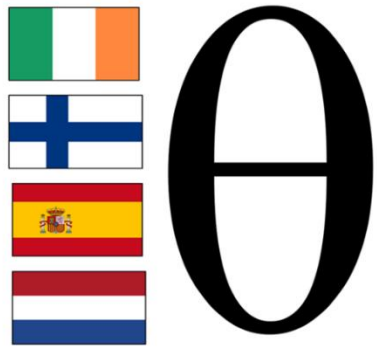

THETA

Transformative Hospitality Education through Tech Abilities:

A blueprint for creating immersive (learning) experiences using VR/AR

Co-funded by the Erasmus+ Programme of the European Union

Rubric Design

THETA Rubrics

Rubrics can help clarify expectations from teaching staff and will show students how to meet them, making students accountable for their performance. The feedback that students receive through a grading rubric can help them improve their performance on revised or subsequent work.

According to Susan M. Brookhart, there are two essential components of effective rubrics. Criteria that relate to the learning and not the tasks, and performance level descriptions against a continuum of quality. Researchers recommend two or more performance criteria with distinct, clear, and meaningful labels (Brookhart, 2018) along with 3-5 quality or performance levels (Popham, 2000; Suskie, 2009). Rubrics are more than a checklist, but guidelines that focus on skills that demonstrate learning. An example of five performance levels might look like this:

· Far Below Expectations

· Below Expectations

· Meets Expectations

· Exceeds Expectations

· Demonstrates Excellence

In summary, effective rubrics can:

· Measure higher-order skills or evaluate complex tasks.

· Clarify learning goals.

· Foster self-learning and self-improvement in students

· Aid students in self-assessment

· Inspire better student performance.

· Improve feedback to students.

· Result in faster and easier grading of assessments

· Enable more accurate, unbiased, and consistent scoring.

· Reduce regrading requests from students.

· Provide feedback to faculty and staff (Suskie, 2009, Wolf & Stevens, 2007).

Informed by past studies on the design and implementation of rubrics for the AR/VR/XR space, (as indicated below in the useful resources), an indicative rubric has been designed, however, any rubric will require adaptation to suit the learning outcomes required.

INDICATIVE RUBRIC FOR USE WITH AR/VR ACTIVITY				
Criteria	**Unsatisfactory/ Needs Improvement**	**Competent**	**Proficient**	**Distinguished**
Technique/ Concepts	Work lacks understanding of concepts, materials and skills	Work shows understanding of concepts, materials and skills	Work reflects understanding of concepts and materials, as well as use of skills discussed in class	Work shows a mastery of skills and reflects a deep understanding of concepts and materials
Clarity & Habits of Mind	Student passively attempts to fulfil activity without much thought or exploration of possibilities	Developing exploration of possible solutions and innovative thinking. Student has more than one idea but does not pursue	Student explores multiple solutions and innovative thinking develops and expands during project	Consistently displays a willingness to try multiple solutions and ask thought provoking questions, leading to deeper, more distinctive results.

Reflection & Understanding	Student shows little awareness of their learning process. The work does not demonstrate understanding of content or review of past learning at a surface level.	Student demonstrates some self-awareness. Work shows some understanding of content, but student cannot justify all of their decisions. May make some effort to link to past learning or experiences.	Student shows self-awareness. Work demonstrates understanding of content and most decisions are conscious and justified. May make references to previous learning and evidence of applying learning to novel situations	Work reflects a deep understanding of the complexities of the content. Every decision is purposeful and thoughtful. Reviews prior learning to reveal changed perspectives and applications in novel situations for maturity and growth.
Level of Effort	Work is not completed in a satisfactory manner. Students shows minimal effort. Student does not use class time effectively.	Work complete but it lacks finishing touches or can be improved with a little effort. Student does just enough to meet requirements.	Completed work in an above average manner, yet more could have been done. Student needs to go one step further to achieve excellence.	Completed work with excellence and exceeded lecturer expectations. Student exhibited exemplary commitment to the project/activity.
Level of Participation	Very little participation	Participation generally lacks frequency or relevance	Reasonably useful relevant participation and adds to the discussions.	Continually relevant and consistent participation throughout the activity/discussion period.

