TPACK IN PHILIPPINE STEAM EDUCATION

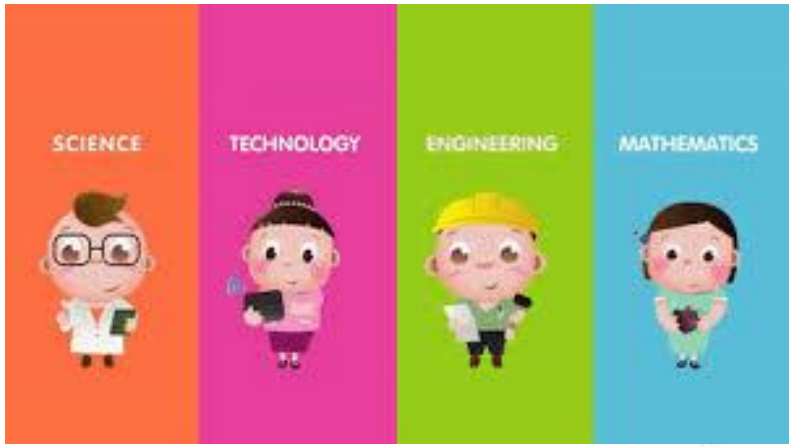
National Forum for STEAM in Higher Education

"Modelling TPACK in Philippine STEAM Education"

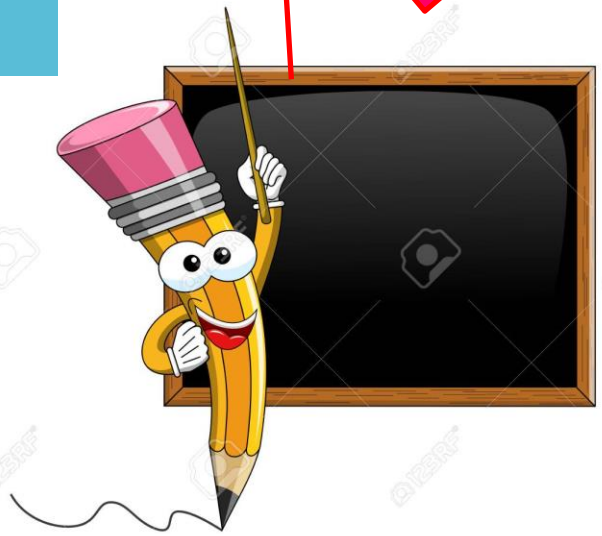
April 25-26, 2019, Heritage Hotel, Manila, Philippines

TPACK in Philippine STEAM Education

2 Major Players/Actors



TEACHERS

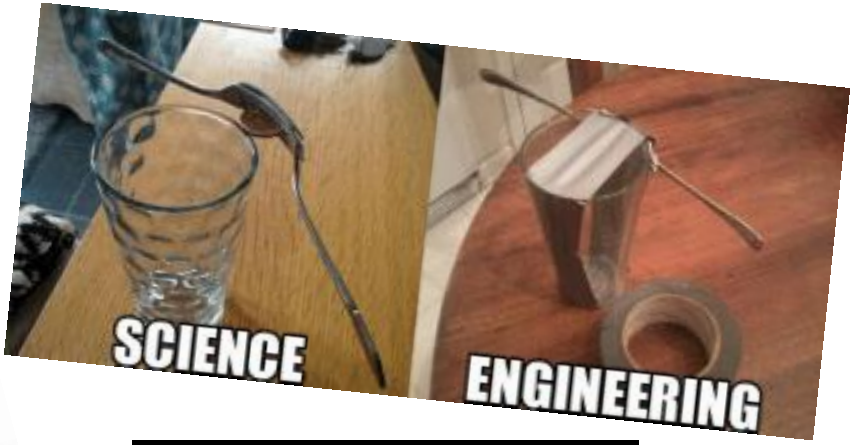


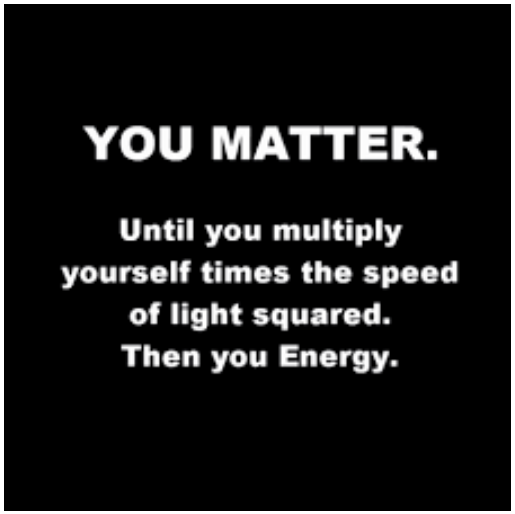
STUDENTS

STEAM STUDENTS

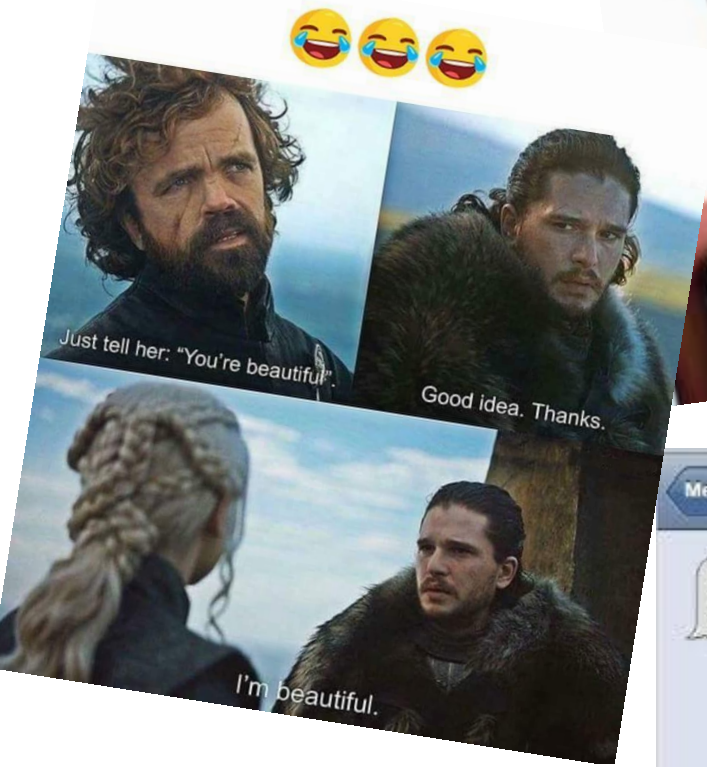
Model Students

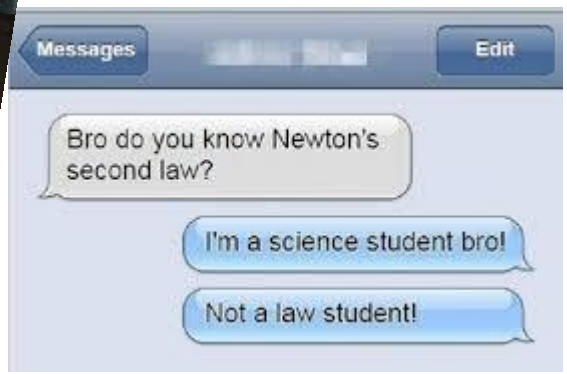
STEAM STUDENTS





STEAM STUDENTS





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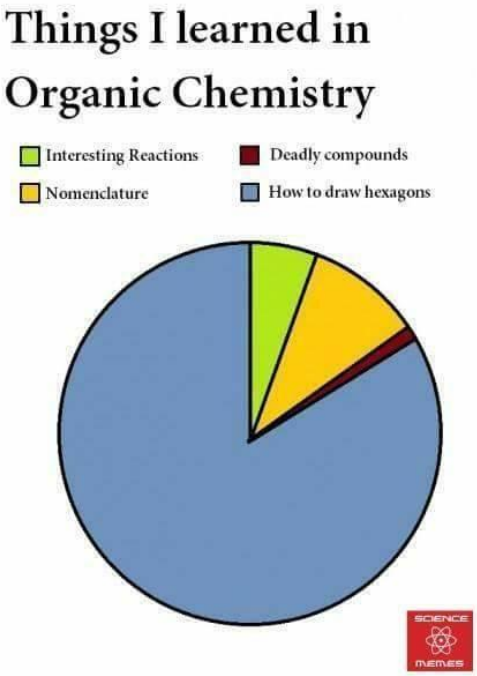
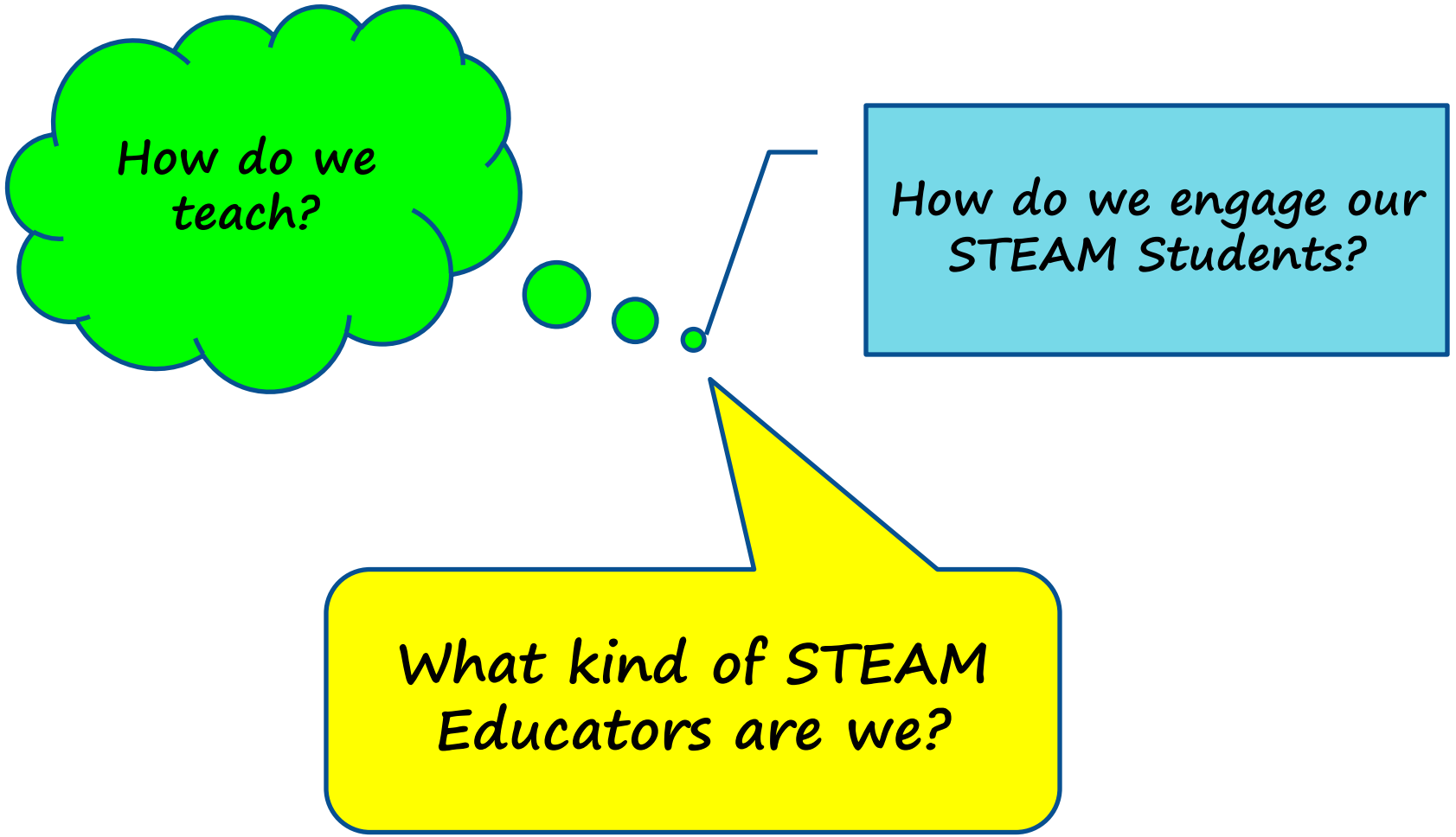


