



# Matrices, Codes, and Constructs (TPACK in Philippine STEAM Education)

Marie Paz E. Morales, Ruel A. Avilla,  
Celina P. Sarmiento, Jovito C. Anito Jr.,  
Thaddeus Owen D. Ayuste, Benilda R. Butron,  
Caesar P. Palisoc, Levi E. Elipane

**Appendix-Table 1.** Education Domain Matrix

<b>Content</b>	<b>Pedagogy</b>	<b>Technology</b>	<b>Other Comments</b>	<b>Notes</b>
General and Inorganic Chemistry	Lecture-Discussion	ppt to show problems		recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Mathematics	Socratic Approach (Uses Template questions for students to easily draw patterns in creating answers)	PPT only used to aid teaching		recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Laws in Electrical Engineering, Contracts, and Ethics	Reporting with teacher input during the reporting process Discussion of all reports	PPT		recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Fundamentals of Material Science and Engineering	Reporting with teacher input during the reporting process Discussion of all reports	PPT	Teacher is not confident with her ideas The teacher needs to improve on lesson delivery and use of technology	knowledge of technology and probable use in the classroom
Clinical Reactions and changes	Lecture-Discussion	PPT and clicker response	Concepts with citations were flashed using ppt (LCD and Laptop)	recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Body Animation	Lecture-Discussion	PPT, Simulations, Computer graphics	Integrates human anatomy in the discussion of body animation	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Differential Calculus	Lecture Method and Independent Learning	Chalkboard Used visualization utilizing graphical representations	used photocopy of formulas	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy

Probability	Lecture-Discussion	Used Galton Board Used graphs and dot matrix for visualization Used video to show how Galton Board works	Relate concepts to marketing strategy games (with prizes for winners)	knowledge of technology and probable use in the classroom
Protein Synthesis, Nucleotides	Lecture-Discussion Socratic Method	PPT only used to aid teaching		knowledge of technology and probable use in the classroom
Analytical Chemistry	Lecture-Discussion Socratic Method	PPT only used to aid teaching		knowledge of technology and probable use in the classroom
Behavioral Statistics	Reporting with teacher input during the reporting process Lecture Discussion of all reports	PPT only used to aid teaching SPSS		knowledge of technology and probable use in the classroom
Advanced Calculus	Deductive Method and Lecture Method	PPT only used to aid teaching SPSS	Some slides are not appropriate for font size	knowledge of technology and probable use in the classroom
Introduction to Computing (Application Software and Business Program)	Lecture Method and Experiential Learning	PPT and Computer for hands-on activities	Some slides are too crowded	knowledge of technology and probable use in the classroom
Mitosis and Meiosis	Lecture-Discussion	PPT only used to aid teaching		knowledge of technology and probable use in the classroom
Mathematics in the Modern World	Lecture-Discussion	PPT only used to aid teaching Movie	No student engagement Teaching tools used are NOT appropriate to the topic being discussed Session Plan with Movie, Actual Session - No Movie	knowledge of technology and probable use in the classroom
Earth Science	Reporting with teacher input during the reporting process Lecture Discussion of all reports and Socratic Method	PPT only used to aid teaching		knowledge of technology and probable use in the classroom
Statistics for Engineering and Scientists	Lecture Method Problem Solving with Activity Integrated other disciplines in teaching	Calculator, PPT, CB		recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy

Chemistry: Changes in Matter	Experiential or Laboratory Method Demonstration Method Lecture-Discussion	White board and ppt		recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
NCM 109 (CPR)	Reporting, Discussion, Simulation	PPT only used to aid teaching and other tools	with assessment	recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Gerontology Nursing	Lecture Discussion	PPT only used to aid teaching and other tools		knowledge of technology and probable use in the classroom
Information Management	Group Presentation and Discovery Approach Discussion	PPT only used to aid teaching and other tools		knowledge of technology and probable use in the classroom
System Integration	Lecture Discussion Demonstration Actual Programming	PPT only used to aid teaching and other tools Computer		knowledge of technology and probable use in the classroom
NCM 105 (Science)	Lecture-Discussion	Video Clip PPT		recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Statistics and Probability	Problem-solving Board work Seatwork	IAE, Calculator and Cartolina No digital technology used	Lesson was still teacher-centered	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Fish Diversity	Lecture-Discussion (with examples found most common in the campus)	Used Computer-Aided Learning PPT was also used (and served as the whole springboard of the discussion)		recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
General Biology	Blended learning	PPT and others Proper visuals were included in slides	High Student engagement	active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Calculus II	Student-centered learning independent learning Discussion	PPT	Activities were given in advance	knowledge of technology and probable use in the classroom
Pharmaceutical Manufacturing	Lecture Discussion Activity	PPT and Opaque Projector	No or minimal student engagement	knowledge of technology and probable use in the classroom

