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17-21 August 2015

Adelaide Convention Centre,
South Australia

**Conference
Proceedings**

Editor: Michael Monaghan

Published by: Simulation Australasia
ABN 13 087 862 619

ISBN
978-0-9925960-0-2
SimTecT 2015

978-0-9925960-1-9
SimHealth 2015

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Reflecting and Gaining Wisdom: Self-Assessment Rubric Model for Optimising Simulation Based Learning

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Abstract. There are three methods to gaining wisdom. The first is reflection, which is the highest. The second is limitation, which is the easiest. The third is experience, which is the bitterest (Confucius). This paper discusses an approach to scaffolding on simulation exercises with a Self-Assessment Rubric to optimise outcomes from simulation exercises in police education - gaining wisdom through reflection. Universally, educators have grappled for the past 40 years with the adequacy of performance assessment and feedback processes as applied in simulation based exercises. Historically educators have applied a traditional scoring approach to rubric design and application for summative based assessment of learner performance. A more recent trend heralds the application of rubrics designed for a formative based assessment process where performance criteria is scaled by levels of quality of demonstrated capacity (Panadero & Jonsson, 2013). The widely acknowledged educational domains in which rubrics have the potential to inform are broadly established as learner performance, instructional design and reflective practice (Anrade, 1997; Reddy & Andrade, 2010; Hollman & Grillo, 2014). The design and application of rubrics for assessing performance, either summative or formative, in simulation based exercises is not new. The point of difference with the self-assessment rubric (SAR) discussed in this paper is its objective to combine building the reflection in action, reflection on action and reflection for action (Bruce, 2001) of participants with the briefing and debriefing of a simulation based learning exercise. The key goals with this approach are to (1) optimise the learning for the participant through building their reflective practitioner skills and (2) sustain the pivotal learning outcomes of the exercise and the post simulation performance of the learner through reference to a common set of criterion. A pilot application of the self-assessment rubric was conducted with a cohort of New South Wales Police officers participating in a Hydra/Minerva simulation exercise. The findings indicate the self-assessment rubric guides purposeful reflective practice; promotes a sustainable criterion reference for future learning and skill application; the common set of transparent criterion enables simulation participants to understand the learning objectives of the exercise and to 'measure' themselves against performance expectations. The design characteristics of the self-assessment model offers educators and simulation exercise instructors an approach which accommodates lowered demands on instructor-participant one-to-one feedback; continuity of performance criterion and is replicable across professions and disciplines for formative assessment of simulation exercise performance. The work will have resonance with public bodies that need their staff to make important 'on the spot decisions' often in high stakes high risk situations.

INTRODUCTION

The increasing investment by education and training organisations to leverage on the affordances of simulation technology creates challenges for educators and instructors. One area which has cause for concern is the scramble to keep pace in developing the associated educational 'tools' to aid optimization of the learning value of the investment in simulation exercises. Similarly, the investment by participants in simulation exercises encourages a desire to understand the level of their performance in the exercise. Accommodating these areas of concern and expectations for simulation exercises is the pivotal focus of the self-assessment rubric designed for application with NSW Police Force (NSWPF) Simulated Operations Unit (NSWPF/SOU) exercises. The varying demands on both human and physical resources to conduct simulation exercises can create an imbalance with optimising the learning outcomes for the exercise participants. In particular individualised feedback whilst desirable is not always achievable dependent on the size of the participant cohort and the exercise specifics. These circumstances provide opportunity to rethink the approach to participant

feedback and assessment in simulation exercises and extend the learning from the exercise to embrace self-assessment as an avenue for developing reflective practitioners.