STEAM TEACHERS

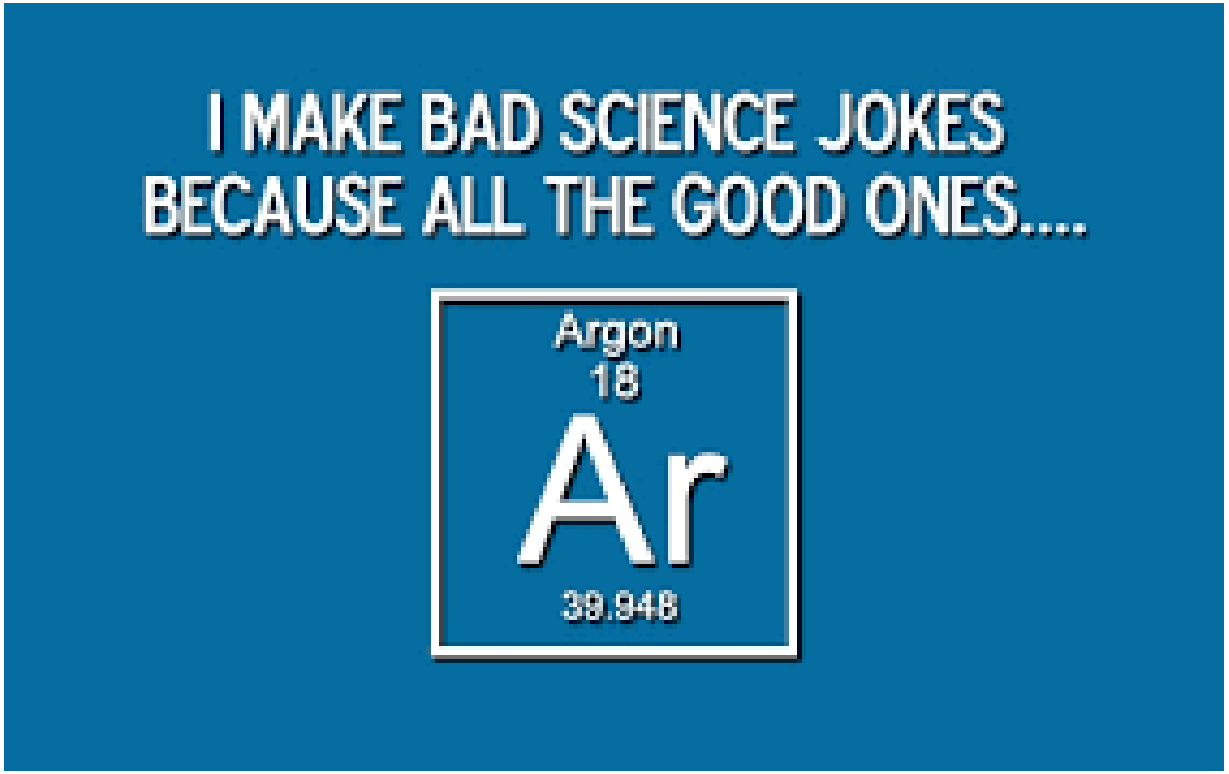


STEAM TEACHERS

The Scientist!

STEAM TEACHERS

The Joker!



STEAM TEACHERS

The Joker!

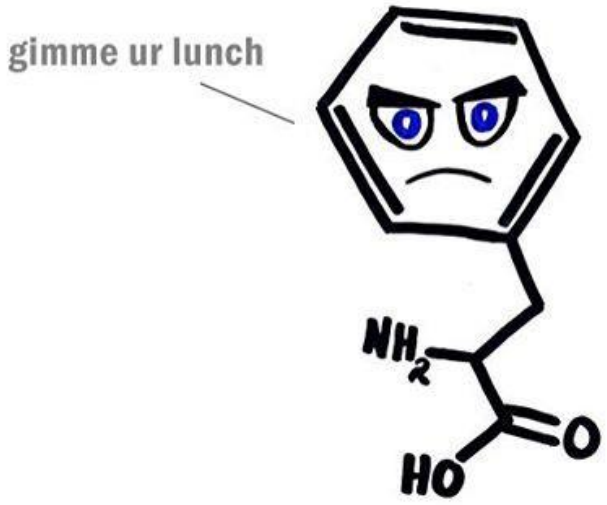
STEAM TEACHERS

The Joker!

STEAM TEACHERS

The Joker!

WHAT DO YOU CALL AN ACID WITH AN ATTITUDE?



A-mean-oh acid.

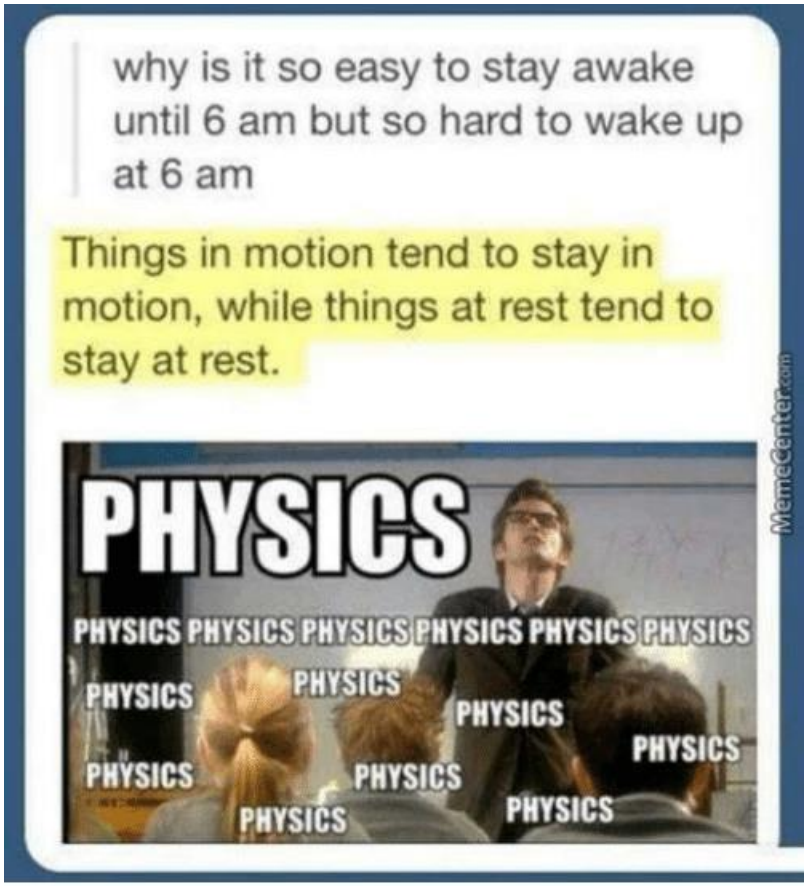
STEAM TEACHERS

The Hero
for these learners!

The Tech-savy

STEAM TEACHERS

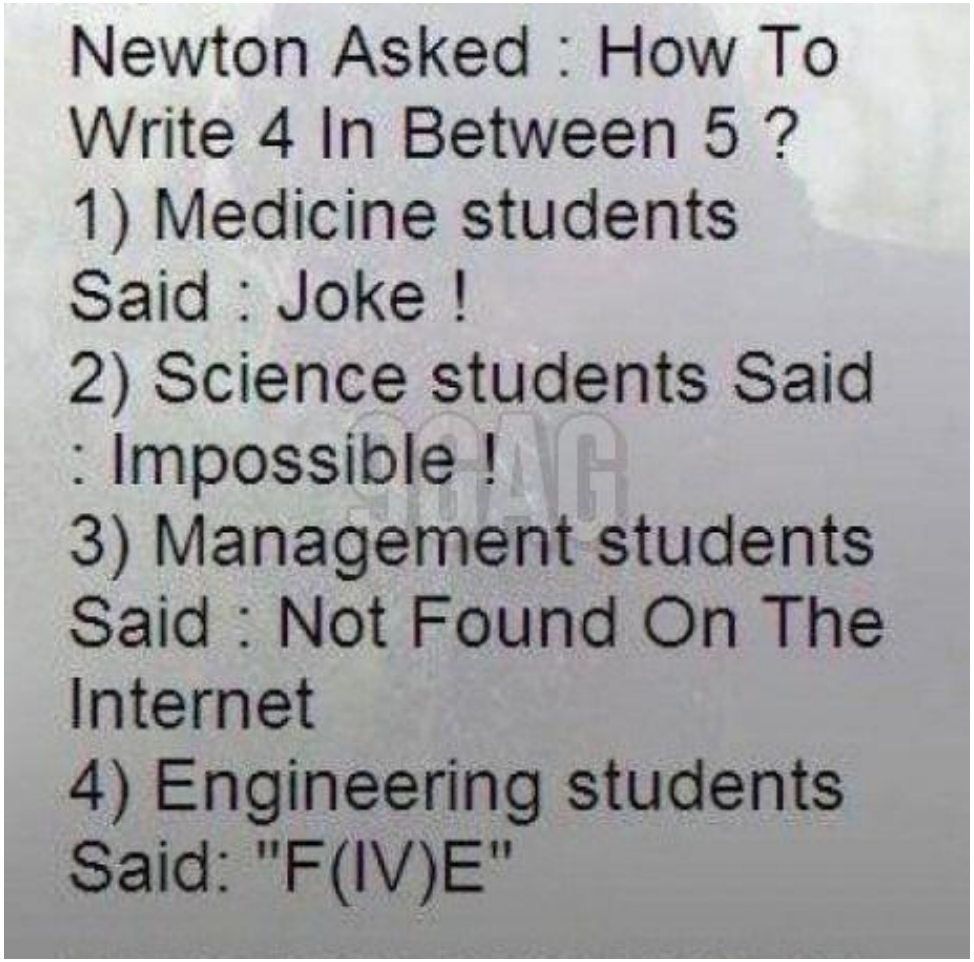
The Science Learner



The science of student life.