Pharmaceutical Care	Reporting with teacher input during the reporting process Discussion of all reports		The tool was only used for lecture only All lessons were delivered using group reporting	knowledge of technology and probable use in the classroom
Clinical Pharmacy	Lecture Method	PPT (with appropriate slides)	There was a misconception on foreign bacteria (Eating spoiled food will activate micro flows of GIT) Correct concept: foreign bacteria cause GIT to resist Low student engagement Low student engagement	knowledge of technology and probable use in the classroom
Clinical Microscopy	Lecture Discussion (Recalls past lessons, connects lessons in clinical microscopy to other subjects, gives examples)	PPT, CB, OP (interactive PPT)		knowledge of technology and probable use in the classroom
Biology	Lecture with Hands-on activity (using microscope)	PPT Microscope	Explained the relevance of the lesson to the new topic Students were attentive With student engagement (students ask questions)	knowledge of technology and probable use in the classroom
Limits (tabular and Graphical Approach)	Lecture Discussion	PPT and Laptop Differently colored markers		active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Group Data, Intervals, Statistics	Lecture Discussion with Activity	calculator, CB Depended on availability	consistency of teacher in variables being used	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Legal Aspects, Professional Ethics (IT)	Lecture Discussion, inquiry, video presentation	PPT Successfully exploited the available tools to deliver the lesson	video clips connects trends in social media and very much related to the topic	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Integumentary System	Lecture Discussion Inquiry-based	PPT highlighting use of electronic visuals for figures		knowledge of technology and probable use in the classroom
Database Management System (IT-Entity Relationship Diagram)	Lecture Discussion	PPT highlighting use of electronic visuals for figures	font size is small, difficult to read	limited knowledge on the appropriate use of the identified technology
Basic Finance	Lecture Discussion	CB (Traditional)	integrates real life scenario	recognize/appreciates technology appropriate to the content of the lesson (STEAM) --

Discrete Math	Student Centered Inquiry-based Student Activity	CB, PPT OP, M		knowledge of technology in relation to content and pedagogy
Mechanics 3	Lecture Method with Discussion Diagraming	CB (Traditional)	Low student engagement	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Engineering Economy	Lecture Discussion Method Facilitates problem solving tasks Student-centered activity	CB, OP, PPT	Group problem solving Half of the class was engaged	limited to using traditional technology
Systems Analysis and Design	Case Study Analysis Group Reporting Simulation	CB, OP, PPT	Flow charting Executed planned session	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Bio Science	Used CALS (Computed Aided Learning Strategy)	OP, PPT, D, LDEM	students conducted research in the class to articulate the problem being discussed	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
General Zoology	Computer-aided Student-centered Collaborative discussion	video Clip PPT	good student engagement	active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Statistics	CAL and Board teaching (Lecture-Discussion)	PPT, OP		recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technology in relation to content and pedagogy
Science	Used good art of questioning Lecture Discussion	PPT		active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Chemistry	Lecture Discussion with Activity (group work-laboratory)	Lab equipment		active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Technology	Lecture Discussion	CB (Traditional-what is available)	limited student engagement	limited to using traditional technology

Statistics and Probability	Lecture Discussion	CB (Traditional-what is available) improvised model of plant cell		active integration of multiple technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
General Chemistry 2	Lecture Discussion	CB (Traditional-what is available)		limited to using traditional technology
General Biology	Lecture Discussion	CB, OP, PPT		active integration of multiple technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Physical Science	Lecture Discussion	CB and PPT		active integration of multiple technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Statistics and Probability	Lecture Discussion with Activity	CB, PPT, D	with student engagement	active integration of multiple technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Database Design for Library	Lecture Discussion with Activity	PC, Programming Software		active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Anatomy and Physiology	Lecture Discussion with Activity	CB, PPT, D		active integration of technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
Clinical Chemistry	Lecture Discussion	CB (Traditional-what is available)		limited to using traditional technology
Quality Assurance and Quality Control Skills Lab	Lecture Discussion with Demonstration Lecture Discussion with Demonstration	CB (Traditional-what is available) CB, PPT, D, Si, LDEM		limited to using traditional technology active integration of multiple technology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy

Color code: pink – traditional technology, blue- with knowledge of and probable use of technology, yellow-integration of multiple technology, green – active use of technology with appropriate pedagogy