1.1 Reflective Practice

The seminal work of Dewey (1916) and Schön (1983) in developing and discussing the fundamental concepts of reflective practice have informed the design approach and application of the self-assessment rubric under discussion in this paper. Importantly, both Schön and Dewey advocate that reflection is not a static state of thinking about one's actions rather it is active. Schön (1983) discusses the notion of reflection-in-action as the learner continuously reflects on their actions in order to modify/adjust their next action. Similarly, Dewey (1916, p. 107) offers the suggestion that reflection is about connecting what went before, what comes after and reflecting in the moment of activity, thereby influencing future activity. How then does this translate into an educational product which guides such reflective practice for simulation exercises? The answer lies in part in the design content of the self-assessment rubric and its place within the

learning framework for the simulation participant. To understand the rationale for employing a rubric styled self-assessment tool with simulation exercises it is helpful to establish (1) the key concepts underpinning rubric design and (2) the connection between reflective practice and a self-assessment rubric.

1.2 Rubric design

There is a wealth of literature devoted to the design and application of rubrics in the education field. In general this literature is in agreement with the description of a rubric as offered by Andrade (1997, p. 14) as:

...a scoring tool that lists the criteria for a piece of work, or what counts; it also articulates gradations of quality for each criterion...

Similarly, Reddy (2007, p.4) suggests rubrics are:

...descriptive scoring schemes, a set of scoring guidelines ...and are aligned to an outcomes based approach to education. (p.4).

Reddy (2007, p.4) further explains that rubrics provide for:

...criterion-referenced discrimination of performances and enables monitoring of students learning against each criteria.

Reddy and Andrade (2010) extend the explanation provided by Reddy (2007) in suggesting that rubrics contain performance criteria and articulate what a student needs to demonstrate to achieve a specified level of performance across a performance scale.

The earlier work of Simon and Forgette-Giroux (2001) laid the foundational concept that a key characteristic of rubrics is their criterion referenced approach to assessment. The notion that rubric design embraces the capacity to assess or measure performance against a core set of criteria to be demonstrated at a specific level of competence and or confidence aligns with the extensive work of Peirce in 2006. Peirce (2006, p.1) in discussing the application of rubrics to assess higher order thinking suggests that using rubrics which describe graduated levels of performance

Helps professors evaluate consistently and efficiently
Lets students know what their professor is looking for and how to meet the expectations
Provides feedback to students.

Of note is the extensive and as yet unlimited education domains into which rubrics have been employed due to the potential of their fundamental characteristics which provide for assessing performance. The health sciences field for example (see Shipman et al., 2012; Wald et al., 2012) has extensively adopted rubrics for assessment and learner reflection. Appreciatively, the education field is a rich source of the design and implementation of rubrics for assessment (see Pandero, Tapia & Huertas, 2014; Hurerta, Lara-Alecio & Tong, 2014). The military training arena (Keista et al., 2014) and the business education field (Makani-Lim et al., 2014; Aparicio-Chueca, Dominguez-Amoròs & Maestro-Yarza, 2014) present an array of rubric applications. All of these fields offer valuable insight into the educational design considerations to be

addressed in progressing the development and implementation of rubrics. Chief amongst such considerations is to identify the rationale for employing a rubric approach to assessment.

1.3 Summative or Formative Assessment

An important rubric design determination is whether the rubric will be utilised for formative or summative assessment. Traditionally summative assessment is based on the awarding of scores or marks which collectively total the level of award for a student for the assessed task. Crawley et al. describe summative assessment as that which:

...Gathers evidence at the end of an instructional event, such as a major project, a course or entire program. Results of summative assessment indicate the extent to which students have achieved the intended outcomes of the project, course or program (2014, p.165-166).

The point of agreement which resonates throughout the rich volume of literature devoted to discussion of summative assessment is its role in:

...Serving to document the learning that has occurred. (Kine, Hasenbank & Coffey, 2014, p.110)

The emergence of a formative approach to assessment has gained traction for its core focus on supporting the developmental learning progress of a student. Here also there is considerable literature devoted to the implications for learning of formative assessment (see Keefer et al., 2014; Ng, 2014; Valle & Andrade, 2014). The work of Crawley et al. (2014) articulates formative assessment as that which:

...collects evidence of student achievement while students are in the process of learning. Results of formative assessment inform students about their progress, help monitor the pace of instruction and indicate areas of instruction that may need to change (p. 165).

