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INSTITUTIONAL EFFECTIVENESS AND REPORTING

**Combining Two AAC&U VALUE Rubrics to Assess Critical Thinking  
at The University of Texas at Arlington**

**FALL 2016 REPORT**

## Combining Two AAC&U VALUE Rubrics to Assess Critical Thinking at The University of Texas at Arlington

Recent reports revealed that *Critical Thinking* continues as an in-demand skill that hiring managers seek in potential employees (National Association of Colleges and Employers, 2016). It also was included as one of only six Texas Core Curriculum (TCC) objectives defined by the Texas Higher Education Coordinating Board (THECB, 2013). While the ability to think critically is highly marketable, defining it is challenging due to the complexity of the integrated skill set that it involves. Many maintain that the practice of exploring information, using analytical reasoning to consider each idea, and forming conclusions based on the evidence, demonstrates *Critical Thinking* (AAC&U, 2015; Lederman, 2015; Peden, Reed, & Wolfe, 2017; Rhodes, 2015). To learn these skills, students complete course assignments over the duration of their academic career to practice *Critical Thinking*. These assignments often involve conducting data analyses and writing a summary of the results. This report contains evidence of *Critical Thinking* attainment as measured within written samples of student work assignments completed in undergraduate TCC courses at The University of Texas at Arlington (UT Arlington).

Each UT Arlington department developed specific measures or “signature assignments” as part of their inclusion application to have courses approved and counted in the list of TCC courses. Planned measurement of *Critical Thinking* in the signature assignments utilized well-vetted rubrics developed by the Association of American Colleges and Universities ([AAC&U](#); Rhodes, 2010). The purpose of this report is to present findings from the assessment of *Critical Thinking* during the 2016 fall semester at UT Arlington.

Assessment planning at UT Arlington followed a multi-year schedule that covered the required TCC objectives defined by THECB within each of the eight Foundational Component Areas (FCA). In fact, *Critical Thinking* is a required objective in all eight FCAs. The fall 2016

semester assessment schedule included several FCAs. Two prepared individual reports and these are posted on the [reports page](#) of the university website. One FCA submitted signature assignments that did not align well with the rubrics. Therefore, this report contains a summary of the findings from signature assignments completed in remaining FCAs, Communication and Creative Arts.

## **Method**

### *Participants*

Signature assignments were collected from four hundred ninety-five enrolled undergraduates. The two primary goals of this data collection were to gather evidence of student attainment within a representative sample and to have trained faculty rate each written student artifact. Two-thirds of the students were female (67%;  $n = 333$ ), the rest were male (33%,  $n = 162$ ). While this collection of student artifacts contained assignments from all ethnicities, the top four ethnic groups represented were White (42%,  $n = 206$ ), Hispanic (22%,  $n = 111$ ), Asian (14%,  $n = 68$ ), and Black/African American (13%,  $n = 62$ ). Self-reported information gathered from student admission materials indicated that over 40% were first-generation college students and a little more than a third were Pell Grant eligible (see Table 1).

Students represented all of the nine UT Arlington colleges and schools. Almost half were from the College of Nursing and Health Innovation, the largest of the colleges and schools in terms of degrees awarded in 2016 (UTA Institutional Summary, Feb 2017). The student artifacts represent work completed in a variety of course types. Nearly half of the students completed the work in a traditional on-campus setting in which they met in a classroom face-to-face with their instructor several times a week. The other half of the students only interacted with the course instructor and course materials in an on-line setting ( $n = 267$ ) via a curriculum-management system over the internet. Most of the on-line students (61%) were enrolled in accelerated, dynamically dated course sections, typically eight weeks in duration. The remainder (39%) followed the traditional schedule in

which students engaged in course curriculum activities over a 16-week semester schedule.