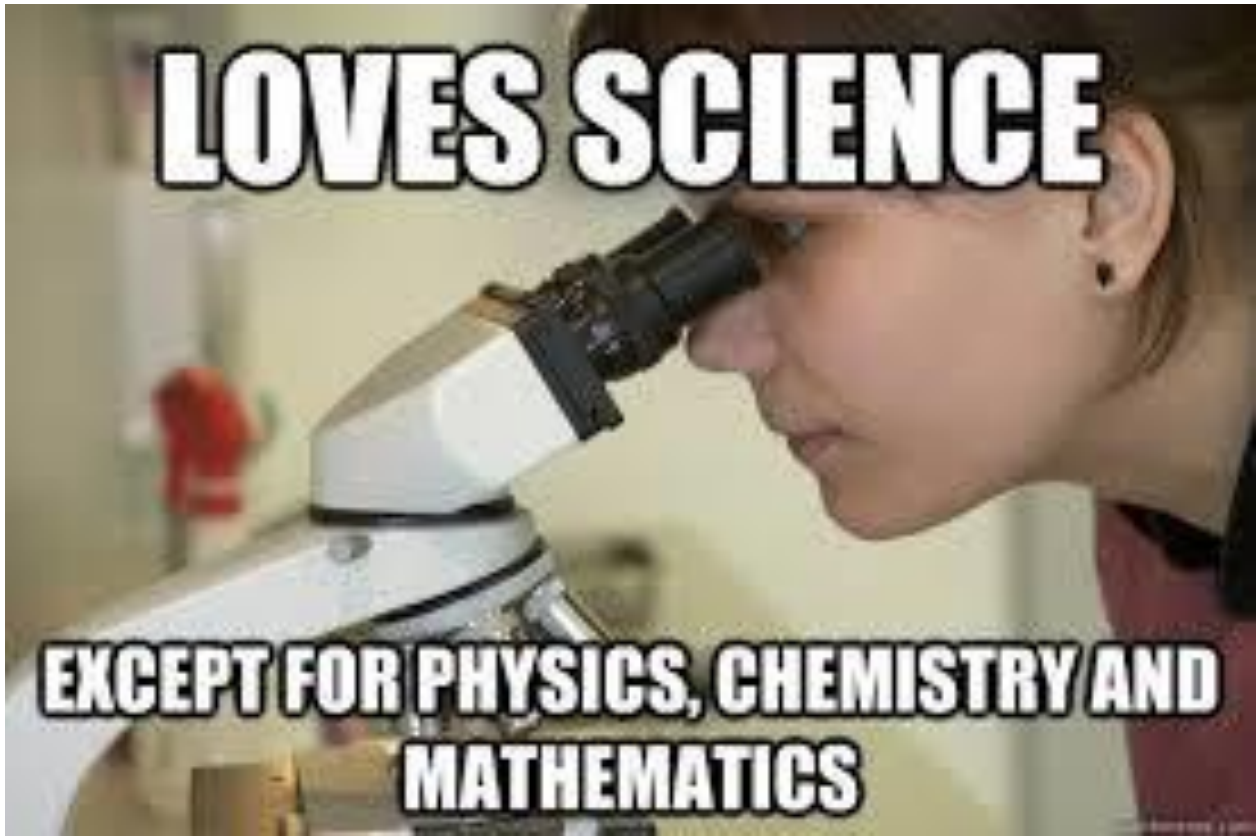
STEAM TEACHERS

The Engineer



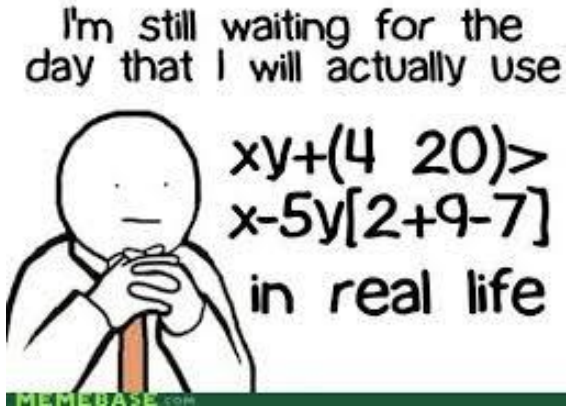
STEAM TEACHERS

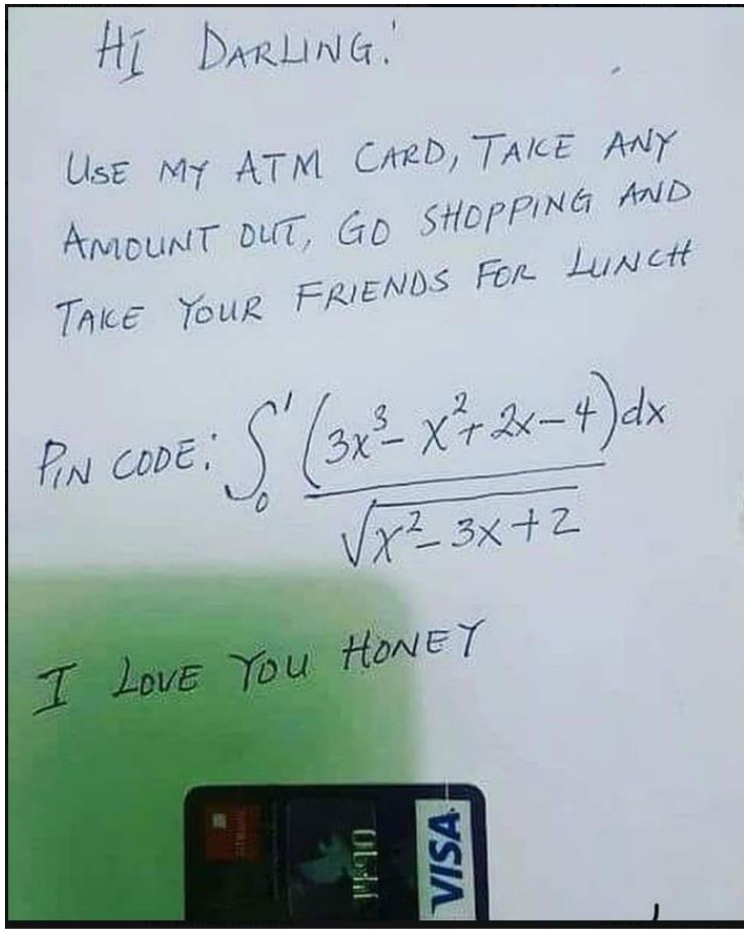
The Bio/Agr/Fishery



STEAM TEACHERS

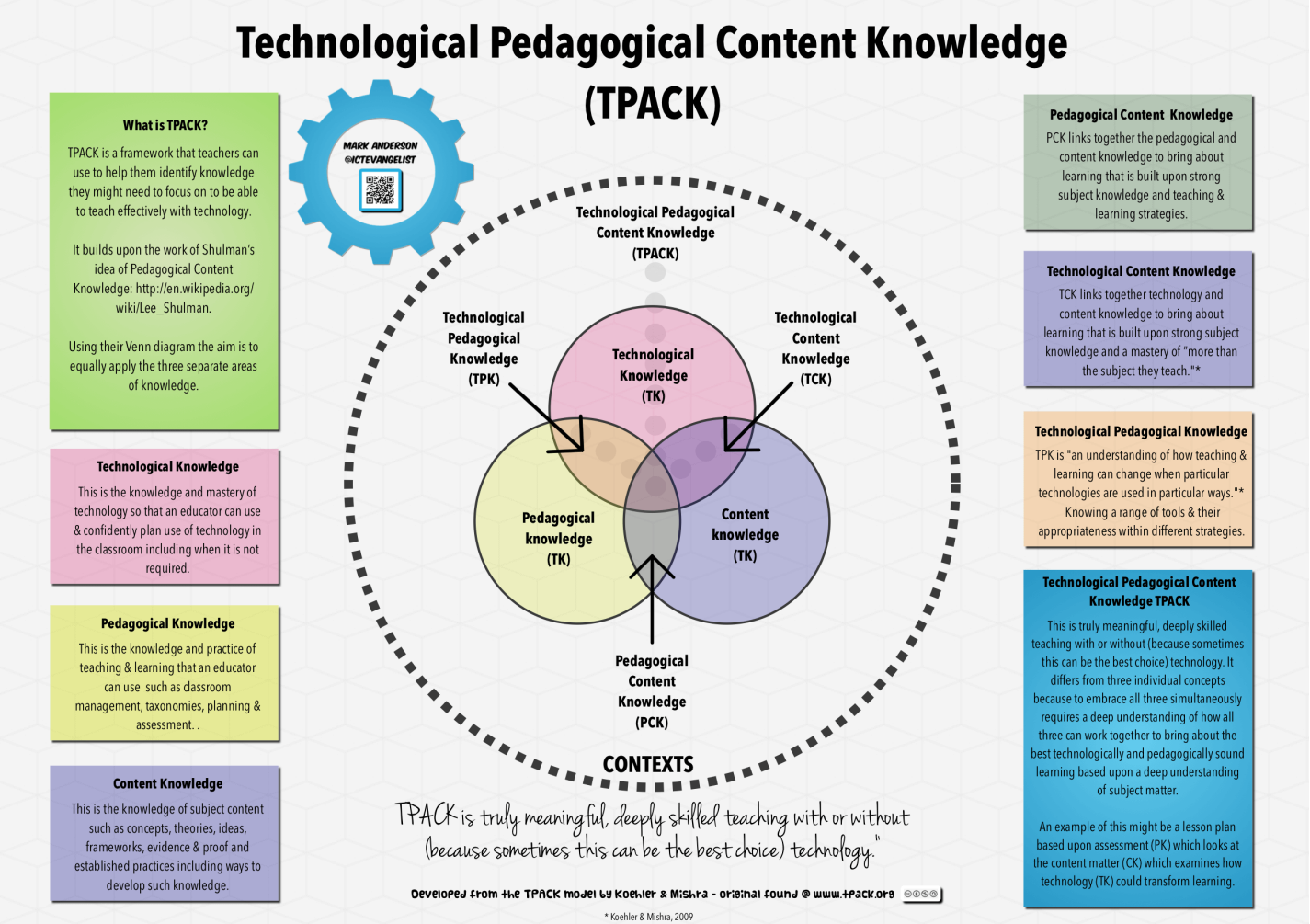
The Mathematician





It's TPACK for Us!!!

