

## Applying Rubrics for Effective LO Assessment

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This project involves compiling, validating and deploying a set of analytic rubrics for the purpose of giving instructors effective tools for assessing learning outcomes. The objective is to develop valid rubrics that can be used across multiple disciplines to assess performance in five competencies, namely, problem solving, investigation, design, communication and teamwork. This work is part of the Learning Outcomes Consortium project funded by the Higher Education Quality Council of Ontario (HEQCO).

The first phase of this project involved compiling outcomes for the purpose of providing a breadth of choices to instructors. In this workshop we will be working with instructors to select outcomes that align with their assessment goals, and create rubrics for a specific assignment, or project.

### Competency: Problem Solving

The student displays the ability to:

Outcome	Indicator	Source
...define the problem	...distinguish a problem from an example	Woods
	...state the problem in their own words	Woods, VALUE <sup>1</sup>
	...identify primary problem goal(s)	Woods, GAC <sup>2</sup>
	...characterize problem types	GAC
	...describe the causes of the problem and its effects	GAC
	...identify known information	GAC(m) <sup>3</sup> , Woods(m),
	...define a problem representation (abstract, visual or otherwise)	Woods(m),
	...identify relevant models, concepts, or theories	GAC
	...identify relevant assumptions	GAC
	...recognize unknown information	GAC
	...interpret a problem (goals, information, assumptions) in terms of relevant models, concepts or theories	GAC(m)
	...formulate subgoals and measurable assessment criteria	GAC(m)
...define strategies or solution processes	...recognize 'off-the-shelf' solutions	Woods, VALUE(m)
	...determine methodological constraints	GAC(m)
	...predictively compare and contrast alternate solution processes in terms of relevant metrics (e.g., accuracy, precision, efficiency, reliability, feasibility, risk, impact, etc.)	GAC(m), VALUE(m)
...propose solution process	...plan a systematic solution process (i.e., identifies measurable tasks that support subgoals)	GAC, VALUE(m)
	...modify 'off-the-shelf' solution process within problem context	Woods(m)
...implement a solution	...implement a defined solution process, within constraints	GAC(m), VALUE(m)
	...recognize impacts of a solution process during execution	Beach and

<sup>1</sup> VALUE: Valid Assessment of Learning in Undergraduate Education

<sup>2</sup> GAC: Graduate Attributes Committee

<sup>3</sup> (m): modified from the original

		McCahan
	...recognize and accommodate for unforeseen constraints, or unattainable subgoals, during execution	Beach and McCahan
...evaluate results	...review results relative to the problem defined	VALUE, GAC(m)
	...evaluate alternative solutions and select a final solution	GAC
	...outline any required further work	VALUE(m)
...reflect on the solution process	...describe and justify improvements or modifications to solution	Beach and McCahan
	...identify limitations and sources of error or uncertainty in the solution	GAC
	...describe and justify issues with problem definition and/or characterization	Beach and McCahan
...reflect on the problem-solving process	...explain and identify specific problem-solving outcomes and indicators in their own process (i.e., demonstrate general process and competency awareness)	Beach and McCahan
...use advanced problem-solving skills	...emphasize accuracy over speed	Woods
	...operate with parallel or non-linear (non-sequential) overall process (i.e., doesn't always follow a linear problem solving process)	Woods

### Competency: Investigation

The student displays the ability to:

Outcome	Indicator	
...define their research	...select an overarching research topic or area	GAC(m), VALUE(m)
	...scope a complex topic down to a manageable set of clear research questions	Beach and McCahan
...collect information	...conduct a literature review	VALUE(m)
	...collect existing information	VALUE(m)
	...perform a pedagogical review of a research paper or article	GAC(m)
	...perform a critical review of a research paper or article	GAC(m)
	...recognize assumptions or points-of-view of the literature review	VALUE(m)
	...synthesize existing information	VALUE(m)
...define a research methodology	...construct and describe a research methodology	VALUE(m)
	...identify assumptions of the research methodology	VALUE(m)
	...compare and contrast with other methodologies for similar problems	GAC(m)

	...describe expected results	Beach and McCahan
...follow a research methodology	...implement or execute a research methodology	GAC(m)
	...recognize impacts of a methodology during execution	GAC(m)
	...recognize and accommodate for unforeseen limitations or assumptions of the methodology during execution	GAC(m)
...perform research analysis	...organize and synthesize evidence to support or address the research questions	VALUE(m)
	...evaluate results with respect to other similar research	GAC(m)
...formulate conclusions	...conclude logically from the research findings	GAC(m), VALUE(m)
	...characterize limitations of the research	GAC(m), VALUE(m)
	...characterize implications of the research	GAC(m), VALUE(m)
...describe future research directions	...outline 'next steps' or future work	GAC(m), VALUE(m)
	...construct and justify a rough schedule or timeline of future research	GAC(m)
	...justify future work in relation to overall research topic or area	Beach and McCahan
...reflect on the research process used	...identify and explain strengths and weaknesses in the chosen research methodology	Beach and McCahan
...reflect on the investigation process	...explain and identify specific investigation outcomes and indicators in their own process (i.e., demonstrate general process and competency awareness)	Beach and McCahan
...use advanced (higher-level) investigation skills	...operate with parallel or non-linear (non-sequential) overall process	Beach and McCahan

## Competency: Design

The student displays the ability to:

