Fortifying the Master's by Research Programme: Alignment of Assessed Activities and Learning Outcomes

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Abstract: - The assignment of a set of learning outcomes as the ultimate achievement upon completion of an academic programme is arguably the core of Outcome-based Education (OBE). The concept is perhaps easier to grasp and the implementation perceived to be more straightforward for taught courses compared to research-based ones. For master's by research programmes, the link and alignment of the assessed activities with the learning outcomes are sometimes unclear or poorly defined. Nonetheless these activities and tasks contribute no less to the attainment of the learning outcomes. This paper examines the possible causes of mismatch between the two, based on reviews of the common activities involved in a typical master by research programme at the University. Whether the activities are laid out before the assessment criteria and outcomes are established, or vice versa, it remains imperative to streamline the two components to ensure both the formative and summative assessments are effectively geared towards achieving the learning outcomes. In addition, the alignment allows preset aims and objectives to guide a student's learning, simplifies an otherwise onerous and complicated grading exercise, and avoids disputes over subjectivity and alleged biases.

Key-Words: - research programme, learning outcomes, assessment criteria, assessed tasks

1 Introduction

Master's by research is a graduate programme based entirely on research work, which culminates in the writing and submission of a thesis for oral examination, or viva-voce. The duration could be as short as a year and extends up to 3 years for a fulltime study, depending very much on personal factors as well as requirements and nature of the project itself.

The difference and uniqueness of the individual project notwithstanding, all master's by research programmes should adhere by a number of preset learning outcomes expected of a graduate upon completion of the study. To achieve these outcomes, a number of activities are designed and conducted to progressively mould a student to attain the targets. With the activities and outcomes in place, the crucial ingredient left is the assessment method and criteria which link them together.

Assessment is a much researched topic on its own and the Malaysian Qualification Agency (MQA) has given some guidelines too. It is the University's responsibilities to develop and manage a robust assessment system which is secure, of quality and is subjected to review and improvement periodically [1]. Regardless of the method adopted, it is important that the criteria be derived from specific characteristics of the learning outcomes. In other words, the assessment criteria must be aligned with the learning outcomes, making attainment of the desirable or targeted features measurable in a graduate and his or her work.

It is generally accepted that a good assessment criteria is transparent, doable, distinctive and specific. To be transparent, students must be informed in advance of the assessment criteria to make guided preparations instead of groping in the dark. The criteria to be assessed must be doable within the limitations of time and resources, as well

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as the minimum expectations of the student's performance. The criteria should also have clear distinction of performance levels to single out exceptional work. Finally, the criteria must be clearly defined for a specific activity or task.
In short, no matter what and how the assessments are carried out, whether they are of a continuous or final evaluation, must conform to an organized structure for meeting the intended learning outcomes. The system must be carefully drawn up with a clear timeline for guidance, an effective close-loop feedback mechanism, and assurance for quality, validity and integrity of both the assessor and assessed.

This paper examines the current master's by research programme at Universiti Tun Hussein Onn Malaysia (UTHM), with specific interest on the assessed activities and learning outcomes. It aims to review the existing tasks and assessment system to form the basis for realignment with the targeted learning outcomes. An integrated model is then proposed to relate the activities with the learning outcomes, via suitable assessment method and criteria.

2 Learning Outcomes

The curriculum was designed in compliance with the provisions of the Malaysian Qualifications Framework [2], including the level of qualifications, learning outcomes, student competencies and academic load. It is essentially a tri-component interactive model of content, pedagogy and assessment. Also, the Standards for Master's and Doctoral Degrees by Research issued by the Malaysian Qualification Agency (MQA) in November 2012 clearly compartmentalized the learning outcomes to be achieved by a research student [3]. These include 7 domains of learning outcomes, where they fall under the categories of 'knowledge or cognitive [c]' (domain 1), 'skill or psychomotor [p]' (item 2) and 'affective [a]' (items 3-9):

1. Knowledge of discipline areas (c)
2. Practical skills (p)
3. Social skills and responsibilities (a1)
4. Values (a2)
5. Attitudes and professionalism (a3)
6. Communication (a4)
7. Leadership and team skills (a5)
8. Problem-solving and scientific skills (a6)
9. Information management and lifelong learning skills (a7)

A further elaboration of these domains is as follows, where upon completion of his or her study, a master's by research graduate must be able to

i. demonstrate the mastery of knowledge in the relevant field (c = **C**);
ii. apply practical skills in the relevant field (p = **P**);
iii. relate to societal issues in the relevant field (a1 = **A1**);
iv. conduct research with minimal supervision and adhere to legal, ethical and professional codes of practice (a2+a3 = **A2**);
v. demonstrate leadership qualities through communicating and working effectively with peers and stakeholders (a4+a5 = **A3**);
vi. generate solutions to problems using scientific and critical thinking skills (a6 = **A4**); and to
vii. manage information for lifelong learning (a7 = **A5**).