Communication & Interaction	Student shows little interest in their peers or lecturer. Mostly indifferent to the discussion. Does not speak clearly.	Little student effort to keep discussions going or provide their views or help. Speaks clearly at times.	Reasonable student effort to respond thoughtfully, provide help and/or keep discussions going on topic. Speaks clearly and effectively.	Student continually responds thoughtfully in a way that consistently keeps discussions going on topic and provides help. Speaks clearly and effectively in a sophisticated manner.
https://www.scu.edu/media/offices/provost/assessment/Collection-of-rubrics-for-online-discussions.pdf				
https://docs.google.com/document/d/1OCpYFYkcIwOwa0d5BCcTH5xahQ6GiaS1PnP0O3lqMsY/edit				

As depicted in Fegely & Cherner's (2021) Figure 1. below, decisions need to be made on the domain, dimensions and then the relevant specific indicators.

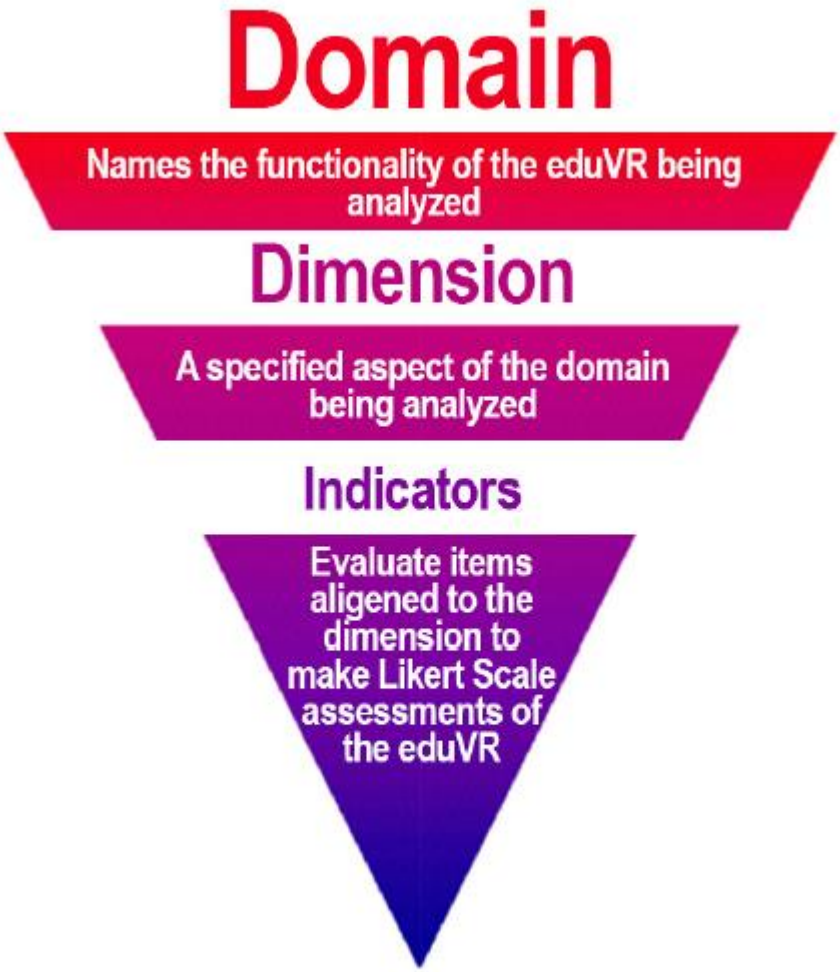

Figure 1. Taxonomy of evaluative domains

The concept of employing a rubric in instructional design is to create a systematic means of measuring responses or learning in an educational context. Considerable thought must be given as to what aspects of learning or engagement are worthy of measurement for effective teaching and learning.