TPACK Framework as we know it…



Let's see how we fair…

Indicators	Yes	No
Acquires content knowledge on core science and mathematics courses.		
Possesses content knowledge on STEAM (Science, Technology, Engineering, Agriculture, and Mathematics)		
Possesses knowledge on related industry/community as service providers.		
(CK-3)		
Acquires (Demonstrates) knowledge on applicable laboratory/clinical skills.		
Observes precautionary measures in the laboratory rooms and classrooms (fire extinguishers, fire force) alarm systems, and campus security		
Monitors (Promotes) proper care and handling of laboratory instruments, tools, equipment, online systems, virtual laboratories, and software		
Uses appropriate modern techniques and tools necessary for the practice of STEAM profession in order to be globally competitive"		
(TK-4)		
Facilitates development of reflective and critical thinking among students.		
Allows flexible channels of communication to get across students of different abilities and comprehension skills and even allows occasional use of mother tongue to help express themselves or their answers better (then translate it to a common language for everyone to appreciate and learn from).		
Facilitates lectures in plenary classes. (Exhibits capability to facilitate large classes)		
Utilizes teaching strategies suited to diverse learners		
Monitors each student by establishing eye contact, walking around the area, being aware of what's happening in the class during sessions, site visits, field trips, tours, and other supervised visits.		
Demonstrates (Promotes) the concept of voluntary service by making students carry out classroom-related duties (e.g., monitoring cleanliness and orderliness in the classroom)		
Arranges opportunities for students to learn by allowing them to form varied group structures (solo, pair, groups, and teams).		
Takes into consideration the cultural, social, and emotional differences among students.		
Facilitates peer learning to support other students cognitively and affectively.		
Listens skillfully, reasonably, and patiently to his or her students (during consultation).		
Possesses knowledge on curricular programs including goals and framework.		
Ensures that the learning outcomes are attained		
(PK-12)		

Let's see how we fair…

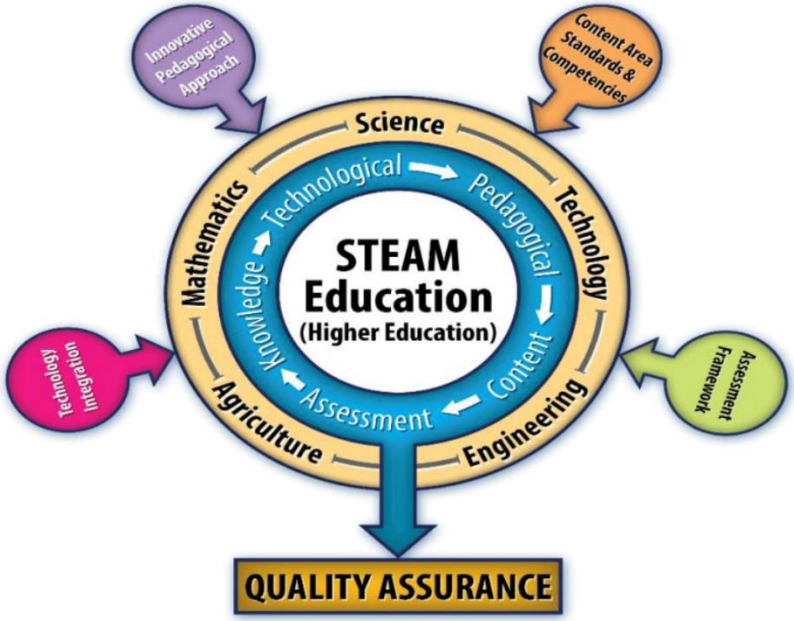
Indicators	Yes	No
Acquires (Demonstrates) content knowledge on STEAM-related fields.		
Promotes inquiry attitude through questioning.		
Facilitates active classroom discussion using inquiry learning strategies (project-based, problem- based, product-based)		
Promotes seamless transition of topics and establishes relevant relationship of concepts		
Engages the students in planning and achieving the learning outcomes.		
Uses updated syllabi and teaching methods to meet the desired learning outcomes		
Designs, communicates, and implements STEAM-related activities in partnership with the community/(industry)		
Possesses skills in using assessment results when making decisions about individual students, planning teaching, developing curriculum, and school improvement."		
Understands (Emphasizes)the effects and impacts of the STEAM profession in the community and society.		
Conducts STEAM-related activities involving the learners, parents and the community.		
(PCK-10) `		
Plans and conducts research, and disseminates STEAM related research.		
Designs, improves, innovates, and supervises (basic to advanced) systems or procedures as solutions to local and global problems within realistic constraints.		
Utilizes research outputs to enhance professional practice and to address national and global concerns.		
Develops/(Improvises) new technology (software, laboratory equipment, and teaching materials) using locally available resources to advance effective and efficient practice of the profession.		
Uses modern statistical and computing techniques and tools in predicting future trends and processes of STEAM.		
Familiarizes with database relevant to the STEAM profession.		
Uses (advanced) and research-based techniques and tools in teaching STEAM content knowledge.		
Seeks out information about subject related research, e.g., via journals or by attending conferences.		
Designs and implements monitoring tools to ensure the desired learning outcomes are met		
Selects standard assessment methods appropriate for instructional decisions.		
(TCK-10)		

Let's see how we fair…

Indicators	Yes	No
Communicates effectively across multiple platforms, both oral and written, especially in the English language.		
Facilitates lessons and activities that are suited to the students' interests and individual differences and do not discriminate any cultural groups and are sensitive to students' needs.		
Develops gender-sensitive instructional materials.		
Prepares materials and lessons appropriate to specific learning capability.		
Applies current trends, practices, and innovations in the teaching process.		
Adapts and utilizes STEAM technologies in the teaching and learning process.		
(TPK-6)		
Acquires (Exhibits) knowledge on STEAM fields (content and skills) responsive to national goals and global concerns.		
Facilitates ethical use of online resources.		
Promotes working effectively in multidisciplinary and multi-cultural teams		
Models various scientific attitudes and STEAM professional traits		
Uses multimedia and other learning resources like journals and online materials in the teaching and learning process.		
Recognizes unethical, illegal and otherwise inappropriate assessment methods and uses of assessment information."		
Demonstrates dedication and commitment to work with honesty and integrity		
Recognizes and understands the professional, social and ethical responsibilities of the STEM profession		
Practices STEAM profession in accordance with the existing laws, legal, ethical and moral standards		
Models the existing general policies, rules and regulations to promote the welfare of the STEAM professions.		
Evaluates (Observes) the existing policies to better serve the students, the school, and the community.		
Maintains reputation as a pedagogical leader.		
Participates in seminars and conferences that may provide valuable inputs to make STEAM teaching relevant and responsive to the changing times.		
Pursues higher learning (ex. graduate studies or short term courses) and accomplish higher goals to advance in one's career stage.		
Engages in professional activities other than teaching (publish articles, conduct valuable and impactful research, take part in the curriculum development, re-echo seminars etc.) to further improve teaching competencies as well as leadership qualities and make a distinction in the field of science		
(TPCK-15)		

Our Framework…

- Grounded on:
  - CHED Policies, Standards and Guidelines **(CHED-PSGs)** for 45 STEAM programs (80% are OBTEC-compliant)
  - Philippine Professional Standards for Teachers **(PPST)**
  - **TPACK** Framework



Aiming at TPACK framework…

The attempt is to model the Philippine Higher STEAM Education and check how far we are from the global standards. Specifically, the study sought concrete retorts to the following objectives:

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model
4. Design and Develop the TPACK Model for Philippine Higher STEAM Education
5. Designing the Philippine STEAM Education Model.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Research Design

- Exploratory Design
- Employed both quantitative (through survey) and qualitative (through interviews and classroom observations) approaches.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Participants

Tier 1 (Sampling)

- At confidence level of 95%
- Randomly selected 220 [156 (71%) private and 64 (29%) public] HEIs (10% of the population) from 17 regions through stratified sampling.
- Positive response from 123 schools (56% of the sampled HEIs).