The Standards also highlighted higher level expectations of the graduates, with enhanced competencies demonstrated in the areas of reviewed publications, as well as future career and research development.

Considering that the final or summative assessment of a master's by research programme is the defense of one's thesis in an oral examination (i.e. viva voce), it is almost impossible to evaluate the attainment of all the above components in a single assessment exercise. Besides, it is the learning process which culminates in the written report or thesis, and the ability of the student to engage in an intellectual discourse, albeit under scrutiny and evaluation, pertaining to his or her work performed throughout the programme.

It is therefore equally, if not more important, to place emphasis on the formative assessment mechanism, which forms cumulative building blocks to the student's learning, from the conceptualization of proposal, execution of planned work, analysis, calibration and critical review, to the final documentation of the entire work. In short, the progressive grading exercise enables continuous monitoring to avoid digression from the primary research scope and targets, in tandem with the capacity and commitment of the student individually. This could result in the effective reduction of 'casualties' along the way to pursuing a research degree on the whole, as sub-par performance would be quickly identified and the underlying problems mitigated to ensure continued and consistent progress of a student. Fig. 1 illustrates the intertwined relationship between assessment and learning outcomes for a master's research programme.

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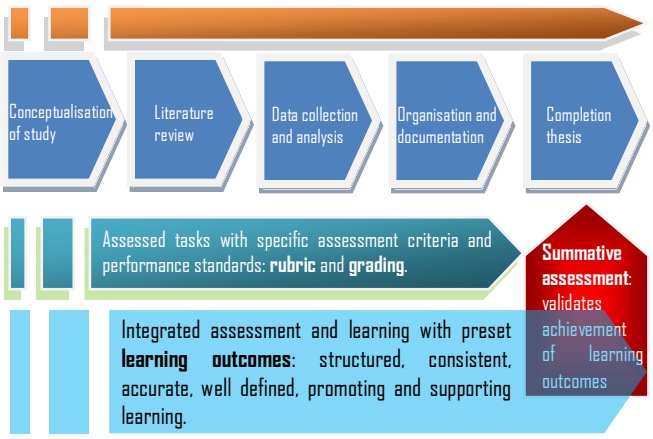

Fig. 1 Relationship between the learning outcomes and the assessments.

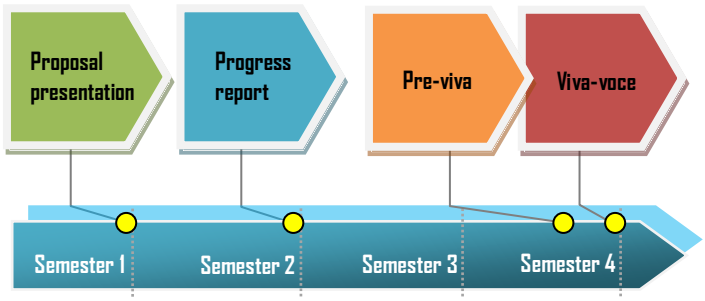

Fig. 2 Idealised timeline for the assessed activities.

3 Assessment and Activities

A fulltime master's by research programme usually spans between 1 to 3 years [4], with the lower limit being the minimum time required and the upper limit indicating the maximum period normally needed to complete the study. The main activities which constitute the milestones in a research student's journey include (1) presentation of the proposal, (2) presentation of the progress report, (3) the pre-viva and (4) the viva-voce itself. The general timeline (idealised) prescribed for each activity is shown in Fig. 2.