For instance, North Carolina State University offer wide-ranging advice on developing a rubric, suggesting, the use of AI to design a suitable rubric based on the learning objectives involved and the level of activity involved. Alternatively, Fegely & Cherner (2020) offer an evaluation rubric for the VR apps employed in educational settings (as depicted below).

Alex Fegely & Todd Cherner's (April 2020) Evaluation Rubric for VR Apps

Evaluation Rubric for VR Apps

D. Positioning of the VR: The following dimensions analyze how the VR is situated based on the learning content.

D1. Use of VR: Is the VR experience appropriate for the content?					
5	4	3	2	1	N/A
VR best meets the needs of the learner aligned to the content.	A mixture of VR and AR best meets the needs of the learner aligned to the content.	AR best meets the needs of the learner aligned to the content.	A mixture of AR, VR, and the physical environment best meets the needs of the learner aligned to the content.	The physical environment best meets the needs of the learner aligned to the content.	Not Applicable
D2. Educational Impact: Where does the VR experience rank on the Substitution, Augmentation, Modification, and Redefinition (SAMR) scale?					
5	4	3	2	1	N/A
The VR aligns to redefinition because the user experience is only possible in a digital context.	The VR aligns to modification because the user experience is only possible only in extreme or rare instances.	The VR aligns to augmentation because it enhances a common user experience.	The VR aligns to substitution because it replicates a common user experience.	It would be more efficient to replace the VR with an analog experience.	Not Applicable
E. Avatar Level: The following dimensions analyze the look and interaction functionalities of the VR's avatars.					
E3. Avatar Representation: How does the VR represent avatars?					
5	4	3	2	1	N/A
The VR's avatar can be stylized and customized in great enough detail to appear lifelike.	The VR's avatar can be stylized and customized in great enough detail to mostly appear lifelike.	The VR's avatar's clothes and accessories can be customized, but not the body.	The VR includes multiple premade avatar choices that cannot be customized.	The VR includes only one premade avatar choice that cannot be customized.	Not Applicable
E4. Avatar Interaction: How does the VR provide for the avatars to interact with one another and in what ways (e.g., real-time conversation, file transfer, 3D modelling, collaborative actions, etc.)?					
5	4	3	2	1	N/A
The VR provides for multiple avatar-to-avatar interactions that are synchronous.	The VR provides for few avatar-to-avatar interactions that are synchronous,	The VR provides for multiple avatar-to-avatar interactions that are asynchronous.	The VR provides for few avatar-to-avatar interactions	The VR does not include avatar-to-avatar	Not Applicable

	but it may include more robust asynchronous interaction options.		that are asynchronous.	interactions.	
F. VR Experience: The following dimensions analyze the VR's user experience.					
F5. Environment Experience: Is the VR experience as real and authentic as possible?					
5	4	3	2	1	N/A
The VR replicates a real-world environment or computer-generated environment that is highly realistic and immersive, which enhances the user experience.	The VR provides a real-world environment or computer-generated environment that does not enhance nor detract from the user experience.	The VR provides a real-world environment or computer-generated environment, but minor flaws within the environment disturb the immersiveness of the user experience.	The VR provides a real-world environment or computer-generated environment, but major flaws exist within the environment that significantly disrupt the immersiveness of user the experience.	The VR does not provide a complete environment of any kind that is suitable for any type of user experience.	Not Applicable
F6. Content Presentation and Engagement: How does the VR leverage multimodal elements (e.g., text, images, audio, video, etc.) and utilize active and passive strategies to engage users in the content?					
5	4	3	2	1	N/A
The VR combines multimodal elements along with passive, active, and strategies that utilize synchronous, person-to-person interaction to engage users in the content.	The VR combines multimodal elements along with active asynchronous strategies that do not include person-to-person interaction to engage users in the content.	The VR combines multimodal elements along with active and passive strategies to engage users in the content.	The VR combines multimodal elements but relies mostly on passive strategies to present users in the content.	The VR largely utilizes one element with passive strategies to present content to users.	Not Applicable
F7. Navigational Aids: Does the experience include indicators to aid navigation?					
5	4	3	2	1	N/A
The VR provides intuitive navigational aids that are logically	The VR provides navigational aids that are mostly intuitive and	The VR provides navigational aids that are intuitive to use but placed	The VR provides few navigational aids that are	The VR provides no navigational aids	Not Applicable