Further clarification of what constitutes formative assessment is provided by Lipenvich et al. (2014) in suggesting that this approach encompasses identifying and articulating a student's actual level of performance against a desired level of performance and the discrepancy between these two levels.

It is this fundamental concept of formative assessment which lends itself to application for self-assessment within the simulation-based learning exercise environment. The combination of a set of criteria or standards accompanied by explanation of 'what it looks like' to demonstrate these standards at a given level offers potential for students to reflect-in and -on and -for performance.

Table 1 presents an extract from the self-assessment rubric which has been developed for application with simulation exercises conducted by the NSWPF Simulated Operations unit. In the traditional style for rubric design the dimension criteria is identified in the left hand column and the range for levels of achievement are displayed across the page. In this instance the level ranges from Foundational to

Advanced. A cross reference between the dimension and level reveals explanation of ‘what’ the learner would demonstrate at that level. In the context of application of the self-assessment rubric with simulation based-learning exercises, a pivotal element is reinforcement of the associated learning outcomes. A feature of the self-assessment rubric is the commonality of the key dimensions which is designed

to support the articulation of the learning outcomes through the exercise briefing, debriefing, self-assessment /reflection and relevant to the field of application.

Table 1: Extract from NSWPF Self-Reflection Rubric for Decision Making

Dimension	Foundational	Adept	Advanced	Personal Notes
Define the problem	-Did not identify underlying issues and problems -Did not have a clear understanding of what was to be achieved. -No attempt to understand significance of problem	-Attempted to ascertain the nature of underlying issues and problems -Developed a basic understanding of a desired outcome - Attempted to understand the nature of the problem	-Identified underlying issues and problems -Identified desired outcome -Correctly identified nature of the problem (significant V insignificant)	
Collect necessary information	-Did not gather relevant information -Failed to interpret information -Did not seek additional information	-Reviewed information at hand. -Sought limited or excessive information	-Gathered relevant information -Identified deficiencies in information and sought extra relevant information	

In 2015, the Self-Assessment Rubric (Table 1) has been piloted with two simulation exercises conducted by the NSWPF Simulated Operations Unit. Exercise No.1 is an Incident Command and Control (ICC) exercise requiring a policing response to emerging public order incidents.

It is valuable to the overall objective of the research to include this simulation exercise as it was the analysis of a prior ICC exercise which highlighted the participants’ advocacy for exercise performance assessment/feedback (Davies, 2013). Exercise No 2 with which the Self-Assessment Rubric was piloted centred on a simulation exercise which required a policing response to a critical incident (investigation of a death). The following sections described the evaluation of the pilot project.

CASE STUDY

The case studies included in the evaluation research centred on a Hydra/Minerva decision-making simulation exercise. The key focus of the exercise is to provide opportunity for senior officers to apply their decision making knowledge and skills to the management of a policing response. The Hydra/Minerva environment was designed by Professor Jonathan Crego and comprises: a plenary/lecture room which acts as both a briefing and debriefing room

three or four syndicate rooms containing a computer, video screen, telephone, each of which is net-worked to the control room, conference table and whiteboards; the rooms are outfitted with the equipment the participants would need in a real life event

a fixed command support/control room from which each syndicate room is monitored via closed-circuit television and boundary microphones. The technology network enables the feed of information to the participants; it may consist of intelligence briefings, police radio traffic, newscasts, or telephone calls. Officials control the exercise and feed of information to the trainees. The control room houses the subject matter experts, program training staff, and replicated police radio communications. (Davies, 2013).