Outcome	Indicator	
...frame a problem in design terms	...elicit requirements from stakeholders	GAC(m)
	...identify stakeholders	GAC(m)
	...extract requirements from conventions, standards or protocols	GAC(m)
	...extract requirements from similar work, past work, or the State of the Art	GAC(m)
	...formulate design goals and subgoals	Beach and McCahan
	...describe functions	Beach and McCahan
	...identify constraints	Beach and McCahan
	...examine and synthesize requirements from other non-stakeholder (e.g., social and professional) concerns	GAC(m)
	...recognize and explain sources of constraint uncertainty	Beach and McCahan
	...recognize and explain sources of goal uncertainty	Beach and McCahan
...generate candidate solutions	...apply idea generation tools to develop a diverse set of candidate solutions	GAC
	...adapt reference or similar designs to generate a diverse set of candidate solutions	GAC
	...use models, prototypes, etc., to enhance understanding of candidate solutions	GAC
	...analyze effects of constraint uncertainty on candidate solutions	Beach and McCahan
	...analyze effects of goal uncertainty on candidate solutions	
...down-select candidate solutions	...apply multi-criteria decision-making to select a set of candidate solutions for further development	GAC
	...use experiment and analysis to select candidate solutions for further development	GAC
...advance a design to an end state	...refine a conceptual design to a detailed design	GAC
	...implement, or provide a plan to implement, a conceptual or detailed design	GAC
	...redevelop or iterate a conceptual design	GAC
...reflect on the design process used	...identify assumptions and/or limitations in the design decisions used	Beach and McCahan
...reflect on the design process overall	...explain and identify specific design outcomes and indicators in their own process (i.e., demonstrate general process and competency awareness)	Beach and McCahan
	...explain the difference between problem-solving and design	Beach and McCahan
...use advanced (higher-level) design skills	...operate with parallel or non-linear (non-sequential) overall process	Beach and McCahan

## Competency: Communication

The student displays the ability to:

Outcome	Indicator	
..organize their communication	...identify the audience and the context	VALUE(wm) <sup>4</sup>
	...describe the purpose of the communication	VALUE(wm)
	...recognize context-relevant structure for the communication	GAC(m), VALUE(wm)
	...formulate, in written, visual and/or spoken form, credible and persuasive support for a claim	GAC, VALUE(wm)
	...structure overall communication elements so that relationship to the main point and one another is clear	GAC, VALUE(om) <sup>5</sup> , VALUE(wm)
	...create 'flow' in communication (oral or written) through organization	GAC, VALUE(om)
	...tailor the mode of communication to the context, or to accommodate different learning	GAC
...deliver their communication	...use effective language choice	VALUE(om)
	...incorporate effective transitions	VALUE(om)
	...incorporate various media effectively	GAC
	...deliver comfortable and compelling communication	VALUE(o)
	...use proper "tone"	VALUE(om)
	...deliver communication according to genre and disciplinary standards and conventions	VALUE(w)
	...deliver 'continuous', 'unbroken', or 'smooth' communication	VALUE(om)
...incorporate supporting material	...describe evidence in support of claims	
	...use a variety of supporting materials	VALUE(o)
	...provide appropriate references and citations	
...convey a central message	...convey a clear and consistent central message	VALUE(o)
...develop communication through iteration	...use iteration to clarify and amplify understanding of issues being communicated	GAC
	...incorporate feedback and past communication to inform future iterations	Beach and McCahan
...reflect on the communication choices made	...identify and explain strengths and weaknesses in the chosen organizational strategy	GAC(m)
	...identify and explain strengths and weaknesses in the chosen delivery method	Beach and McCahan
	...identify and explain strengths and weaknesses in the chosen central message	Beach and McCahan
...reflect on the communication process	...explain and identify specific communication outcomes and indicators in their own process (i.e., demonstrate general process and competency awareness)	Beach and McCahan
...use advanced (higher-level) communication skills	...deviate from traditional or conventional communication respectfully and effectively (e.g., effective use of humour, originality, rhetoric, or personalization)	Beach and McCahan

<sup>4</sup> (wm): written communication – modified from the original

<sup>5</sup> (om): oral communication – modified from the original

## Competency: Teamwork

The student displays the ability to:

Outcome	Indicator	
...facilitate team member contributions	...articulate merits of alternative ideas	VALUE
	...offer new suggestions to advance the group work	VALUE
	...offer alternative solutions building on the ideas of others	VALUE
...contribute outside of team meetings	...complete all assigned tasks by deadline	GAC(m), VALUE
	...accomplish work that advances the project	VALUE
	...help other team members complete assigned tasks	VALUE
...foster a constructive team climate	...communicate respectfully with team members	GAC(m)
	...apply formal models of team and individuals (e.g. psychometrics, team role models, etc.) to adapt individual actions to team norms	GAC
	...re-assess and refine team's norms of practice during the course of a project	GAC
	...establish and codify norms of practice (e.g., rules, roles, charters, etc.)	GAC
	...convey a positive attitude about the team and its work (e.g., through tone and expression)	GAC(m), VALUE
	...motivate teammates by emphasizing confidence in their success (e.g., by reference to past successes)	VALUE
	...motivate teammates by emphasizing importance of the task	VALUE
	...motivate teammates by emphasizing team control over the outcome	Beach and McCahan
	...provide assistance to team members	VALUE
	...provide encouragement to team members	VALUE
	...outline clear agenda items for team meetings	Beach and McCahan
	...reflect on progress with team after meetings	Beach and McCahan
...mediate conflict	...directly address destructive conflict	VALUE(m)
	...identify and acknowledge conflict	VALUE(m)
	...stay actively engaged with team conflicts	VALUE(m)
	...redirect team focus toward common ground	VALUE(m)
...reflect on team performance	...identify team strengths and weaknesses with respect to teamwork and team management	Beach and McCahan
	...quantify individual contributions to a team activity through attribution tables or reflections	GAC
	...identify areas of teamwork improvement	Beach and McCahan
...reflect on the teamwork process	...explain and identify specific teamwork outcomes and indicators in their own process (i.e., demonstrate general process and competency awareness)	Beach and McCahan

## References

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