: pink – traditional technology (5), blue-knowledge of technology in relation to content and pedagogy (7), blue- with knowledge of and probable use of technology (20), yellow-integration of multiple technology (17), green – active use of technology with appropriate pedagogy (8)

**Appendix-Table 2.** Codes and Constructs per Model

Pedagogical Model	Technology Integration	Assessment	TPDK (TPACK Model for University Setting (Techno Pedagogical Disciplinary Knowledge)
<p><b>Drivers of Pedagogical Processes</b></p> <ol style="list-style-type: none"> <li>1. Institutional Support to Pedagogical Processes</li> <li>2. Institutional Pedagogical Culture</li> <li>3. Teacher’s Pedagogical Character</li> <li>4. Teacher’s Pedagogical Beliefs</li> <li>5. Institutional Support for Faculty Development</li> <li>6. Monitoring and Evaluation of Pedagogical Processes</li> <li>7. Institutional Planning for Pedagogical Processes</li> </ol> <p><b>STEAM Pedagogical Processes</b></p> <ol style="list-style-type: none"> <li>1. Employs Inquiry-Based Learning Approach</li> <li>2. Emphasizes Output over Process</li> <li>3. Values Feelings and Emotions in the Pedagogical Processes</li> <li>4. Utilizes Lecture Method</li> <li>5. Employs Modeling as a Teaching Strategy</li> <li>6. Demonstrates Ability to Develop Tests</li> <li>7. Maintains a Positive Learning Environment</li> <li>8. Monitors Learners’ Acquisition of Knowledge</li> <li>9. Orients the Learners with Assessment Standards</li> <li>10. Monitors the Learners’ Construction of Knowledge</li> </ol>	<p><b>Teacher Technological Knowledge</b></p> <ol style="list-style-type: none"> <li>1. Lesson Structure</li> <li>2. Content Based</li> </ol> <p>a. Engaged b. Enhanced c. Extended</p> <p><b>Administrative Support</b></p> <ol style="list-style-type: none"> <li>1. Capacity Building</li> <li>2. Technology Architecture, System and Design</li> </ol>	<p><b>Three variables:</b></p> <ol style="list-style-type: none"> <li>1) Enablers of STEAM Assessment</li> <li>2) Drivers of STEAM Assessment</li> <li>3) Process of STEAM Assessment</li> </ol> <p><b>I. ENABLERS of STEAM Assessment</b></p> <p><b>A. Institutional Affordances</b></p> <ol style="list-style-type: none"> <li>1. Curriculum development</li> <li>2. Institutional identities</li> <li>3. Agency and empowerment</li> </ol> <p><b>B. Sustainability</b></p> <ol style="list-style-type: none"> <li>1. Quality assurance</li> <li>2. Research undertakings</li> <li>3. Policies and programs</li> </ol> <p><b>II. DRIVERS of STEAM Assessment</b></p> <p><b>A. Ensuring Equity</b></p> <ol style="list-style-type: none"> <li>1. Gender sensitivity</li> <li>2. Monitoring and feedback</li> <li>3. Student interests and expressions</li> <li>4. Contextualization and localization</li> <li>5. Ethics</li> </ol> <p><b>B. Pursuing Collaboration</b></p> <ol style="list-style-type: none"> <li>1. student-to-student</li> <li>2. teacher-to-teacher</li> <li>3. teacher-to-student</li> <li>4. Community involvement</li> <li>5. Involvement of other stakeholders</li> </ol> <p><b>C. Utilizing Modality</b></p> <ol style="list-style-type: none"> <li>1. Tools and technology</li> <li>2. Types of assessment</li> </ol> <p><b>III. PROCESS of STEAM Assessment</b></p> <p><b>A. Planning and preparation</b></p> <p><b>B. Implementation</b></p> <p><b>C. Grading</b></p> <p><b>D. Reporting</b></p> <p><b>E. Reflection</b></p>	<p><b>Disciplinary Specific</b></p> <ol style="list-style-type: none"> <li>1. Pedagogy-Discipline (PCK)</li> <li>2. Technology-Pedagogy-Discipline (TPCK)</li> <li>3. Technology - Discipline (TC)</li> <li>4. Technology -Pedagogy (TP)</li> <li>5. Technology-Discipline-Epistemology</li> <li>6. Discipline-Epistemology</li> </ol> <p><b>Personal Epistemology</b> <i>(teacher's beliefs about knowledge and the act of knowing, beliefs about how people learn in general and about the relative value of knowledge)</i></p> <ol style="list-style-type: none"> <li>1. Pedagogy-Epistemology</li> <li>2. Technology-Epistemology</li> <li>3. Discipline-Epistemology</li> <li>4. Pedagogy-Epistemology-Discipline</li> <li>5. Technology-Discipline-Epistemology</li> <li>6. Technology-Pedagogy-Epistemology</li> </ol>
<p><b>Outcomes of STEAM Pedagogical Processes</b></p> <ol style="list-style-type: none"> <li>1. Graduates are Critical Thinkers</li> <li>2. Graduates Pass the Licensure Examinations</li> <li>3. Graduates are Employable</li> </ol>	<p><b>Quality of Technology</b></p> <ol style="list-style-type: none"> <li>1. Availability</li> <li>2. Affordability</li> <li>3. Appropriateness</li> </ol>	<p><b>Variable 1 Enablers of STEAM Assessment</b></p> <ol style="list-style-type: none"> <li>1. Observes practices and programs for continuous improvement and attainment of the curriculum Presence and utilization of appropriate technology that aids the assessment process</li> <li>2. Appropriations of financial support for improving the assessment process. Existence of continuing faculty development programs and activities related to assessment</li> <li>3. Presence of guidelines for hiring new faculty members Existence and implementation of internal quality assurance practices Existence and implementation of external quality assurance practices Conducts research projects/programs in improving the assessment practices Existence and implementation of policies and programs ensuring quality of the assessment process</li> </ol>	<p><b>Pedagogical Knowledge</b></p> <ol style="list-style-type: none"> <li>1. Pedagogy-Epistemology</li> <li>2. Pedagogy-Discipline (PC)</li> <li>3. Technology-Pedagogy (TP)</li> <li>4. Pedagogy-Epistemology-Discipline</li> <li>5. Technology-Pedagogy-Discipline (TPCK)</li> <li>6. Technology-Pedagogy-Epistemology</li> </ol> <p><b>Technological Knowledge</b></p> <ol style="list-style-type: none"> <li>1. Technology-Pedagogy (TP)</li> <li>2. Technology-Discipline (TC)</li> <li>3. Technology-Pedagogy-Discipline (TPCK)</li> <li>4. Technology-Pedagogy-Epistemology</li> </ol>



