscript E : scored as Essential, Subscript U : scored as Useful, Subscript E+U : scored as Essential or Useful

| Set-1 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 16 | 29 | 28 | 16 | 13 | 24 | 18 | 13 | 16 | 22 |
| $N_U$ | 18 | 5 | 5 | 17 | 19 | 8 | 13 | 18 | 17 | 11 |
| $N_{E+U}$ | 34 | 34 | 33 | 33 | 32 | 32 | 31 | 31 | 33 | 33 |
| $CVR_E$ | -.09 | .66 | .60 | -.09 | -.26 | .37 | .03 | -.26 | -.09 | .26 |
| $CVR_{E+U}$ | .94 | .94 | .89 | .89 | .83 | .83 | .77 | .77 | .89 | .89 |

| Set-1 | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 24 | 27 | 29 | 25 | 23 | 22 | 9 | 19 | 16 | 8 |
| $N_U$ | 8 | 7 | 6 | 9 | 11 | 12 | 19 | 12 | 18 | 21 |
| $N_{E+U}$ | 32 | 34 | 35 | 34 | 34 | 34 | 28 | 31 | 34 | 29 |
| $CVR_E$ | .37 | .54 | .66 | .43 | .31 | .26 | -.49 | .09 | -.09 | -.54 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $CVR_{E+U}$ | .83 | .94 | 1.0 | .94 | .94 | .94 | .60 | .77 | .94 | .66 |

| Set-1 | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 19 | 9 | 23 | 25 | 19 | 22 | 9 | 32 | 28 | 28 |
| $N_U$ | 13 | 13 | 12 | 10 | 15 | 11 | 18 | 2 | 6 | 7 |
| $N_{E+U}$ | 32 | 22 | 35 | 35 | 34 | 33 | 27 | 34 | 34 | 35 |
| $CVR_E$ | .09 | -.49 | .31 | .43 | .09 | .26 | -.49 | .83 | .60 | .60 |
| $CVR_{E+U}$ | .83 | .26 | 1.0 | 1.0 | .94 | .89 | .54 | .94 | .94 | 1.0 |

| Set-1 | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 9 | 28 | 10 | 17 | 26 | 20 | 30 | 18 | 19 | 33 |
| $N_U$ | 21 | 6 | 19 | 15 | 7 | 14 | 5 | 16 | 11 | 2 |
| $N_{E+U}$ | 30 | 34 | 29 | 32 | 33 | 34 | 35 | 34 | 30 | 35 |
| $CVR_E$ | -.49 | .60 | -.43 | -.03 | .49 | .14 | .71 | .03 | .09 | .89 |
| $CVR_{E+U}$ | .71 | .94 | .66 | .83 | .89 | .94 | 1.0 | .94 | .71 | 1.0 |

| Set-1 | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 28 | 12 | 26 | 34 | 12 | 11 | 22 | 23 | 29 | 23 |
| $N_U$ | 6 | 14 | 9 | 1 | 17 | 16 | 12 | 8 | 6 | 12 |
| $N_{E+U}$ | 34 | 26 | 35 | 35 | 29 | 27 | 34 | 31 | 35 | 35 |
| $CVR_E$ | .60 | -.31 | .49 | .94 | -.31 | -.37 | .26 | .31 | .66 | .31 |
| $CVR_{E+U}$ | .94 | .49 | 1.0 | 1.0 | .66 | .54 | .71 | .77 | 1.0 | 1.0 |

| Set-1 | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 29 | 13 | 8 | 23 | 19 | 21 | 24 | 23 | 27 | 20 |
| $N_U$ | 6 | 19 | 22 | 10 | 11 | 12 | 10 | 11 | 7 | 15 |
| $N_{E+U}$ | 35 | 32 | 30 | 33 | 30 | 33 | 34 | 34 | 34 | 35 |
| $CVR_E$ | .66 | -.26 | -.54 | .31 | .09 | .20 | .37 | .31 | .54 | .14 |
| $CVR_{E+U}$ | 1.0 | .83 | .71 | .89 | .71 | .89 | .94 | .94 | .94 | 1.0 |