Table 1  
*Student Demographics*

<b>Categorical Information</b>	<b>Number of Students</b>	<b>Percent</b>
<b>Gender</b>		
Female	333	67
Male	162	33
<b>Ethnic Description</b>		
American Indian or Alaskan Native	3	<1
Asian	68	14
Black, African American	62	13
Foreign, Non-Resident Alien	19	4
Hispanic, All races	111	22
Multiple Ethnicities	23	5
Unknown or Not Specified	2	<1
White, Caucasian	206	42
<b>Level</b>		
Freshman	214	43
Sophomore	65	13
Junior	53	11
Senior	163	33
<b>Type of course</b>		
Traditional 16-week on-campus	228	46
Traditional 16-week on-line	105	21
Accelerated, dynamic-dated on-line	162	33
<b>First generation college student (self-report)</b>		
Yes	209	42
No	284	57
Unknown	2	<1
<b>Pell Grant eligible upon admission (self-report)</b>		
Yes	172	35
No	321	65
<b>College or School</b>		
College of Nursing and Health Innovation	234	47
College of Business	58	12
University College	57	12
College of Liberal Arts	53	11
College of Science	44	9
College of Engineering	18	4
College of Education	14	3
College of Architecture, Planning, & Public Affairs	10	2
School of Social Work	7	1

*Procedure*

After contacting faculty teaching TCC courses, assignments were collected to serve as

purposeful evidence of *Critical Thinking* attainment. Some TCC courses assigned students a research position paper in which they discussed both sides of an argument. Most instructors gave students the option to choose a topic that was personally relevant. Another type of signature assignment from the Creative Arts courses directed the students to complete a written report after visiting a museum and selecting a piece of artwork for analysis. Specifically, with a visual analysis guide from the instructor in hand, students were instructed to exercise their observation skills to relate how the artist used specific artistic elements and principles, and then specifically, in the form of an argument, discuss how the artist integrated these elements and principles to achieve emphasis and intended meaning. After completion, university staff from the Institutional Effectiveness and Reporting Department collected the student assignments from the departments and prepared them for rating. Papers were assigned a coded tracking number and then all personal identification information (e.g., the student's name, the faculty instructor's name) was removed to prevent rater bias during the planned group "Scoring Day" activities.

### *Assessment Instrument*

The assessment instruments used in this report were the AAC&U's Critical Thinking Rubric and Inquiry/Analysis Rubric (AAC&U, 2015). These Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics were developed by a multi-disciplinary team of faculty experts directed by the AAC&U. Raters utilized the Critical Thinking rubric for the research position paper (see Figure 1). They used an adapted rubric for the Creative Arts papers (see Figure 2). Necessary adaptations combined dimensions from both rubrics for rating student artifacts from the Creative Arts FCA. These were needed because the assignment focused less on problem-solving and more analysis of art elements as well as inquiry about the author's intended meaning. As such, the adapted rubric used three dimensions from Critical Thinking rubric and two dimensions from the Inquiry Analysis. This resulted in a rubric better aligned for rating the assignments from the Creative Arts FCA, titled "Critical

Thinking/Inquiry/ Analysis Rubric for the Creative Arts.”

The AAC&U Critical Thinking VALUE rubric is organized into five measures: 1) *Explanation of issues*, 2) *Evidence*, 3) *Influence of context and assumptions*, 4) *Student’s position*, and 5) *Conclusions and related outcomes*. Likewise, the UT Arlington adapted Critical/Thinking/Inquiry/ Analysis rubric contained five measures: 1) *Existing Knowledge, Research and/or views*, 2) *Analysis*, 3) *Influence of context and assumptions*, 4) *Student’s position*, and 5) *Conclusions and related outcomes*. Both rubrics contain tables that provide a narrative description of the expected work quality and the corresponding point values for rating the five measures. Rating values ranged from 1 – 4, with 4 representing the highest mastery of Critical Thinking. Raters read the student papers and assigned scores for each of the five measure scores respectively.

**CRITICAL THINKING VALUE RUBRIC**

*for more information, please contact value@aacu.org*



**Definition**

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

*Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (all one) level performance.*

	Capstone	Milestones		Benchmark
	4	3	2	1
<b>Explanation of issues</b>	Issue/ problem to be considered critically is stated clearly and described comprehensively delivering all relevant information necessary for full understanding.	Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown.	Issue/ problem to be considered critically is stated without clarification or description.
<b>Evidence</b> <i>Selecting and using information to investigate a point of view or conclusion</i>	Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question.
<b>Influence of context and assumptions</b>	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
<b>Student's position (perspective, thesis/hypothesis)</b>	Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ hypothesis).	Specific position (perspective, thesis/ hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/ hypothesis).	Specific position (perspective, thesis/ hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious.
<b>Conclusions and related outcomes (implications and consequences)</b>	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.