(1) Presentation of proposal

A student is generally expected to submit and defend a proposal by the end of the first 6 months of study. This involves a written report outlining the proposed work, and may include some preliminary results to support and justify the project. The report is accompanied by an oral presentation for an assembly of jury, usually of a chairperson and a couple of panelists. Assessment is made on both the written report and the oral presentation, using a standardized rubric which encompasses the relevant components. Technicality aside, a large part of the evaluation on the oral presentation touches on the onsite performance of the student, i.e. the presentation slides, other visual aids and the student's composure while delivering the proposal's contents. The written report, on the other hand, is usually submitted a week in advance to allow sufficient time for review by the panelists. It is therefore understandable if the student is subjected to immense pressure to make a positive impression on the panelists within the 30-45 minutes of contact time. Of course, the main supervisor is responsible for grading the student's work too, separately.

It ought to be mentioned that it is compulsory for all research students to attend the Research Methodology class in the first semester. Apart from guiding the students through the general aspect and process of a research study, the course's ultimate outcome and assessment revolve around the written proposal of the student's respective project. The course provides not just the basics of how to conduct a research, including overview of types of research, techniques for effective literature search and review, identification and selection of test methods, management and analysis of data, discussions and drawing of conclusions, the course also helps groom the students into astute researchers equipped with the fundamental skills to serve them throughout their studies.

(2) Presentation of progress report

In subsequent semesters after the first, the student is expected to submit progressive completion of the thesis in the form of a progress report. This practice is perhaps unconventional compared to the normal practice of writing the thesis only upon pulling the plug on data collection. It necessitates the parallel writing of the thesis while the research study is on-going. This requirement to demonstrate a student's ability to put into words his or her construction of the thesis as work progresses has several advantages:

a. It puts the student's time management skills to test and to be honed.
b. It avoids a general tendency to procrastinate documenting the research work in an organized manner, as students get engrossed in the data collection process.
c. It actually helps to achieve the 'graduate on time' aspiration.
d. Students can learn from the mistakes as pointed out by the assessors (supervisor and panelists) and initiate the process of 'amendments' and 'corrections' of the thesis itself.

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However, as with all things, there are always two sides to a coin. Some disadvantages are also found in the practice:

a. In some ways it is a burden and chore to the student, especially if the project involves intensive data collection and processing.
b. Confusion may arise on the priority of tasks at hand and consequently affects the student's overall quality of work.
c. The pressure to have the chapters written and submitted while work is still in progress may inadvertently raise the risks of plagiarism.
d. Not all research work follow the same sequence of activities, making the arrangement and writing of the thesis at early and middle stage of the project difficult, if not impossible.

A panel is again assembled to evaluate the student's work with an oral presentation. A separate evaluation is performed by the supervisor too. There are no fixed and fast rules on the selection of panelists, therefore the same student could be assessed by an array of different academic staff in each evaluation session (including the proposal defense). Whether or not and to what extent this inconsistency affects the evaluation process is unknown, but it does allow for variation and appointment of assessors based on the different needs and niche of the student's project at different stages of his or her work.

While the assessment of the progress report is per semester by the supervisor, the frequency of evaluation by the panelists is a prerogative of the faculties. Some faculties request a regular assessment session every semester, while some consider a progress assessment between the proposal defense and pre-viva as sufficient, regardless of the time lapse between the two. The former is understandably to keep close monitoring of the student's work and development, but some may argue the underlying lack of trust and empowerment of the supervisors, who are after all the one most closely related to the student's work. The latter, on the other hand, may cause the unsatisfactory performance of a student to be overlooked till late into the allocated study period.

(3) The pre-viva

Once the student has completed and compiled the research work, and is prepared to submit his or her thesis, a pre-viva session will be arranged, with the actual internal examiner of the final viva-voce appointed as one of the panelists. The thesis draft is handed over to the assessors a week before the oral evaluation session. The pre-viva serves partially as a platform of practice before the finale for the student, and partially as an internal quality control gateway or final checkpoint, so to speak.

The supervisor is exempted from this assessment exercise, with only evaluation by the panelists taken into consideration for grading purposes, i.e. fit for the actual viva-voce or not. It has found much approval among the academic staff as the session does not only befit a transparent academic practice, it also allows any remaining discrepancies, shortcomings or mistakes in the thesis to be rectified.

There are occasions where a student essentially fails the pre-viva and is required to make major corrections for a second assessment. While this is rare, it further emphasizes the importance of the quality assurance practice.