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Participants

Tier 2 (Sampling)

- Spawned 33 schools (27%) with at least one representative school and a maximum of three per region (a total of 17 regions),

Criteria:

1. inclusion of STEAM disciplines in their curricular offerings,
2. schools are either clustered as SUC (1 and 2), LUC or private colleges and universities, and
3. the places or provinces where the schools are located are most accessible to any means of transportation.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Participants

Table 1. Summary of the number of STEAM teachers observed and interviewed per region

Region	Number of Schools	Number of STEAM teachers
National Capital Region (NCR)	5	10
Cordillera Administrative Region (CAR: Kalinga-Apayao)	1	4
Region 1 (Ilocos Sur)	2	5
Region 2 (Batanes)	1	4
Region 3 (Aurora, Bulacan, Pampanga)	3	15
Region 4 (Laguna, Quezon)	3	16
Region 5 (Camarines Sur, Camarines Norte, Masbate)	3	9
Region 6 (Negros Occidental, Iloilo	2	10
Region 7 (Bohol, Siquijor)	2	4
Region 8 (Southern Leyte)	1	5
Region 9 (Zamboanga del Norte)	1	5
Region 10 (Camiguin, Misamis Occidental)	2	4
Region 11 (Davao del Norte, Davao del Sur)	2	7
Region 12 (North Cotabato)	2	8
Region 13 (Agusan del Norte)	1	0
Total	31	106

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Instruments

Classroom Observation Protocol for STEAM

- This is a pack containing five different instruments:

1. STEAM Classroom Observation Rating Scale (a 48-item, 6-point Likert scale tool),
2. Classroom Observation Notes (includes questions clustered into the dimensions of TPACK designed for use of the researcher for qualitative observations),
3. TPACK interview protocol (6-item, main questions with corresponding probing questions clustered in themes,
4. Technology Integration checklist, and
5. Assessment Checklist.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Data Collection

Preliminaries

- Letters to the school heads or university presidents thru the HEI representative (field researcher) for accomplishment of set of forms:

1. participating institution's reply form specifying the time and day or date of the interviews and classroom observations,
2. pre-observation questions (which should be accomplished by the recommended STEAM teachers),
3. Technology integration checklist
4. Session guide.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Data Collection

School Visit

- *Courtesy call*
- Consent forms to all interviewees and to all STEAM teachers for classroom observation
- *Interviews* (audio-taped) with the head of the department or the dean of the college of the STEAM disciplines for about an hour
- *Classroom Observation*
- *Post-Conference (with observed STEAM Teacher)*

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Data Analysis

- Virtual folders per HEI for all accomplished forms
  - pre-observation and interview,
  - accomplished classroom observation rating scales,
  - classroom observation notes,
  - video and audio recordings in a virtual folder allotted per HEI.

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Data Analysis

- Transcriptions of all collected qualitative data
- Summary Tables with descriptive statistics for classroom observation rating scale
- Summary table for Technology Integration checklist
- Farmed all organized data to cells (Pedagogy, Technology Integration, Assessment) for coding and further analysis

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

Data Analysis

- ***Three Tier Coding (aided with a software) per research cell to come up with individual models***
- Two rounds of Validation, Critiquing and Revision of Models
- Consolidation of model constructs and generated themes and plugged into TPACK Framework

Aiming at TPACK framework…

Objectives	Data Collection and Analysis
4. Design and Develop the TPACK Model for Philippine Higher STEAM Education	• Workshops for Model Analysis • Validation of TPACK Framework (Presentation, Critiquing, and Revisions) • Redefining the aims of the research program/project to accommodate unique themes and constructs. • Checking and Recoding • Developing the Philippine STEAM Education Model
5. Designing the Philippine STEAM Education Model.	

Aiming at TPACK framework…

Objectives

4. Design and Develop the TPACK Model for Philippine Higher STEAM Education
5. Designing the Philippine STEAM Education (PSE) Model.

Data Collection and Analysis

- Workshop for Validation (February 25, 2019) of PSE Model (Presentation, Critiquing, Revisions, and inputs from STEAM educators of COEs and CODs)
- Developing the emerging Philippine STEAM Education Model
- Validation by 113 STEAM Educators (March 19-21, 2019) with Lesson Exemplars
- Revision and Finalization of Models

Aiming at TPACK framework…

Objectives

1. Develop the Philippine Higher STEAM Education Pedagogical Model
2. Develop the Philippine Higher STEAM Education Assessment Framework
3. Develop the Philippine Higher STEAM Education Technology Integration Model

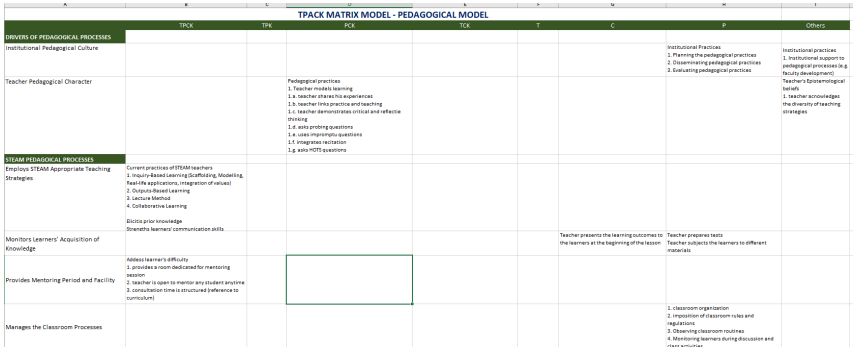
Results and Discussion

Aiming at TPACK framework…

Objectives

4. Design and Develop the TPACK Model for Philippine Higher STEAM Education

Results and Discussion



TPACK MATRIX MODEL - PEDAGOGICAL MODEL

	TCK	TPK	PCK	TCK	T	C	P	Others
DRIVERS OF PEDAGOGICAL PROCESSES								
Institutional Pedagogical Culture							Institutional Practices 1. Planning the pedagogical practices 2. Disseminating pedagogical practices 3. Evaluating pedagogical practices	Institutional practices 1. Institutional support to pedagogical processes (e.g. faculty development)
Teacher Pedagogical Character			Pedagogical practices 1. Teacher models learning 1.a. teacher shares his experiences 1.b. teacher links practice and teaching 1.c. teacher demonstrates critical and reflectie thinking 1.d. asks probing questions 1.e. uses impromptu questions 1.f. integrates recitation 1.g. asks HOTS questions					Teacher's Epistemological beliefs 1. teacher acnowledges the diversity of teaching strategies
STEAM PEDAGOGICAL PROCESSES								
Employs STEAM Appropriate Teaching Strategies	Current practices of STEAM teachers 1. Inquiry-Based Learning (Scaffolding, Modelling, Real-life applications, Integration of values) 2. Outputs-Based Learning 3. Lecture Method 4. Collaborative Learning Elicits prior knowledge Streneths learners' communication skills							
Monitors Learners' Acquisition of Knowledge						Teacher presents the learning outcomes to the learners at the beginning of the lesson	Teacher prepares tests Teacher subjects the learners to different materials	
Provides Mentoring Period and Facility	Address learner's difficulty 1. provides a room dedicated for mentoring session 2. teacher is open to mentor any student anytime 3. consultation time is structured (reference to curriculum)							
Manages the Classroom Processes							1. classroom organization 2. imposition of classroom rules and regulations 3. Observing classroom routines 4. Monitoring learners during discussion and	

Aiming at TPACK framework…

A	B	C	D	E	F	G	H	I
TPACK MATRIX MODEL - PEDAGOGICAL MODEL								
	TPCK	TPK	PCK	TCK	T	C	P	Others
DRIVERS OF PEDAGOGICAL PROCESSES								
Institutional Pedagogical Culture							Institutional Practices 1. Planning the pedagogical practices 2. Disseminating pedagogical practices 3. Evaluating pedagogical practices	Institutional practices 1. Institutional support to pedagogical processes (e.g. faculty development)
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Provides Mentoring Period and Facility	Addess learner's difficulty 1. provides a room dedicated for mentoring session 2. teacher is open to mentor any student anytime 3. consultation time is structured (reference to curriculum)							
Manages the Classroom Processes							1. classroom organization 2. imposition of classroom rules and regulations 3. Observing classroom routines 4. Monitoring learners during discussion and class activities	

Aiming at TPACK framework…

Content	Pedagogy	Technology	Other Comments	Notes
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	knowledge of technology and propotale use in the classroom

Aiming at TPACK framework…

knowledge of technology and propobale use in the classroom	knowledge of technology and propobale use in the classroom
recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy	recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
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	knowledge of technology and propobale use in the classroom
	knowledge of technology and propobale use in the classroom

Aiming at TPACK framework…

recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
knowledge of technology and propobale use in the classroom
limited knowledge on the appropriate use of the identified technology
recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
limited to using traditional technology

recognize/appreciates use of multiple technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy
active integration of tehcnology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
active integration of tehcnology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
limited to using traditional technology
active integration of multiple tehcnology in the teaching and learning of the content or STEAM lessons weaved with appropriate pedagogy
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limited to using traditional technology

Aiming at TPACK framework…

Notes	Pedagogical Model	Tehcnology Integration	Assessment	TPDK (TPACK Model for University Setting (TechnoPedagogical Disciplinary Knowledge)
recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy	**Drivers of Pedagogical Processes** 1. Institutional Support to Pedagogical Processes 2. Institutional Pedagogical Culture 3. Teacher's Pedagogical Character 4. Teacher's Pedagogical Beliefs 5. Institutional Support for Faculty Development 6. Monitoring and Evaluation of Pedagogical Processes 7. Institutional Planning for Pedagogical Processes	**Teacher Technological Knowledge** 1. Lesson Structure 2. Content Based a. Engaged b. Enhanced c. Extended	**Three variables:** 1) Enablers of STEAM Assessment 2) Drivers of STEAM Assessment 3) Process of STEAM Assessment	**Disciplinary Specific** 1. Pedagogy-Discipline (PCK) 2. Technology-Pedagogy-Discipline (TPCK) 3. Technology - Discipline (TC) 4. Technology -Pedagogy (TP) 5. Technology-Discipline-Epistemology 6. Discipline-Epistemology
recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy	**STEAM Pedagogical Processes** 1. Employs Inquiry-Based Learning Approach 2. Emphasizes Output over Process 3. Values Feelings and Emotions in the Pedagogical Processes 4. Utilizes Lecture Method 5. Employs Modeling as a Teaching Strategy 6. Demonstrates Ability to Develop Tests 7. Maintains a Positive Learning Environment 8. Monitors Learners' Acquisition of Knowledge 9. Orients the Learners with Assessment Standards 10. Monitors the Learners' Construction of Knowledge	**Administrative Support** 1. Capacity Building 2. Tehcnology Archtecture, System and Design	**I. ENABLERS of STEAM Assessment** **A. Institutional Affordances** 1. Curriculum development 2. Institutional identities 3. Agency and empowerment **B. Sustainability** 1. Quality assurance 2. Research undertakings 3. Policies and programs **II. DRIVERS of STEAM Assessment** **A. Ensuring Equity** 1. Gender sensitivity	**Personal Epistemology** *(teacher's beliefs aboutknowledge and the act of knowing, beliefs about how people learn in general and about the relative value of knowledge)* 1. Pedagogy-Epistomology 2. Technology-Epistemology 3. Discipline-Epistemology 4. Pedagogy-Epistemology-Discipline 5. Technology-Discipline-Epistemology 6. Technology-Pedagogy-Epistemology
recognize/appreciates technology appropriate to the content of the lesson (STEAM) -- knowledge of technolopgy in relation to content and pedagogy	**Outcomes of STEAM Pedagogical Processes** 1. Graduates are Critical Thinkers 2. Graduates Pass the Licensure Examinations 3. Graduates are Employable	**Quality of Technology** 1. Availablity 2. Affordability 3. Appropriateness		**Pedagogical Knowledge** 1. Pedagogy-Epistemology 2. Pedagogy-Discipline (PC) 3. Technology-Pedagogy (TP) 4. Pedagogy-Epistemology-Discipline 5. Technology-Pedagogy-Discipline (TPCK) 6. Technology-Pedagogy-Epistemology
knowledge of technology and propobale use in the classroom				Technological Knowledge 1. Technology-Pedagogy (TP) 2. Technology-Discipline (TC) 3. Technology-Pedagogy-Discipline (TPCK) 4. Technology-Pedagogy-Epistemology
recognize/appreciates technology appropriate to the content				