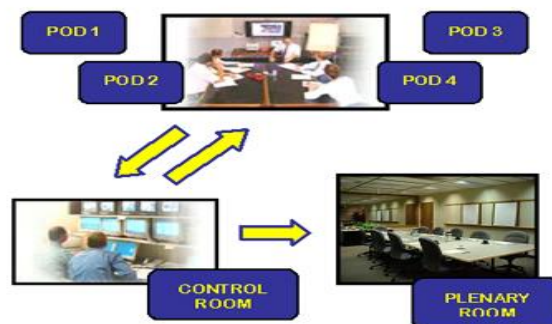


Figure 2: Hydra/Minerva simulation environment

The simulation exercise is conducted in real time. Exercise No. 1 comprised 13 participants and Exercise No. 2 comprised 20 participants. The participants are divided into teams which are assigned to the syndicate rooms. An exercise briefing and debriefing is included in the full day exercise. It is important to note that the philosophy underpinning the design of the Hydra/Minerva simulation environment is for the application of knowledge and skills without formal assessment of performance.

3. DATA COLLECTION

The data collection methodology chosen to provide a comprehensive evaluation is important to the potential extent, insightfulness and quality of the data. In this research a mixed method data collection approach was employed. Employing a mixed method approach combining qualitative and quantitative data is premised on the seminal work of Bryman (1988), Denzin (1978) and Green, Caracelli and Graham (1989). The mixed method approach has the potential to allow the quantitative and qualitative data to complement each other and provide scope and breadth to the study.

A post-simulation survey was conducted which included Likert scale and short answer questions. A field based interview, post-simulation was conducted with participants. These interviews were designed to capture the participants' reflection on their understanding and application of the self-assessment rubric. Further the survey and interview questions were designed to inform on the contribution the self-assessment rubric offered to supporting and engaging the learner in reflective practice. Whilst the interview questions were similarly worded to those of the short answer survey questions, conducting interviews offered the opportunity for participants to expand the articulation of their experience with the self-assessment rubric. The intrinsic nature of policing does not readily lend itself to officers' having opportunity to complete surveys or participate in interviews within a research project timeframe irrespective of their commitment to assist such evaluation initiatives. The result is often less than optimal survey and interview response rates. To address this anticipated situation, this research project is considered a preliminary evaluation with further application of the SAR planned following revision on the basis of feedback during the initial pilot project.

DATA ANALYSIS

The presentation of the data analysis is organised into categories which align with the key objectives of the evaluation project.

SAR influence on learning from simulation exercise

Question 1 of the on-line survey asked participants to indicate their level of agreement that the SAR assisted their learning from simulation exercise. The data indicates 85% of responses ($n=13$) Agreed, Strongly Agreed or Very Strongly Agreed with the statement.

The remaining 15% ($n=2$) were undecided on this statement.

This was an important question for (1) the capacity to contextualise the survey and draw the focus of the participants to the theme of the survey; and (2) to identify the 'general' perspective on the SAR by the participants.

Common Set of Standards –briefing, debriefing & SAR

As discussed earlier, a design intent of the SAR was as a tool for connecting the key learning goals to the core performance criterion. Further this connection to be consistent and sustained through briefing, debriefing and self-reflection. Whilst this was perceived by the SAR developers as a key learning support initiative, it is the experience of the learners who ultimately determine its value to their learning experience with the simulation. Interestingly, as presented in Table 2, the data indicates support for establishing the common set of standards/criterion across the three domains – briefing, debriefing and the SAR.

Table 2: Common Set of Standards/Criterion

Question	Responses		
The consistency of a common set of standards for the briefing, debriefing and SAR is helpful to my learning	Very Strongly Agree, Strongly Agree, Agree	Un-decided	Very Strongly Disagree, Strongly Disagree, Disagree
	12 (92.4%)	1 (7.6%)	0

The data in Table 2 is further supported by the comments offered by participants to Question 9: How does using the SAR assist in connecting the briefing, debriefing and your performance reflection? In the words of Participant 4:

...The rubric provides a tool during performance reflection to measure performance against the briefing and debriefing information.

The notion that embedding the common set of standards/criterion across the three phases is further endorsed by the comments from Participant 2: ...It all ties into the one; and Participant 3 suggested:

...Ties the process together by acting as a revision or review matrix.