(4) The viva-voce

Finally, the student will submit the amended thesis for the examination of an external and an internal examiner. The review process usually takes less than 2 months before the oral examination is held. The session is normally conducted based on the pre-evaluation or review by the individual examiner, where discussions as well as question-and-answer unfold in accordance with what the examiners would like to clarify from their earlier assessments. The student can take the opportunity to shed light on areas previously unclear to the examiners, while the examiners validate the authenticity and depths of the student's achievement in the submitted work.

The result of a viva could be one of the following:

a. pass with no corrections
b. pass with minor corrections (resubmission in 1-3 months)
c. major corrections pending resubmission in 6-12 month
d. major correction pending resubmission and re-viva in 6-12 months
e. fail

The oral examination is the subject of summative assessment, where the learning outcomes are to be summarily evaluated and the student finally graded. It could therefore be considered the final test of a student's achievement with relevance to the intended knowledge and skills, as outlined in the programme learning outcomes. In fact, the outcomes are formulated as the minimum competence level expected of a student upon completion of the research programme, i.e. what he or she 'knows' and 'able to do' from this point forward. Intricate as the thesis examination (viva-voce) may seem, the evaluation exercise is essentially a measurement of the student's

performance and growth against a predetermined set of outcomes in all 3 domains of learning, namely cognitive, psychomotor and affective.

4 Alignment: Assessment Criteria – Learning Outcomes

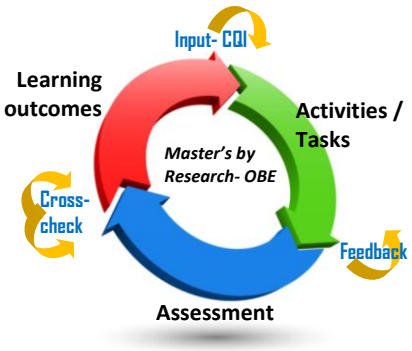
The alignment of the assessment criteria and learning outcomes must be accompanied by the mapping of the activities (Fig. 3). The assessments, both formative and summative, must be supported by tangible evidence, which could be obtained in a direct or indirect manner. Direct evidence consists of information gathered through quantitative and qualitative assessments, while feedbacks in the form of students' self-evaluation or perception of their learning experience constitute the indirect evidence [1].

Table 1 presents the assessment of learning outcomes attainment for each of the key activities in the master's by research programme. Refer to the second paragraph of section II for the coding of the learning outcomes. The targeted learning outcomes for activities 2-4 should not be misconstrued as attainment of all the components by the activity per se. As the activities are organized in a prescribed timeline (Fig. 2), and that except for item 4, the other activities form part of the formative assessment subjects (Fig. 1), Table 1 clearly lacks a measure of competence level in the assessment procedure. As such, the progressive development of a student's learning process can only be clearly defined and depicted with a yardstick incorporated in the rubric (Fig. 4).

The competence level of each learning domain represents a gradual increase in the expected capabilities of the students [2]. These encompass the following:

a. Depth, complexity and comprehension of knowledge
b. Application of knowledge and skills
c. Degree of autonomy and creativity in decision making
d. Communication skills
e. Breadth and sophistication of practices

At master's level, students are expected to reach the second highest level given in the Malaysian Qualification Framework [2], i.e. Level 7, with emphasis on the advancement and furtherance of knowledge, skills and abilities obtained at the undergraduate level. This is translated as expectations of a master's graduate to be able to satisfactorily conduct the following:



Activities and Tasks: designed to meet certain learning outcomes
Assessment: assigned components and criteria related to the learning outcomes
Learning outcomes: ultimate know-how and skills

Fig. 3 Interaction betweeen activties, assessment and learning outcomes.

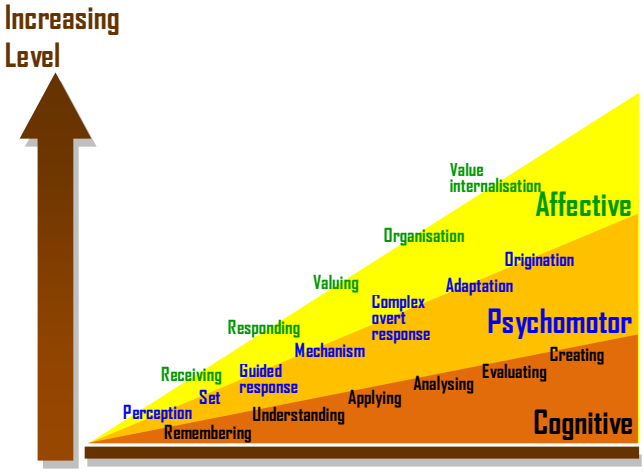


Fig. 4 Competence levels of the learning outcomes [5, 6, 7].