We even tried…..TPDK from Literature…

Aiming at TPACK framework…

A	B	C	D
DIMENSIONS OF TPACK MODEL			
Outcomes	**Drivers**	**Institutional Support**	**Processes**
	Pedagogical Model		
	Institutional Pedagogical Culture		Planning the Pedagogical Processes
	Teacher Pedagogical Character		Employing STEAM Appropriate Teaching Strategies
			Monitoring Learners' Acquisition of Knowledge
			Mentoring Mechanisms for Students
			Classroom Management
	Technology Integration		
1. Critical Thinking 2. Performance in Licensure Examination 3. Employability	Teacher Technological Knowledge 1. Lesson Structure 2. Content-Driven	Availability	Technological Artchitecture
	Administrative Support 1. Technological Artchitecture	Affordability	Capacity Building
		Appropriateness	
	Assessment Model		
	TP	Institutional Affordances	Planning and Preparation
	Ensuring Equity	Sustainability	Implementation
	Promoting Collaboration		Rating
			Reporting
			Reflection

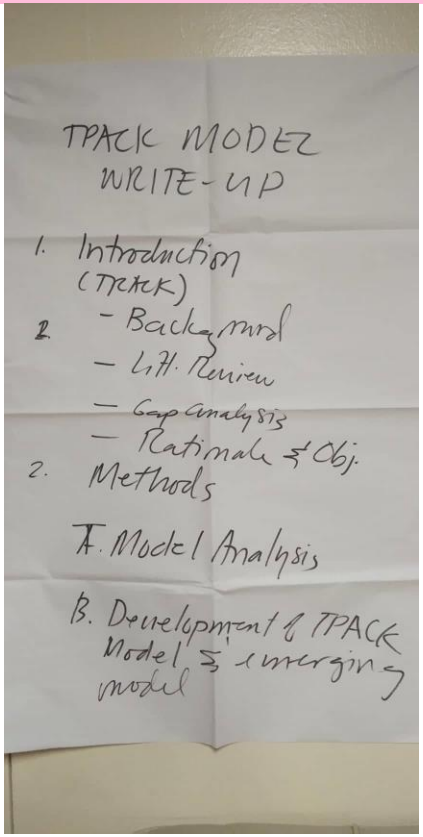
Model Re-analysis…

Aiming at TPACK framework…

Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

Results and Discussion

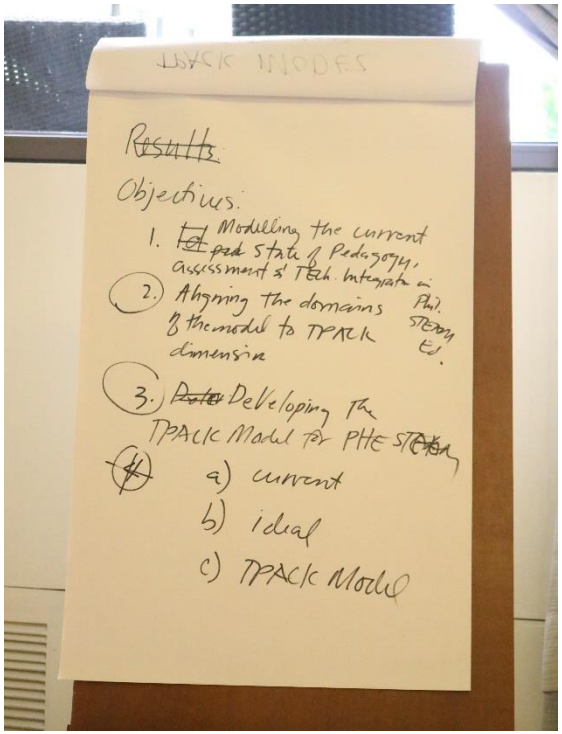


Aiming at TPACK framework…

Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

Results and Discussion

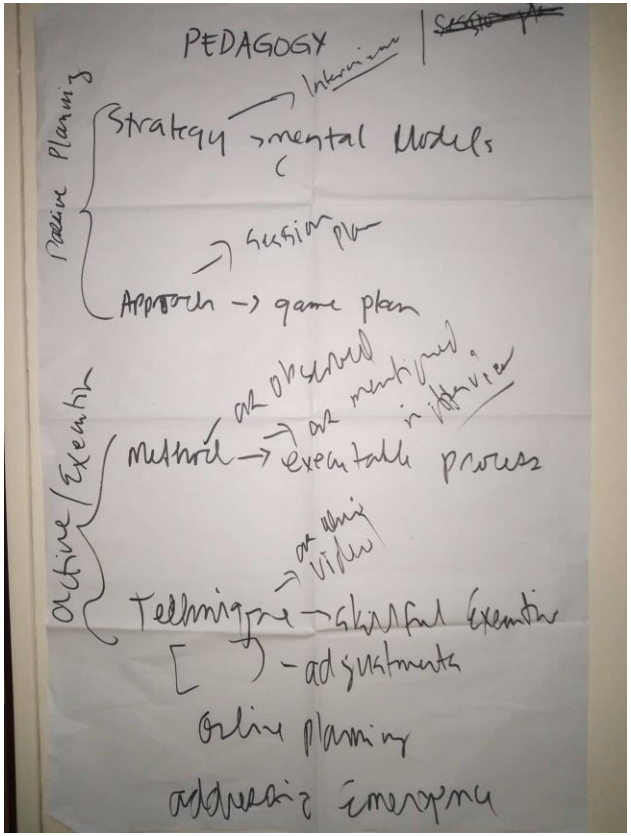


Aiming at TPACK framework…

Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

Results and Discussion



PSE Model w/ TPACK framework…

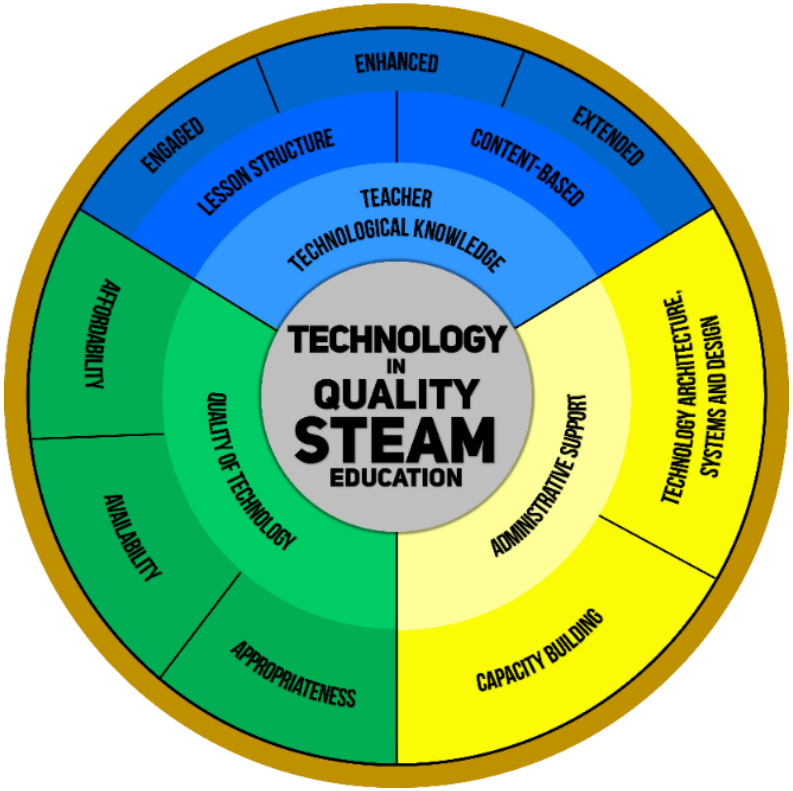
A	B	C
Outcomes	**Drivers**	**TPACK Framework**
	Institutional Pedagogical Culture	Institutional Practices: 1. Planning Pedagocial Practices 2. Disseminating Pedagogical Practices 3. Evaluating Pedagogical Practices
		Institutional Support to Pedagogical Practices (e.g., faculty development
	Teacher Pedagogical Character	Pedagogical Practices: 1. Teacher models learning 1.a. Teacher shares his experiences 1.b. Teacher links practices 1.c. Teacher demonstrates critical and reflective thinking 1.d. Asks probing questions 1.e. Uses impromtu questions 1.f. Integrates recitation 1.g. Asks HOTS questions
	Teacher Technological Knowledge	
	1. Lesson Structure	Teaching and Learning Experience
		Teachers' understanding of the affordance of technology
		1. Laboratory activity or simulation activity 2. Applicability to the topic Lesson objectives/topics
		Knowledge on the different tupes of technology 1. chalkboard 2. power point 3. movie, documentary, youtubes, videos 4. overhead projector
		1. Productive discussions 2. Increase relevance of the subject
		Teaching objectives