### Variable 2 Drivers of STEAM Assessment and Variable 3 Process of STEAM of Assessment

1. Ensures balanced distribution of items in terms of content
  2. Includes real life application problems (since the application is usually disciplined)
  3. Remediates students' difficulties and misconceptions
  4. Involves other experts and stakeholders in the assessment process
  5. Uses various reliable references (including online sources) to create assessment tools
  6. Considers the different background of students in terms of language, circumstances (some are returnees), learning styles, pacing, etc. and contextualizes the assessment
  7. Ensures balanced distribution of items on tests in terms of difficulty and assessment tools
  8. Includes questions that provokes HOTS and critical thinking
  9. Involves repetition of items/activities for mastery of skills
  10. Interprets the result of previous assessment and use it to design the next
  11. Selects appropriate assessment based on the competencies and expected outcome
  12. Orients learners about expectations for the assessment and how they will be graded
  13. Ensures the quality of assessment
  14. Plans rules that students must adhere to
  15. Identifies the appropriate type of grouping
  16. Encourages students to create (and improve their output)
  17. Utilizes both traditional and authentic tasks
  18. Integrates technology to innovate assessment implementation
  19. Coordinates with other stakeholders in the assessment process
  20. Exercises the art of questioning (rephrase questions that students cannot understand)
  21. Observes students expressions
  22. Uses assessment for/of/as learning
  23. Provides clear instructions
  24. Ensures proper monitoring of the assessment implementation
  25. Assign roles to students (leaders, monitors, etc.)
  26. Integrates technology to innovate rating of submission
  27. Uses rubrics
  28. Identifies difficulties of students
  29. Rates outputs and performances according to standards (set and agreed)
  30. Conducts item analysis (difficulty and discrimination)
  31. Ensures the quality of student submission
  32. Deliberates the grade that will be given to the student (some schools do teaching)
  33. Integrates technology in reporting the assessment results
  34. Monitors the number of students who reached the standards and progress of each student
  35. Informs students about the results of the assessment for/of/as learning
  36. Practices academic integrity and fairness
  37. Maintains confidentiality of results
  38. Provides recommendations
  39. Evaluates the effectiveness of integrating technology in innovating the assessment
  40. Analyzes reasons/factors for students' difficulties and misconceptions
  41. Encourages students to reflect on the result of their assessment
  42. Evaluates the need to re-teach the lesson or move on to the next
  43. Uses item analysis to improve assessment
  44. Improves classroom practices based on the results of the assessment
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**Appendix-Table 3.** Summarized codes for Pedagogy, Assessment and Technology Integration