| Set-1 | C-61 | C-62 | C-63 | C-64 | C-65 |
|---|---|---|---|---|---|
| $N_E$ | 21 | 23 | 13 | 13 | 14 |
| $N_U$ | 14 | 12 | 20 | 18 | 18 |

| | | | | | |
|---|---|---|---|---|---|
| $N_{E+U}$ | 35 | 35 | 33 | 32 | 32 |
| $CVR_{E}$ | .20 | .31 | -.26 | -.26 | -.20 |
| $CVR_{E+U}$ | 1.0 | 1.0 | .89 | .83 | .83 |

TABLE 3-2 : The CVR for each Criterion Item C-1 to C-65
Set-2 : Group OER Experts, N = 14
Subscript E : scored as Essential, Subscript U : scored as Useful, Subscript E+U : scored as Essential or Useful

| Set-2 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_{E}$ | 12 | 11 | 12 | 6 | 9 | 10 | 12 | 9 | 7 | 6 |
| $N_{U}$ | 2 | 3 | 2 | 7 | 5 | 2 | 1 | 5 | 4 | 7 |
| $N_{E+U}$ | 14 | 14 | 14 | 13 | 14 | 12 | 13 | 14 | 12 | 13 |
| $CVR_{E}$ | .71 | .57 | .71 | -.14 | .29 | .43 | .71 | .29 | .00 | -.14 |
| $CVR_{E+U}$ | 1.0 | 1.0 | 1.0 | .86 | 1.0 | .71 | .86 | 1.0 | .71 | .86 |

| Set-2 | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_{E}$ | 7 | 10 | 13 | 10 | 8 | 10 | 6 | 8 | 9 | 6 |
| $N_{U}$ | 5 | 1 | 1 | 4 | 6 | 1 | 5 | 6 | 5 | 6 |
| $N_{E+U}$ | 12 | 11 | 14 | 14 | 14 | 11 | 11 | 14 | 14 | 12 |
| $CVR_{E}$ | .00 | .43 | .86 | .43 | .14 | .43 | -.14 | .14 | .29 | -.14 |
| $CVR_{E+U}$ | .71 | .57 | 1.0 | 1.0 | 1.0 | .57 | .57 | 1.0 | 1.0 | .71 |

| Set-2 | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_{E}$ | 10 | 6 | 10 | 11 | 11 | 8 | 6 | 14 | 9 | 13 |
| $N_{U}$ | 4 | 4 | 4 | 3 | 3 | 6 | 7 | 0 | 4 | 1 |
| $N_{E+U}$ | 14 | 10 | 14 | 14 | 14 | 14 | 13 | 14 | 13 | 14 |
| $CVR_{E}$ | .43 | -.14 | .43 | .57 | .57 | .14 | -.14 | 1.0 | .29 | .86 |
| $CVR_{E+U}$ | 1.0 | .43 | 1.0 | 1.0 | 1.0 | 1.0 | .86 | 1.0 | .86 | 1.0 |

| Set-2 | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_{E}$ | 5 | 12 | 8 | 9 | 10 | 12 | 12 | 11 | 11 | 14 |
| $N_{U}$ | 8 | 1 | 5 | 3 | 4 | 2 | 1 | 3 | 3 | 0 |
| $N_{E+U}$ | 13 | 13 | 13 | 12 | 14 | 14 | 13 | 14 | 14 | 14 |
| $CVR_{E}$ | -.29 | .71 | .14 | .29 | .43 | .71 | .71 | .57 | .57 | 1.0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $CVR_{E+U}$ | .86 | .86 | .86 | .71 | 1.0 | 1.0 | .86 | 1.0 | 1.0 | 1.0 |

| Set-2 | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 10 | 2 | 9 | 13 | 5 | 4 | 10 | 9 | 13 | 7 |
| $N_U$ | 4 | 7 | 5 | 1 | 7 | 7 | 4 | 5 | 0 | 7 |
| $N_{E+U}$ | 14 | 9 | 14 | 14 | 12 | 11 | 14 | 14 | 13 | 14 |
| $CVR_E$ | .43 | -.71 | .29 | .86 | -.29 | -.43 | .43 | .29 | .86 | .00 |
| $CVR_{E+U}$ | 1.0 | .29 | 1.0 | 1.0 | .71 | .57 | 1.0 | 1.0 | .86 | 1.0 |