Aiming at TPACK framework…

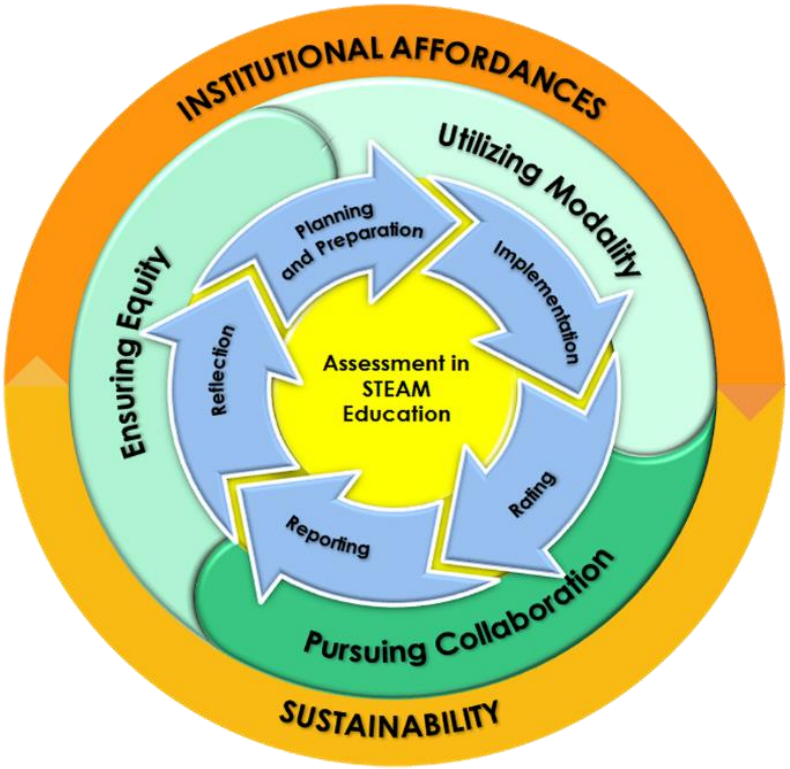
Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

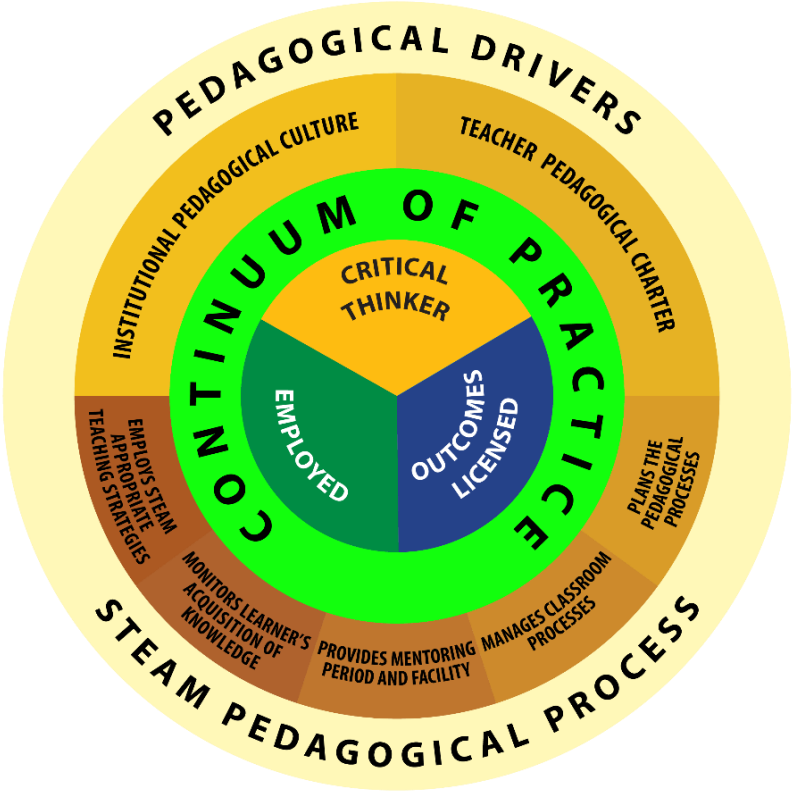
Draft Technology Integration Model



Aiming at TPACK framework…

Objectives	Draft Assessment Model
5. Designing the Philippine STEAM Education (PSE) Model.	

Aiming at TPACK framework…

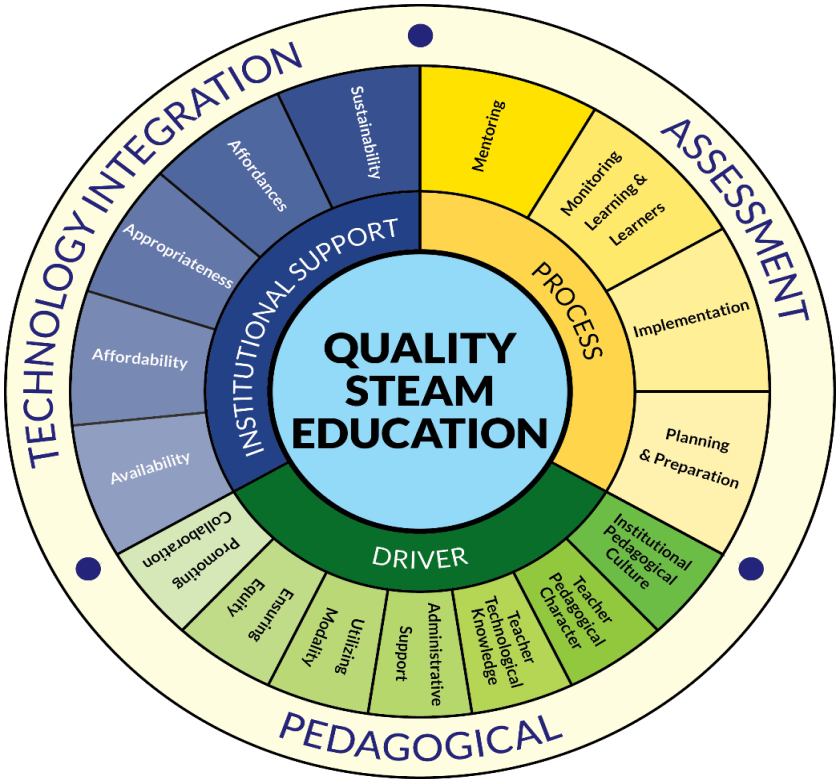
Objectives	Draft Pedagogical Model
5. Designing the Philippine STEAM Education (PSE) Model.	