placed to support users maneuvering through the experience at their own pace.	logically placed to support users maneuvering through the experience at their own pace.	illogically, which limits the ease at which users can maneuver through the experience.	not intuitive to use and illogically placed, which severely limits the ease at which users can maneuver through the experience.	whatsoever and users must employ landmarks and trail-and-error strategy for maneuvering through the experience.	
F8. Multimedia Elements: How well does the VR integrate multimedia elements (e.g., text, graphics, videos, sound, live streaming, etc.) to immerse users within the experience?					
5	4	3	2	1	N/A
The VR's multimedia elements are seamlessly integrated and organized in a way that enhances the user experience.	The VR's multimedia elements are integrated and organized in a way that does not enhance or detract from the user experience.	The VR's multimedia elements are well-integrated, but their organization detracts from the overall user experience.	The VR's multimedia elements are integrated and organized in a way that reduces the quality of the user experience.	The VR's multimedia elements are jumbled, confusing, and/or poorly organized, which significantly reduces the user experience.	Not Applicable
F9. Immersion: How immersive is the experience to the user?					
5	4	3	2	1	N/A
The VR stimulates many of the users' senses to create a completely interactive experience that results in them making an emotional investment in the experience and blurring their physical and virtual worlds.	The VR stimulates the users' senses to create an interactive experience but lacks a strong enough emotional appeal needed for users to blur their physical and virtual worlds.	The VR only stimulates some of the users' senses, which precludes the experience from being interactive or emotional.	The VR allows users to interact with space, trigger events, or engage with manipulatives, but little else.	The VR only consists of a 360º environment that does not allow for user interaction outside of viewing the content.	Not Applicable

G. VR Abilities: The following dimensions analyze the VR's user-centric capabilities.					
G10. Experiential Component: How does the VR utilize experiential learning to engage users?					
5	4	3	2	1	N/A
The VR leverages experiential learning to engage users in tasks that require abstract logic and reasoning.	The VR includes an experiential learning component that provides users with added ability, access, or opportunity to complete tasks as compared to a similar concrete learning experience.	The VR provides an experiential learning component comparable to a similar concrete learning experience.	The VR includes an experiential learning component that provides users with less ability, access, or opportunity to complete tasks as compared to a similar concrete learning experience.	The VR could include an experiential learning component but does not.	Not Applicable
G11. Pathways: What pathways through the VR experience are available to users?					
5	4	3	2	1	N/A
The VR provides limitless pathways through the experience that users can navigate through at their own pace	The VR includes a set number of pathways through the experience that users can navigate through at their own pace within set parameters.	The VR only includes one pathway through the experience that users can move along at their own pace.	The VR only includes one pathway through the experience, and users are moved through it at a pace they do not control.	The VR only allows users to stand or be located in one place without any options for moving through the experience.	Not Applicable
G12. Dimensionality of Movement: Does the VR allow users to freely move around within the environment?					
5	4	3	2	1	N/A
Users have freedom of 3-dimensional movement (forward/backward, left/right, up/down) within the experience.	Users have freedom of 2-dimensional movement (forward/backward, left/right) experience.	Users have freedom of 1-dimensional movement (forward/backward).	Users' movements within the environment are dictated by the VR experience.	Users cannot move off a set point on a plane.	Not Applicable

G13. Virtual Manipulatives: Within the VR, how can avatars interact with virtual manipulatives (e.g. objects, tools, multimedia) in the environment?					
5	4	3	2	1	N/A
The VR allows avatars to move and share objects in 3 dimensions (e.g. pick up and toss a ball to another avatar).	The VR allows avatars to move objects in 3 dimensions (e.g. pick up a ball, spin it top to bottom or side to side).	The VR allows avatars to move and share objects in 2 dimensions (e.g. hit an air hockey puck back/forth, left/right against each other).	The VR allows avatars to move objects in 2 dimensions (e.g. moving a pencil left/right, up/down).	The VR allows avatars to interact with objects in 1 dimension (e.g. pressing a button in).	Not Applicable

Whereas, Philip Dawson's (2017) study suggests 15 different rubric design elements as depicted below:

Table 1. Summary of the rubric design elements.