| Set-2 | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 14 | 12 | 7 | 13 | 12 | 11 | 11 | 9 | 12 | 10 |
| $N_U$ | 0 | 2 | 6 | 1 | 2 | 3 | 3 | 5 | 2 | 2 |
| $N_{E+U}$ | 14 | 14 | 13 | 14 | 14 | 14 | 14 | 14 | 14 | 12 |
| $CVR_E$ | 1.0 | .71 | .00 | .86 | .71 | .57 | .57 | .29 | .71 | .43 |
| $CVR_{E+U}$ | 1.0 | 1.0 | .86 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | .71 |

| Set-2 | C-61 | C-62 | C-63 | C-64 | C-65 |
|---|---|---|---|---|---|
| $N_E$ | 4 | 9 | 6 | 7 | 8 |
| $N_U$ | 8 | 4 | 8 | 7 | 6 |
| $N_{E+U}$ | 12 | 13 | 14 | 14 | 14 |
| $CVR_E$ | -.43 | .29 | -.14 | .00 | .14 |
| $CVR_{E+U}$ | .71 | .86 | 1.0 | 1.0 | 1.0 |

TABLE 3-3 : The CVR for each Criterion Item C-1 to C-65
Set-3 : Individual OER Experts, N = 21
Subscript E : scored as Essential, Subscript U : scored as Useful, Subscript E+U : scored as Essential or Useful

| Set-3 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 19 | 19 | 17 | 18 | 18 | 19 | 20 | 16 | 17 | 18 |
| $N_U$ | 1 | 1 | 1 | 2 | 2 | 1 | 0 | 3 | 3 | 2 |
| $N_{E+U}$ | 20 | 20 | 18 | 20 | 20 | 20 | 20 | 19 | 20 | 20 |
| $CVR_E$ | .81 | .81 | .62 | .71 | .71 | .81 | .90 | .52 | .62 | .71 |
| $CVR_{E+U}$ | .90 | .90 | .71 | .90 | .90 | .90 | .90 | .81 | .90 | .90 |

| Set-3 | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 18 | 20 | 19 | 19 | 19 | 17 | 16 | 19 | 16 | 17 |
| $N_U$ | 2 | 0 | 1 | 0 | 1 | 2 | 4 | 0 | 4 | 3 |
| $N_{E+U}$ | 20 | 20 | 20 | 19 | 20 | 19 | 20 | 19 | 20 | 20 |
| $CVR_E$ | .71 | .90 | .81 | .81 | .81 | .62 | .52 | .81 | .52 | .62 |
| $CVR_{E+U}$ | .90 | .90 | .90 | .81 | .90 | .81 | .90 | .81 | .90 | .90 |

| Set-3 | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 18 | 18 | 18 | 19 | 19 | 19 | 15 | 18 | 18 | 19 |
| $N_U$ | 2 | 2 | 1 | 1 | 1 | 0 | 5 | 2 | 2 | 1 |
| $N_{E+U}$ | 20 | 20 | 19 | 20 | 20 | 19 | 20 | 20 | 20 | 20 |
| $CVR_E$ | .71 | .71 | .71 | .81 | .81 | .81 | .43 | .71 | .71 | .81 |
| $CVR_{E+U}$ | .90 | .90 | .81 | .90 | .90 | .81 | .90 | .90 | .90 | .90 |

| Set-3 | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 16 | 20 | 14 | 16 | 19 | 17 | 18 | 12 | 17 | 18 |
| $N_U$ | 4 | 0 | 5 | 4 | 1 | 3 | 2 | 8 | 3 | 2 |
| $N_{E+U}$ | 20 | 20 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| $CVR_E$ | .52 | .90 | .33 | .52 | .81 | .62 | .71 | .14 | .62 | .71 |
| $CVR_{E+U}$ | .90 | .90 | .81 | .90 | .90 | .90 | .90 | .90 | .90 | .90 |