Figure 1. AAC&U Critical Thinking VALUE Rubric

**CRITICAL THINKING/INQUIRY/ANALYSIS  
RUBRIC FOR THE CREATIVE ARTS**

	Milestones			Benchmark 1
	4 Capstone	3	2	
<b>Existing Knowledge, Research, and/or Views</b>	Synthesizes in-depth information from relevant sources representing various points of view/approaches.	Presents in-depth information from relevant sources representing various points of view/approaches.	Presents information from relevant sources representing limited points of view/approaches.	Presents information from irrelevant sources representing limited points of view/approaches.
<b>Analysis</b>	Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus.	Organizes evidence to reveal important patterns, differences, or similarities related to focus.	Organizes evidence, but the organization is not effective in revealing important patterns, differences, or similarities.	Lists evidence, but it is not organized and/or is unrelated to focus.
<b>Influence of context and assumptions</b>	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
<b>Student's position (perspective, thesis/hypothesis)</b>	Specific position (perspective, thesis/hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).	Specific position (perspective, thesis/hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.
<b>Conclusions and related outcomes (implications and consequences)</b>	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.



Adapted for the University of Texas at Arlington  
from AAC&U's Critical Thinking and Inquiry/Analysis VALUE Rubrics  
Last Revised 01/25/2016

*Figure 2. Adapted Critical Thinking/Inquiry/Analysis rubric for the Creative Arts.*

*Raters, best practices for “Scoring Day” and inter-rater reliability goals*

We recruited raters with advanced degrees from among the UT Arlington academic community and provided training for scoring the signature assignments (see Table 2). Most were female and had earned doctoral degrees in their respective fields. On average, they had over 12 years of teaching experience at the university level ( $M = 12.24, SD = 8.1$ ). This multi-disciplinary group of raters represented six colleges and schools: College of Business (8%), College of Liberal Arts (40%), College of Nursing and Health Innovation (16%), College of Science (12%), School of Social Work (4%), University College (4%). Others (16%) represented the UTA Libraries (8%) and the UTA Institutional Effectiveness and Reporting Department.

Two steps were followed on “Scoring Day.” First, the raters gathered in a group setting and completed a training/rater-calibration process before scoring any student work samples. It is important to note that these training sessions were led by a faculty expert that acted as a facilitator for

discussing the nuances of pedagogy from the FCAs represented by the papers. For example, after listening to the facilitator present and describe the elements to look for in each level of the rubric, two samples of student work were used as anchor papers in the hands-on rater calibration process. During this step, based on the rubric, each rater read the anchor paper and assigned values for each measure. Then the facilitator led a discussion of the rater’s scores aimed at reaching a common understanding of each measure of *Critical Thinking*.

Table 2  
*Rater Demographics*

<b>Categorical Information</b>	<b>Number of Raters</b>	<b>Percent</b>
<b>Gender</b>		
Female	18	72
Male	7	28
<b>Ethnic Description</b>		
Black, African American	1	4
Foreign, Non-Resident Alien	0	0
Hispanic, All races	2	8
White, Caucasian	22	88
<b>Classification</b>		
Faculty	17	68
Staff	7	28
Graduate Teaching Assistant	1	4
<b>Highest Degree Received</b>		
Masters	12	48
Doctoral	13	52
<b>Additional Certifications</b>		
K-12 Teaching Certificate	1	4
Licensed or Certified Mediator	2	8
Licensed Master Social Worker	1	4
Registered Nurse, Nurse Educator, or CNS <sup>a</sup>	4	16
TESOL <sup>b</sup>	1	4

Note. <sup>a</sup> Clinical Nurse Specialist. <sup>b</sup> Teacher of English to Speakers of Other Languages.

Next, the scoring process began. A minimum of two raters individually read each paper and scored it independently using the rubric. After rating, Rater A covered their ratings on the score sheet with an adhesive “post-it” type note to avoid biasing Rater B with their scores.