1. Demonstrate continuing and additional knowledge and comprehension above that of the bachelor's degree and have the capabilities to develope or use ideas, usually in the context of research.
2. Use the knowledge and comprehension to solve problems related to the field of study in new situations and multi-disciplinary contexts.
3. Integrate knowledge and manage complex matters.
4. Evaluate and make decision in situations without or with limited information by considering social responsibilities and related ethics.
5. Deliver clearly the conclusion, knowledge and rationale to experts and non-experts alike.
6. Demonstrate study skills to continuously progress on their own with a high degree of autonomy to do so.

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Referring to the yardstick for measuring the competence level for each learning domain or outcome (Fig. 4), Table 1 can be refined to express the progressive cultivation of the skills and knowledge, with the inclusion of sub-activities to form suitable assessed tasks (Table 2).

Take for instance the learning outcome of A3 (i.e. leadership qualities through communicating and effective team-working). By assigning the task of organizing the seminar to students of the same batch, these skills could be honed and developed, from a more passive 'receiving' and 'responding' at the early stage, to active participation through the ability to 'value', 'organize' and 'internalize values' (or the enhanced adaptability to one's surrounding, including people, environment and situations).

All these are evaluated by formative assessment, with feedbacks to the students for improvement and enhancement of their knowledge and skills (see Fig. 3). The summative assessment of the viva-voce ascertains achievement of all the learning outcomes. It may not seem apparent for some domains (e.g. A3 and A5), but the cumulative betterment of the student over time is bound to sharpen the necessary skill set.

A master's graduate, upon completion of his or her study, will qualify as being adequately learned and skilled, in the specific fields and generic areas, prepared to either join the workforce or to pursue the doctoral degree. The knowledge and skills, no matter how minimum would and should serve them well in either of the chosen paths. After all, the competencies and their corresponding levels assigned to the programme are but the lowest attainable and expected, defined as the learning outcomes (see section 3, sub-section 4).

5 Conclusion

The learning outcomes and assessed activities for the master's by research programme at UTHM were examined and reviewed. The 2 components were next realigned to ensure corroboration of the targeted outcomes and the evaluation exercises. It is shown that the existing assessed activities are relevant, with some addition of sub-activties and improvement of the assessment criteria necessary to better reflect the attributes and competencies desirable of the graduates. The proposed realignment model shall serve as the basis for strengthening the master's programme, via attainment of the learning outcomes and inculcation of the values and features in the graduates. A survey is currently underway to validate and fine-tune the proposed alignment strategy.

Acknowledgment:
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Table 1. Activities – learning outcome assessment map

Activities	Learning Outcomes
1. Proposal	C, A1, A4, A5
2. Progress report	C, P, A1, A2, A3, A4, A5
3. Pre-viva	C, P, A1, A2, A3, A4, A5
4. Viva-voce	C, P, A1, A2, A3, A4, A5

Table 2. Refined activities – learning outcome assessment map

Activities	Learning Outcomes
1. Proposal	
- Written report	C(L1-L3), A1(L1-L2), A4(L1), A5(L1)
- Organisation of seminar for oral presentation	A3(L1-L2)
- Oral presentation	A3(L1-L2)
- Self evaluation	A4(L1-L2)
2. Progress report	
- Written report	C(L4-L5), P(L1-L5), A1(L3-L4), A2(L1-L3), A4(L2-L3), A5(L2-L3)
- Organisation of seminar for oral presentation	A3(L3-L5)
- Oral presentation	A3(L3-L5)
- Self evaluation	A4(L3-L5)
3. Pre-viva	C(L5-L6), P(L6-L7), A1(L4-L5), A2(L4-L5), A3(L4-L5), A4(L4-L5), A5(L4-L5)
4. Viva-voce	C(L6), P(L7), A1(L5), A2(L5), A3(L5), A4(L5), A5(L5)

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