| Set-3 | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 16 | 13 | 16 | 18 | 14 | 17 | 18 | 18 | 18 | 17 |
| $N_U$ | 3 | 4 | 3 | 2 | 5 | 2 | 2 | 2 | 2 | 3 |
| $N_{E+U}$ | 19 | 17 | 19 | 20 | 19 | 19 | 20 | 20 | 20 | 20 |
| $CVR_E$ | .52 | .24 | .52 | .71 | .33 | .62 | .71 | .71 | .71 | .62 |
| $CVR_{E+U}$ | .81 | .62 | .81 | .90 | .81 | .81 | .90 | .90 | .90 | .90 |

| Set-3 | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
|---|---|---|---|---|---|---|---|---|---|---|
| $N_E$ | 16 | 19 | 18 | 18 | 17 | 16 | 18 | 17 | 20 | 20 |
| $N_U$ | 4 | 1 | 2 | 2 | 2 | 4 | 2 | 2 | 0 | 0 |
| $N_{E+U}$ | 20 | 20 | 20 | 20 | 19 | 20 | 20 | 19 | 20 | 20 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $CVR_E$ | .52 | .81 | .71 | .71 | .62 | .52 | .71 | .62 | .90 | .90 |
| $CVR_{E+U}$ | .90 | .90 | .90 | .90 | .81 | .90 | .90 | .81 | .90 | .90 |

| Set-3 | C-61 | C-62 | C-63 | C-64 | C-65 |
|---|---|---|---|---|---|
| $N_E$ | 15 | 17 | 18 | 16 | 16 |
| $N_U$ | 5 | 2 | 2 | 3 | 3 |
| $N_{E+U}$ | 20 | 19 | 20 | 19 | 19 |
| $CVR_E$ | .43 | .62 | .71 | .52 | .52 |
| $CVR_{E+U}$ | .90 | .81 | .90 | .81 | .81 |

## APPENDIX 2 : Wave Analysis

For the wave analysis (Leslie, 1972), the 32 survey responders comprising Set-1 of Individual OER Experts were randomly ordered using the statistical random number tables online at http://www.rand.org/publications/classics/randomdigits. There were 38 responses e1 ~ e38 collected, and on individual inspection 6 of these were not used (e4, e11, e13, e26, e36, and e38). The remaining 32 were searched for serially in columns of random numbers, and the sequence of their occurrences was taken as their new random order for wave analysis. The sequence was e15, e08, e25, e37, e16, e21, e03, e19, e33, e20, e28, e27, e02, e12, e18, e17, e09, e34, e23, e31, e22, e07, e32, e01, e05, e24, e10, e14, e29, e30, e06, and e35. The first ten in this sequence were assigned as being wave-1, the next ten as being in wave-2, and the next ten as being in wave-3, with the last two held aside from wave analysis (and after wave analysis had confirmed the confidence, then these were added back in and all 32 responses were analysed for Content Validity Ratio analysis).

The three waves are shown in FIGURE 4 in the RESULTS Section-3.2, and the numerical data of $N_E$ 'Essential' scores (on the y-axis) used to draw FIGURE 4 are given here for each Criterion C1 ~ C-65 (on the x-axis), for openness and reference.

| Set-1 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-1 | 4 | 10 | 9 | 4 | 3 | 9 | 4 | 4 | 4 | 4 |
| wave-2 | 5 | 8 | 8 | 4 | 5 | 6 | 6 | 5 | 5 | 7 |
| wave-3 | 4 | 7 | 7 | 7 | 4 | 6 | 7 | 3 | 5 | 7 |
| | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
| wave-1 | 8 | 7 | 8 | 6 | 7 | 6 | 2 | 6 | 2 | 3 |
| wave-2 | 7 | 8 | 9 | 8 | 7 | 5 | 3 | 5 | 5 | 3 |
| wave-3 | 7 | 8 | 10 | 8 | 8 | 8 | 3 | 6 | 7 | 2 |

| | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-1 | 5 | 2 | 6 | 7 | 5 | 5 | 0 | 9 | 8 | 8 |
| wave-2 | 6 | 3 | 8 | 7 | 6 | 8 | 3 | 9 | 9 | 8 |
| wave-3 | 5 | 4 | 7 | 9 | 7 | 7 | 5 | 9 | 8 | 8 |
| | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
| wave-1 | 3 | 6 | 1 | 5 | 7 | 5 | 7 | 4 | 4 | 9 |
| wave-2 | 2 | 9 | 3 | 5 | 9 | 8 | 8 | 6 | 5 | 10 |
| wave-3 | 3 | 10 | 5 | 5 | 8 | 5 | 10 | 6 | 7 | 9 |
| | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
| wave-1 | 7 | 3 | 7 | 10 | 3 | 1 | 7 | 6 | 8 | 6 |
| wave-2 | 7 | 4 | 8 | 10 | 4 | 4 | 8 | 8 | 7 | 6 |
| wave-3 | 9 | 3 | 9 | 10 | 4 | 5 | 6 | 7 | 9 | 8 |
| | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
| wave-1 | 8 | 3 | 1 | 5 | 3 | 6 | 5 | 5 | 6 | 5 |
| wave-2 | 8 | 4 | 3 | 7 | 6 | 6 | 7 | 8 | 8 | 8 |
| wave-3 | 10 | 4 | 4 | 7 | 6 | 7 | 9 | 8 | 9 | 5 |
| | C-61 | C-62 | C-63 | C-64 | C-65 | | | | | |
| wave-1 | 7 | 6 | 3 | 3 | 4 | | | | | |
| wave-2 | 4 | 5 | 4 | 4 | 3 | | | | | |
| wave-3 | 6 | 9 | 5 | 4 | 5 | | | | | |

Wave analysis was not performed for the $N_U$ 'Useful' scores. However the data collected is presented numerically here.

| Set-1 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-1 | 7 | 0 | 1 | 6 | 7 | 1 | 4 | 6 | 6 | 6 |
| wave-2 | 4 | 2 | 2 | 5 | 4 | 3 | 4 | 5 | 5 | 2 |
| wave-3 | 5 | 2 | 2 | 2 | 4 | 2 | 2 | 3 | 4 | 2 |
| | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
| wave-1 | 2 | 3 | 2 | 3 | 2 | 4 | 6 | 3 | 8 | 4 |
| wave-2 | 1 | 2 | 1 | 2 | 3 | 4 | 3 | 4 | 5 | 5 |
| wave-3 | 2 | 1 | 0 | 2 | 2 | 2 | 6 | 3 | 3 | 8 |
| | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
| wave-1 | 4 | 3 | 4 | 3 | 5 | 4 | 6 | 1 | 2 | 2 |
| wave-2 | 3 | 4 | 1 | 3 | 4 | 1 | 5 | 0 | 1 | 2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-3 | 4 | 4 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | 2 |
| | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
| wave-1 | 5 | 4 | 7 | 4 | 2 | 5 | 3 | 6 | 5 | 1 |
| wave-2 | 7 | 1 | 4 | 5 | 1 | 2 | 2 | 3 | 3 | 0 |
| wave-3 | 7 | 0 | 4 | 3 | 2 | 5 | 0 | 4 | 2 | 1 |
| | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
| wave-1 | 3 | 3 | 3 | 0 | 5 | 6 | 3 | 2 | 2 | 4 |
| wave-2 | 3 | 5 | 2 | 0 | 5 | 5 | 2 | 1 | 3 | 4 |
| wave-3 | 0 | 4 | 1 | 0 | 4 | 3 | 3 | 2 | 1 | 2 |
| | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
| wave-1 | 2 | 5 | 6 | 5 | 6 | 4 | 5 | 5 | 4 | 5 |
| wave-2 | 2 | 6 | 6 | 1 | 1 | 2 | 2 | 1 | 2 | 2 |
| wave-3 | 0 | 6 | 6 | 3 | 3 | 3 | 1 | 2 | 1 | 5 |
| | C-61 | C-62 | C-63 | C-64 | C-65 | | | | | |
| wave-1 | 3 | 4 | 6 | 5 | 4 | | | | | |
| wave-2 | 6 | 5 | 5 | 6 | 6 | | | | | |
| wave-3 | 4 | 1 | 5 | 4 | 5 | | | | | |