Design element	References	Sample rubric
Specificity: the particular object of assessment	Tierney and Simon (2004): generic rubrics vs. task-specific Dornisch and McLoughlin (2006): challenges of using non-task-specific rubrics from the web Timmerman et al. (2010): example of a rubric to assess 'scientific writing' in general	Task-specific
Secrecy: who the rubric is shared with, and when it is shared	Torrance (2007): challenges of sharing criteria and different interpretations (not rubric-specific)	Shared with task description
Exemplars: work samples provided to illustrate quality	Tierney and Simon (2004): argues for providing exemplars with rubrics	One example of high-quality work was provided with a completed rubric
Scoring strategy: procedures used to arrive at marks and grades	Sadler (2009a): different types of scoring logic Johnson, Penny, and Gordon (2000): score resolution when assessors disagree Popham (1997): rubric definition mentions scoring strategies Dimopoulos, Petropoulou, and Retalis (2013): use of computers in a scoring strategy	Analytic. Cumulative scoring logic to arrive at broad grade. Faculty policy required double-marking of fails
Evaluative criteria: overall attributes required of the student	Popham (1997): rubric definition mentions evaluative criteria	Absent
Quality levels: the number and type of levels of quality	Sadler (2009b): mentions quality levels, noting that they need not be uniform across criteria Fluckiger (2010): provides rationale for using just one quality level Biggs and Tang (2007, 210): levels aligned with SOLO	Five levels corresponding to grade descriptors
Quality definitions: explanations of attributes of different levels of quality	Popham (1997): rubric definition mentions quality definitions Sadler (2009b): notes terminology is not uniform around quality descriptors and criteria. Tierney and Simon (2004): encourages consistency across levels	Present but inconsistent attributes across performance levels

(*Continued*)

Table 1. (*Continued*).

Design element	References	Sample rubric
Judgement complexity: the evaluative expertise required of users of the rubric	Sadler (2009b): 'qualitative judgements' vs. 'analytic judgements' Dimopoulos, Petropoulou, and Retalis (2013): computers making judgements in 'learning analytics enriched rubrics'	Moderate: mixture of analytic and qualitative judgements
Users and uses: who makes use of the rubric, and to what end	Nordrum, Evans, and Gustafsson (2013): teachers using rubrics to communicate feedback information Panadero and Romero (2014); Andrade and Du (2005): particular student uses of rubrics Dimopoulos, Petropoulou, and Retalis (2013): computers as users of rubrics	Teachers use for summative assessment; students use for planning and self-assessment; students use for formative peer assessment
Creators: the designers of the rubric	Andrade and Du (2005); Boud and Soler (2015): rubrics co-created by students and teachers Timmerman et al. (2010): researchers creating a rubric	Teacher
Quality processes: approaches to ensure the reliability and validity of the rubric	Johnson, Penny, and Gordon (2000): inter-rater reliability Timmerman et al. (2010): example of rubric that has undergone reliability and validity testing	No formal quality processes. Informal refinement based on student feedback and performance
Accompanying feedback information: comments, annotation, or other notes on student performance	Nordrum, Evans, and Gustafsson (2013): compared rubric-articulated feedback with in-text commentary	In-class: rubric acts as a stimulus for peer feedback discussion Summative marking: rubric accompanied by narrative from marker, and in-text comments
Presentation: how the information in the rubric is displayed	Sadler (2009a): usual presentation is a grid, table or matrix of text Google Images (2015): a range of examples of how rubrics are presented	Paper-based table of text
Explanation: instructions or other additional information provided to users	Hafner and Hafner (2003): provided minimal instruction Panadero and Romero (2014): more detailed instructions	Minimal: 'Use this to self- and peer-assess. Submit a highlighted self-assessed copy'