Achievement of inter-rater agreement was a high priority. If values of the measure scores from the two raters were identical or within two points, then the scores were averaged. For example, if Rater 1 scored the *Evidence* measure with a value of 2 and Rater B scored *Evidence* with



a value of 4, then the score for *Evidence* was averaged, resulting in a score value of 3. If the scores from the two raters differed by more than two points, then the facilitator assigned a third rater to read the paper. Next, from the three scores, the two most similar scores were averaged together and the third was dropped. Figures 3 and 4 contain the rater score sheets.

	<b>Grader 1</b>				<b>Grader 2</b>				<b>Grader 3 (only if needed)</b>			
<b>Explanation of the issues</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Evidence</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Influence of context and assumptions</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Student's position</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Conclusions and related outcomes</b>	4	3	2	1	4	3	2	1	4	3	2	1

Figure 3. Rater Score Sheet for Critical Thinking VALUE Rubric

	<b>Grader 1</b>				<b>Grader 2</b>				<b>Grader 3 (only if needed)</b>			
<b>Existing Knowledge</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Analysis</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Influence of context and assumptions</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Student's position</b>	4	3	2	1	4	3	2	1	4	3	2	1
<b>Conclusions and related outcomes</b>	4	3	2	1	4	3	2	1	4	3	2	1

Figure 4. Rater Score Sheet for Critical Thinking/Inquiry/Analysis Rubric for Creative Arts

## Analysis and Results

### *Inter-rater reliability*

Inter-rater agreement analyses assessed whether the raters agreed when assigning measure values for the student's papers. Levels of agreement were determined by calculating the intraclass correlation coefficient (ICC). High ICC values indicate more agreement between rater scores (Fleiss, 1986; Shrout & Fleiss, 1979). For this sample, values indicated good to excellent agreement (see

Table 3). These high values give confidence to proceed in describing student attainment trends may emerge in subsequent analyses.

Table 3

*Intraclass Correlation Coefficient (Fleiss' Kappa) for Critical Thinking Measures*

	Museum Analysis Essay	Research Position Paper	ICC Mean (as available)
Measurement Dimensions from AAC&U Critical Thinking and Inquiry/Analysis VALUE Rubrics	<i>n</i> = 267	<i>n</i> = 228	<i>N</i> = 495
Existing Knowledge	0.69		
Analysis	0.72		
Influence of context and assumptions	0.63	0.70	0.66
Student's position	0.65	0.72	0.69
Conclusions and related outcomes	0.69	<b>0.76</b>	0.72
Explanation of issues		<b>0.75</b>	
Evidence		0.69	

Note 1: less than 0.40 = poor agreement; between .40 and .74 = fair to good agreement; greater than .74 = excellent agreement.

Note 2: the intra-class correlation coefficient (ICC) was calculated as a one-way random effects model. Values in this type of model with random rater pairings are typically expected to be lower than models where rater pairings are fixed throughout rating day.

Note 3: where excellent agreement was found, values are indicated in bold

*Scores from Signature Assignment ratings*

An examination of the score frequencies indicated that distributions closely followed standard normal curves with more student scores of 2 and 3 and fewer scores of 1 and 4. Because each paper was rated twice, the combined frequencies for both rater scores are presented (see Table 4). The means (Table 5) show that the average score for 6 of the 7 measures exceeded a value of 2.5. This indicates that, on average, students more than met the attainment level of 2, which was the threshold set by the university to measure *Critical Thinking*. One measure, *Conclusions and related outcomes* fell a little short of 2.5, however it was above the attainment threshold (Table 5).

Further analyses used standardized scores and the Empirical Rule (e.g., 68-95-99.7 Rule, first described by de Moivre in 1733) to answer the question “what percent of students score within one standard deviation of the mean or better?” In other words, how many have scores that are not statistically different from the mean and above. This is important for examining alternatives for

setting the bar for student attainment, in addition to those typically used (e.g., all students will score a “C” or better (70%) or the average for all scores on the rubric will exceed a value of two). Our targeted threshold from the Empirical Rule was that 84% of students would have a score greater than negative 1 standard deviation of the mean ( $84\% > \mu - 1\sigma$ ). For this sample, students exceeded that goal in three of the seven dimensions, *Evidence*, *Influence of Context & assumptions*, and *Student’s Position*. For all seven measures at least 73% of the students scored greater than negative 1 standard deviation of the mean (see Table 5).