	<b>Organizing Theme</b>	<b>Selected Codes/Basic Themes</b>	<b>Description or Organizing Theme</b>
<b>PEDAGOGICAL MODEL</b>	Institutional Pedagogical Culture	Planning the Pedagogical Processes Disseminating Pedagogical Processes Evaluating the Pedagogical Processes Institutional Support to Pedagogical Processes	This refers to institutional practices that support the pedagogical process and requirements of faculty and staff.  The model proposes an institutional mechanism in planning, disseminating, and evaluating pedagogical processes.
	Teacher Pedagogical Character	Teacher acknowledges the diversity in teaching strategies Teacher models learning	This pertains to the teachers' epistemological beliefs and pedagogical practices.
	Employing STEAM Appropriate Teaching Strategies	Employing Output-Based Learning Employing Lecture Method Employing Collaborative Learning Eliciting prior knowledge Strengthening learner's communication skills Monitoring of Learners' Acquisition of Knowledge Establishing a Mentoring Mechanism for Students Managing the classroom Planning the Pedagogical Processes	The pedagogical processes currently employed by Philippine STEAM teachers in teaching STEAM courses, primarily the teaching approaches and corresponding teaching techniques.
	Outcomes of the Pedagogical Processes	Critical Thinking among Graduates Performance in Licensure Examinations Employability of Graduates	Attributes of the products the pedagogical culture and processes
<b>ASSESSMENT MODEL</b>	Institutional affordances	Curriculum development Institutional identities Agency and empowerment	Refers to the properties or facilities of educational institutions or an aspect of its environment and policies that aids the STEAM assessment process.
	Sustainability	Quality assurance Research undertakings Policies and programs	Efforts exerted to secure, maintain, and improve the quality of the STEAM assessment process.
	Ensuring equity	Gender sensitivity Monitoring and feedback Student performance, interest, and expression (Recognizing student differences)	Ensuring inclusion of all learners and making certain that each student has a fair and equal opportunity during assessment process.
	Pursuing collaborations	Student-to-student Teacher-to-teacher Community involvement Involvement of other stakeholders	Dynamics that exist between the various key players in the assessment process.
	Utilizing modality	Tools and technology Assessment types	Describes the variety of tools used and methods applied in the assessment process.

**TECHNOLOGY  
INTEGRATION**

Institutional  
Support

Capacity building  
Architecture, design and system  
Quality of technology

Assistance in any form given by the institutions to enhance/equip STEAM teachers in integrating technology in their respective STEAM disciplines

Teacher  
Technological  
Knowledge

Content driven  
Lesson structure

The teachers' knowledge and understanding on the use of technology. This also includes the teachers' knowledge in integrating technology in their respective pedagogies and in various parts of the lesson delivery.

**Appendix-Table 4.** Three-Tier Validation of the TPACK Model for Philippine STEAM Education

	<b>Outcomes</b>		<b>Process</b>		<b>Drivers</b>			<b>Institutional Support</b>	
<b>Technology Integration</b>	Critical Thinking	Critical Thinker	Critical Thinker	Technological Architecture	Lesson Structure	Teacher Technological Knowledge	Teacher Technological Knowledge	Availability	Quality of
	Performance in Licensure Examination	Productive citizen	Innovative	Capacity Building	Content-Based	Lesson Structure		Affordability	Technology
	Employability	Innovative	Productive			Content-Driven		Appropriateness	Capacity
		STEAM	Citizen			Administrative Support			Building
		Professional				Technological Architecture			Technology
<b>Assessment</b>	Critical Thinking	Critical Thinker	Critical Thinker	Planning and Preparation	Implementation	TP	Ensuring Equity and	Equity and	Institutional Affordances
	Performance in Licensure Examination	Productive citizen	Innovative	Rating	Reporting	Ensuring Equity	Diversity	Diversity	Sustainability
	Employability	Innovative	Productive	Reflection		Promoting Collaboration	Providing Modality	Modality Collaboration	
		STEAM	Citizen			Pursuing Collaboration			
		Professional							

Pedagogy	Critical Thinking Performance in Licensure Examination Employability	Critical Thinker Productive citizen Achieved Discipline-based requirement	Critical Thinker Innovative Productive Citizen	Planning the Pedagogical Processes Employing STEAM Appropriate Teaching Strategies Monitoring Learners' Acquisition of Knowledge Mentoring Mechanisms for Students Classroom Management	Planning Facilitating Learning Monitoring Mentoring	Institutional Pedagogical Culture Teacher Pedagogical Character	Institutional Pedagogical Culture STEAM Pedagogical Processes
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