The 13 usable responses g1 ~ g13 by anonymous experts in Set-2 of OER Groups are reordered into random order. Then the incidence of 'Essential' $N_E$ scores in the first ten responses are collated here and compared to see if this wave-4 fits with the other three waves.

| Set-2 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-4 | 8 | 9 | 9 | 5 | 7 | 8 | 8 | 7 | 5 | 5 |
| | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
| wave-4 | 5 | 7 | 9 | 8 | 6 | 7 | 4 | 7 | 7 | 4 |
| | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
| wave-4 | 7 | 4 | 8 | 8 | 8 | 5 | 4 | 10 | 7 | 9 |
| | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
| wave-4 | 3 | 8 | 5 | 7 | 7 | 10 | 8 | 7 | 8 | 10 |
| | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
| wave-4 | 7 | 2 | 8 | 9 | 3 | 2 | 8 | 7 | 9 | 4 |
| | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
| wave-4 | 10 | 9 | 5 | 9 | 8 | 7 | 8 | 6 | 9 | 8 |
| | C-61 | C-62 | C-63 | C-64 | C-65 | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| wave-4 | 2 | 6 | 4 | 5 | 7 |

The numerical data of $N_E$ for wave-5 and wave-6 for Set-3 of Individual Teachers are given here.

| Set-3 | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9 | C-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| wave-5 | 9 | 10 | 9 | 9 | 9 | 10 | 10 | 10 | 9 | 9 |
| wave-6 | 9 | 9 | 7 | 8 | 9 | 8 | 9 | 7 | 7 | 7 |
| | C-11 | C-12 | C-13 | C-14 | C-15 | C-16 | C-17 | C-18 | C-19 | C-20 |
| wave-5 | 9 | 10 | 10 | 10 | 10 | 9 | 8 | 10 | 9 | 8 |
| wave-6 | 7 | 9 | 8 | 9 | 9 | 8 | 9 | 9 | 6 | 7 |
| | C-21 | C-22 | C-23 | C-24 | C-25 | C-26 | C-27 | C-28 | C-29 | C-30 |
| wave-5 | 8 | 10 | 10 | 9 | 9 | 10 | 8 | 10 | 9 | 10 |
| wave-6 | 8 | 8 | 8 | 9 | 9 | 9 | 7 | 8 | 8 | 8 |
| | C-31 | C-32 | C-33 | C-34 | C-35 | C-36 | C-37 | C-38 | C-39 | C-40 |
| wave-5 | 9 | 10 | 8 | 8 | 9 | 8 | 9 | 7 | 9 | 10 |
| wave-6 | 6 | 9 | 6 | 8 | 9 | 7 | 8 | 5 | 9 | 8 |
| | C-41 | C-42 | C-43 | C-44 | C-45 | C-46 | C-47 | C-48 | C-49 | C-50 |
| wave-5 | 8 | 7 | 8 | 9 | 8 | 8 | 8 | 9 | 9 | 8 |
| wave-6 | 9 | 5 | 7 | 9 | 5 | 9 | 9 | 8 | 8 | 8 |
| | C-51 | C-52 | C-53 | C-54 | C-55 | C-56 | C-57 | C-58 | C-59 | C-60 |
| wave-5 | 8 | 9 | 9 | 10 | 10 | 8 | 9 | 9 | 10 | 10 |
| wave-6 | 7 | 9 | 8 | 8 | 8 | 7 | 8 | 8 | 9 | 9 |
| | C-61 | C-62 | C-63 | C-64 | C-65 | | | | | |
| wave-5 | 8 | 9 | 9 | 8 | 9 | | | | | |
| wave-6 | 7 | 8 | 9 | 7 | 7 | | | | | |