In Conclusion

As rubrics are designed to aid transparency and enhance standards, it is important that any rubrics are made public and shared with students in advance of their use. According to Sambell and Brown (2022), the development of any rubric will require a considerable degree of dialogue with different stakeholders, but student engagement with rubrics is crucial for

success. Furthermore, these authors indicate that "it is to design and use rubrics in such a way that they, together with other activities and assessment materials, act as bridges to future performance, but avoid 'traps that can result in a rubric becoming a task-focused checklist' (Ferrell and Knight, 2022)" (ibid, 2022, p.3). Hence, the design of a suitable rubric will most likely be iterative and subject to reflection and adaptation over time.

Useful Rubrics Resources:

Association of American Colleges and Universities. (2009). Inquiry and analysis VALUE rubric. https://www.aacu.org/initiatives/value-initiative/value-rubrics/value-rubrics-inquiry-and-analysis
https://www.aacu.org/initiatives/value-initiative/value-rubrics

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Edutopia Sample Rubric https://docs.google.com/document/d/1OCpYFYkcIwOwa0d5BCcTH5xahQ6GiaS1PnP0O3lqMsY/edit

Fegely & Cherner (2021) https://www.researchgate.net/profile/Todd-Cherner/publication/369670097_Bridging_the_XR_Technology-to-Practice_Gap_Methods_and_Strategies_for_Blending_Extended_Realities_into_Classroom_Instruction/links/642720a792cfd54f8442c93c/Bridging-the-XR-Technology-to-Practice-Gap-Methods-and-Strategies-for-Blending-Extended-Realities-into-Classroom-Instruction.pdf#page=98

Ferrell, G and Knight, S. (2022) Principles of good assessment and feedback. JISC. Available at: Principles of good assessment and feedback | Jisc

Johnson-Glenberg, M.C. – **QUIVRR** Quality of Immersive VR in Education Rubric - https://direct.mit.edu/books/oa-edited-volume/5306/Movement-MattersHow-Embodied-Cognition-Informs. https://doi.org/10.7551/mitpress/13593.003.0023

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North Carolina State University advice on rubric design and development https://teaching-resources.delta.ncsu.edu/rubric_best-practices-examples-templates/

Peisachovich, E., Appel, L., Sinclair, D., Luchnikov, V., & Da Silva, C. (2021). CVRriculum program faculty development workshop: outcomes and suggestions for improving the way we guide instructors to embed virtual reality into course curriculum. Cureus, 13(3).

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Pomerantz, Jeffrey. XR for Teaching and Learning: Year 2 of the EDUCAUSE/HP Campus of the Future Project. ECAR research report. Louisville, CO: EDUCAUSE, October 2019. https://library.educause.edu/-/media/files/library/2019/10/2019hpxr.pdf?la=en&hash=306474918AA2F101DDDCABD59E4366AD7244D572

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Sambell, K. and Brown, S. (2022) Using Rubrics to Promote Learning. A Maynooth University 'Assess for Success' Guide. Maynooth: Maynooth University.

Suskie, L. (2009) Using assessment results to inform teaching practice and promote lasting learning. In Assessment, learning and judgement in higher education (pp. 1-20). Dordrecht: Springer Netherlands.

Wolf, K. & Stevens, E. (2007) The role of rubrics in advancing and assessing student learning. Journal of Effective Teaching, 7(1), pp.3-14.

To evaluate Inquiry & Analysis (from Syracuse) see https://effectiveness.syr.edu/wp-content/uploads/2022/10/Inquiry-and-Analysis-Rubric.pdf
To evaluate integrative learning (from Syracuse) see https://effectiveness.syr.edu/wp-content/uploads/2022/10/Integrative-Learning.pdf
To evaluate class participation (from Syracuse) see https://effectiveness.syr.edu/wp-content/uploads/2018/08/SP96_grading-class-participation.pdf