The participants' perspective of the value to their reflection and learning of the role of the common set of standards/criterion aligns with their perspective of the SAR as a tool to guide self-assessment and reflection.

Role of SAR as guide for self-assessment of performance

A key design objective for the SAR was to offer a tool which supported guided self-reflection of performance

on a continuum to building capacity as a reflective practitioner. The data offers a clear vision of the participants' perspective of the SAR's role in guiding self-assessment. In particular the responses to the question: How has the provision of a SAR assisted you in reflecting on your learning experience in the simulation exercise? offered valuable insight in this area. Table 3 presents examples of participant responses to this question.

A total of ten responses were received for this question with the exception of one response indicating 'unsure' the remaining nine responses identified positive examples of how the SAR assisted their self-assessment and or reflection.

Table 3: SAR as guide for Self –Assessment

Question	Example participant responses
How has the provision of a SAR assisted you in reflecting on your learning experience in the simulation exercise?	<p>The rubric provides a useful reminder of good and poor examples of competencies in each area. By looking at each dimension and assessing my performance against those criteria provides some guidance of assessing my performance (P4);</p> <p>The self-assessment rubric provided an opportunity to evaluate your own performance based on the performance of your peers during the exercise (P3);</p> <p>Assisted me in breaking down the decision making processes and identifying where I performed well and poorly and will assist me in future incidents of this nature (P7);</p> <p>Provides a tool to assist with self-reflection (P8);</p> <p>It has assisted me in reflecting on areas of strength and weakness during the course of the Hydra (P1).</p>

4.4 Influence of SAR on future practice

As discussed in Sections 1.2 and 1.3 the application of a SAR with simulation exercises is premised on the concept of building participants' capacity to reflect-in, -on and -for performance. Understanding how the participants will use the SAR in their future professional practice provides evidence as to the contribution of the SAR to (1) extending the educational value of simulation learning exercises and (2) the contribution to developing participants' reflective practice.

The question: How do you think you will use the SAR in the future? was posed to the participants. Interestingly, this process also highlighted a level of unfamiliarity with SARs, with two of the ten responses indicating they were unsure how they would use the SAR in the future. One participant indicated they would not use it in the future, however, the remaining seven respondents indicated a clear and direct role for

the SAR in their individual future practice. The following responses illustrate the potential application of the SAR for participants in this study.

Participant 3 commented:

...to identify areas of weakness/deficiency and research methods of improvement or strengthening.

This perspective is similarly reflected in the following participant responses:

...I will probably use the rubric more as a reminder of examples of strong competencies, and benchmark my performance against those (P4);

...As a review process after involvement in complex incidents (P5);

...assist in taking time to reflect on my own performance (P7);

...to review performance in [the] future (P2).

DISCUSSION AND CONCLUSIONS

Whilst as acknowledged here the concept of rubrics and specifically, rubrics which embrace a formative approach to assessment are not new, there is limited published work in the field of rubric design and application in the simulation exercise environment.

It is acknowledged that the data reported from the evaluation of the SAR in this project is limited (small number of trial participants), it does nonetheless provide encouraging evidence for the future of this SAR model and application.

The two key overarching goals of the SAR design and application as discussed earlier focussed on optimising learning from simulation based exercises through

1. building reflective practitioner skills; and
2. sustaining longevity of learning through establishing a common set of standards/criterion through briefing, debriefing, the SAR which are premised on real world operational expectations.

The SAR model applied to the NSW Police Force simulation exercises and its subsequent evaluation offers a contribution to the future initiatives of those educators and trainers responsible for maximising learning outcomes from simulation based exercises. Grounded in the seminal education focused literature for reflective practice and rubric design, an encouraging characteristic of this SAR model is its adaptability to the many and varied professions engaged in simulation based learning.

The NSW Police Force Simulated Operations Unit continues to revise, apply and evaluate the SAR model through its commitment to best practice simulation based training.

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