Table 4  
*Frequencies for Critical Thinking Measure Scores*

Measurement dimensions	N	Rubric Values (Percent of Student papers)			
		1	2	3	4
Existing Knowledge	534	25 (5%)	181 (34%)	235 (44%)	93 (17%)
Analysis	534	41 (8%)	146 (27%)	228 (43%)	119 (22%)
Influence of Context and assumptions	990	85 (9%)	372 (38%)	431 (44%)	102 (10%)
Student’s Position	990	106 (11%)	325 (33%)	435 (44%)	124 (13%)
Conclusions and Related Outcomes	990	147 (15%)	381 (39%)	354 (36%)	108 (11%)
Explanation of the issues	456	23 (5%)	125 (27%)	226 (50%)	82 (18%)
Evidence	456	26 (6%)	192 (42%)	191 (42%)	47 (10%)

Note: Each paper was rated twice; therefore, the number of papers is double for this table, compared to Table 5.

Table 5  
*Means for Critical Thinking Measure Scores*

Measurement dimensions	N	Mean	SD	Percent $> \mu - 1\sigma$
Existing Knowledge	267	2.74	0.70	73
Analysis	267	2.80	0.77	74
Influence of Context and assumptions	495	2.56	0.68	89
Student’s Position	495	2.58	0.73	88
Conclusions and Related Outcomes	495	2.43	0.77	80
Explanation of the issues	228	2.80	0.69	78
Evidence	228	2.57	0.65	94

We ran analysis of variance (ANOVA) to examine relationships between the student characteristics and the seven *Critical Thinking* measures. There was a significant difference between student levels for the *Existing Knowledge* measure,  $F(263) = 3.02$ ,  $p = 0.03$ , in which the mean scores were higher for junior and senior-level students as compared with freshman and sophomores. Mean

scores for students who were the first generation from their family to attend college were not significantly different from their peers.

## **Summary**

The current assessment of signature assignments used the AAC&U Critical Thinking and Inquiry Analysis VALUE rubrics. Results revealed some patterns in the evidence that indicated strengths and weaknesses in *Critical Thinking* for a relatively large sample of undergraduate students. In addition, analyses included an examination of student characteristics in order to identify trends and comparisons by groups.

In this 2016 sample, average student scores were strongest for three measures: *Existing Knowledge, Analysis, and Explanation of issues*. The means for the other four measures *Influence of context and assumptions, Student's position, Evidence, and Conclusions and related outcomes* exceeded the threshold value. Therefore, for all measures, the student's average scores importantly met threshold criteria established by AAC&U of using rubric values of two or better.

In addition, these data portray that the 2016 students exceeded the means from previous studies for all measures (see Table 4, [2016 THECB Core Objective Assessment Report](#), p. 12). For example, the mean for *Explanation of issues* significantly increased from 2.43 to 2.80,  $t(539) = 3.43, p = .0007$ . This evidence suggests that the UTA experience positively affected the *Critical Thinking* of undergraduates in an ongoing and increasing manner.

This is the first report that includes analyses to set a new criteria of attainment, using standardized scores and the Empirical Rule. That is, that 84% of the students would attain average measure scores above or within one standard deviation of the mean. Used in conjunction with the AAC&U threshold, which indicated attainment for all measures, this additional analysis drilled down a bit further to show that higher percentages of students attained some measures of the THECB *Critical Thinking* Core Objective more than others. It revealed that *Influence of context*

*and assumptions, Student's position, and Evidence* met the threshold of 84%. While these analyses were exploratory in nature, future studies plan to continue this analytical approach to examine trends in student performance.

An examination of student characteristics indicated that the sample was generally descriptive of the university. Evidence of increases in measures such as *Existing Knowledge* as the students progress from their freshman to senior year is extremely encouraging. The large representation from the College of Nursing and Health Innovation may explain why the numbers of Pell-eligible and first-generation students are lower than expected, as many of the students in this sample were from the RN to BSN program. In this program, registered nurses, established in their careers, return to school to earn their baccalaureate degree in nursing.

This report contains evidence from two of the eight Foundational Component Areas collected as part of the multi-year plan to assess Critical Thinking. It presents evidence of student attainment for Critical Thinking in seven measures for fall 2016. Reports from other areas are posted on the [UT Arlington website](#).

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