Aiming at TPACK framework…

Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

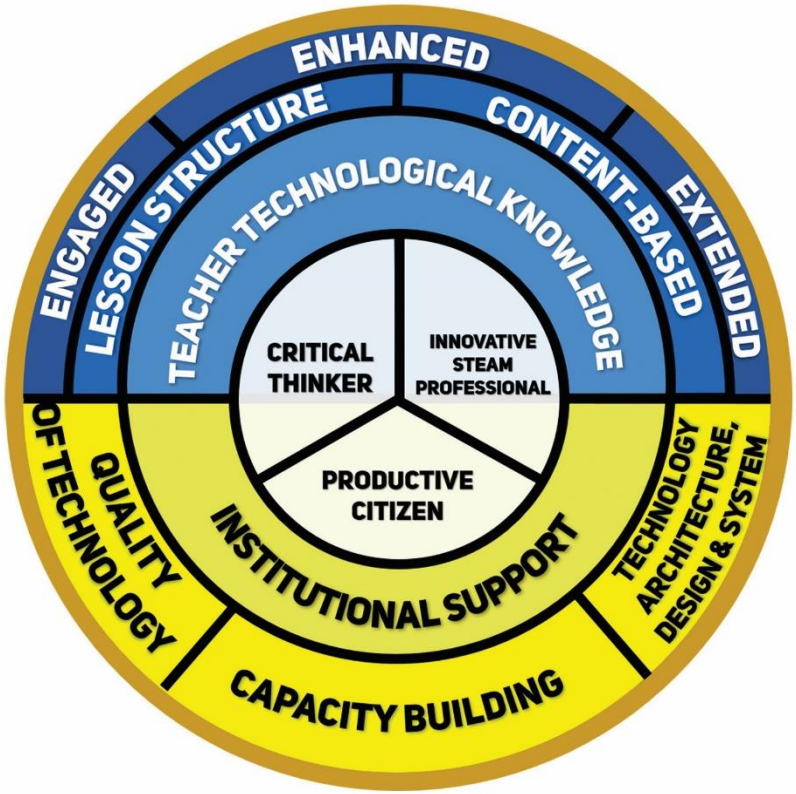
Draft PSE Model



Aiming at TPACK framework…

Objectives	Validated/Emerging Tech Integration Model-T1

5. *Designing the Philippine STEAM Education (PSE) Model.*



Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

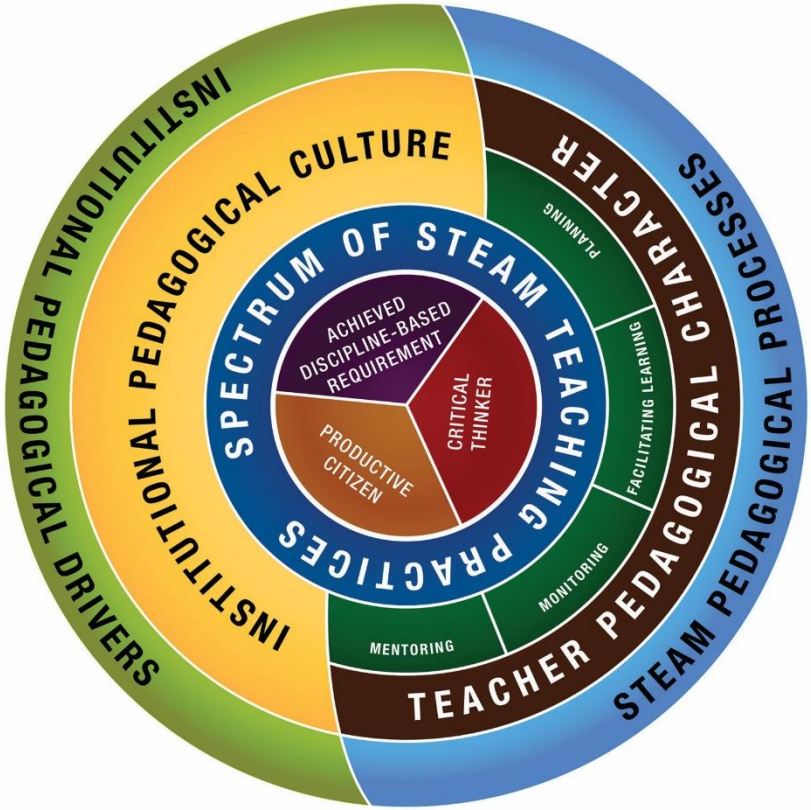
Validated Assessment Model-T1

Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

Validated Pedagogical Model-T1

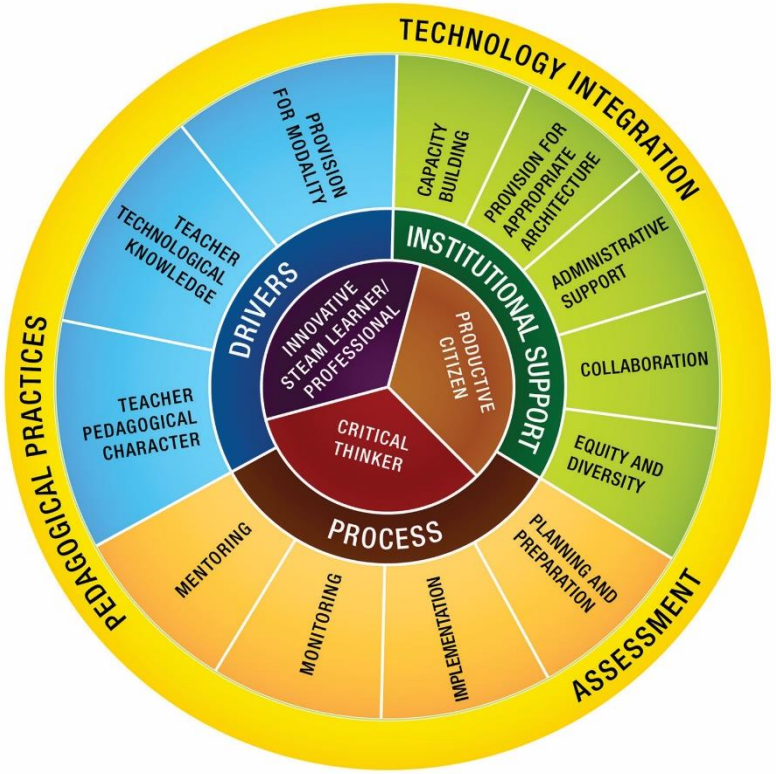


Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

Validated PSE Model-T1



Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

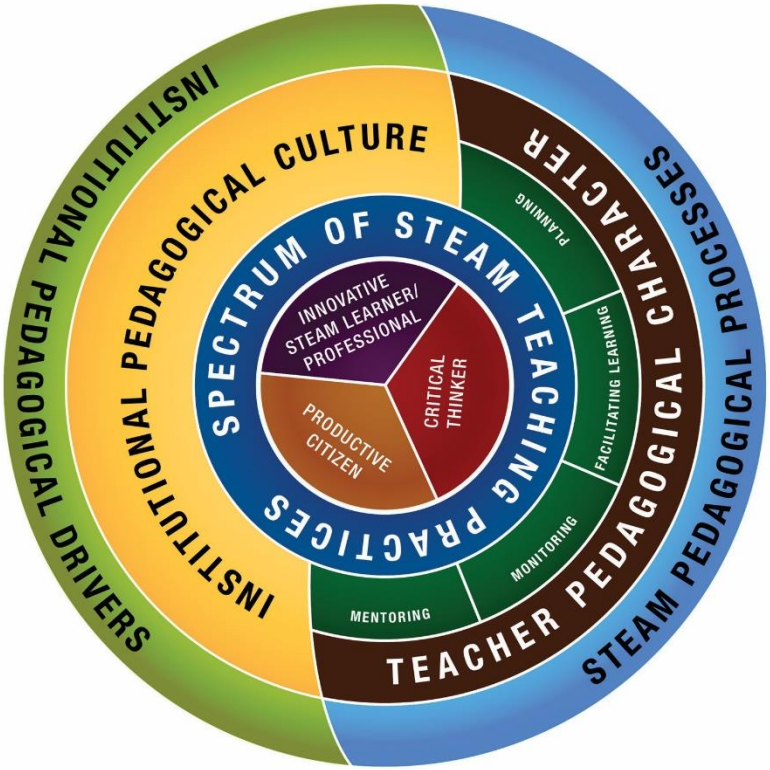
Emerging Assessment Model-T1

Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

Emerging Pedagogical Model-T1

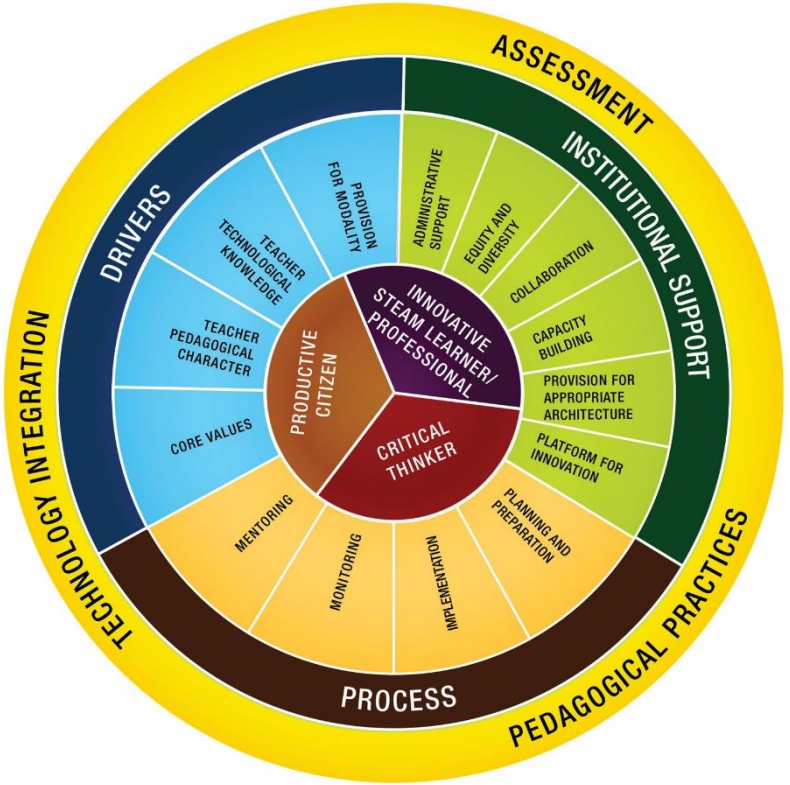


Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

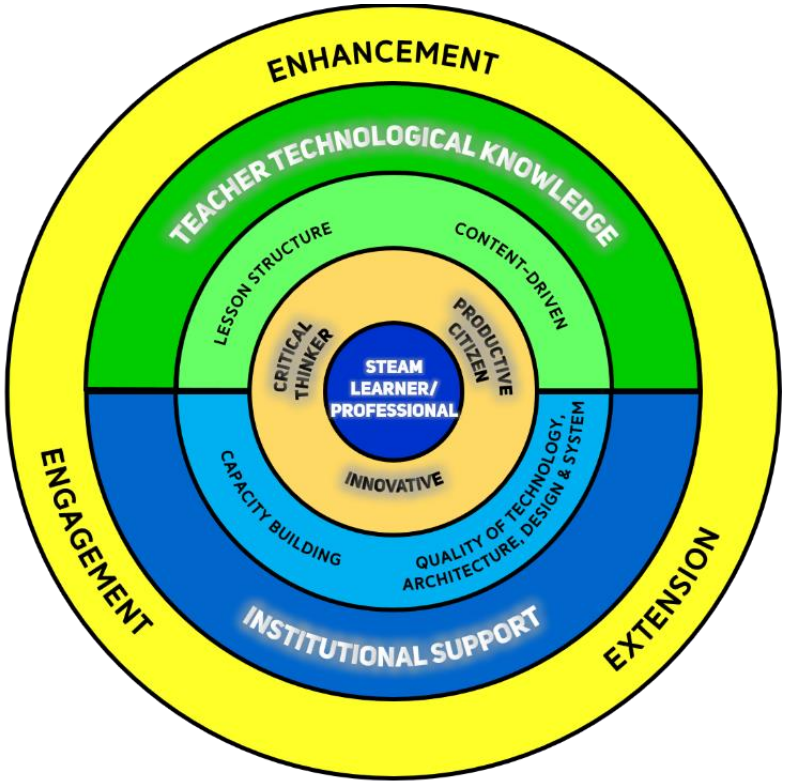
Emerging PSE Model-T1



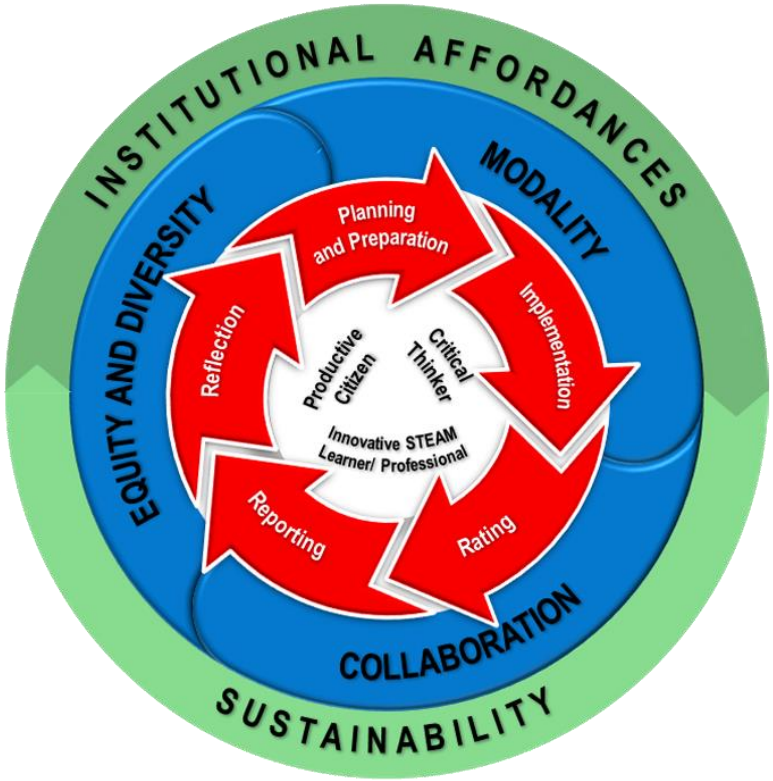
Aiming at TPACK framework…

Objectives	Validated Tech Integration Model-T2 (Final)

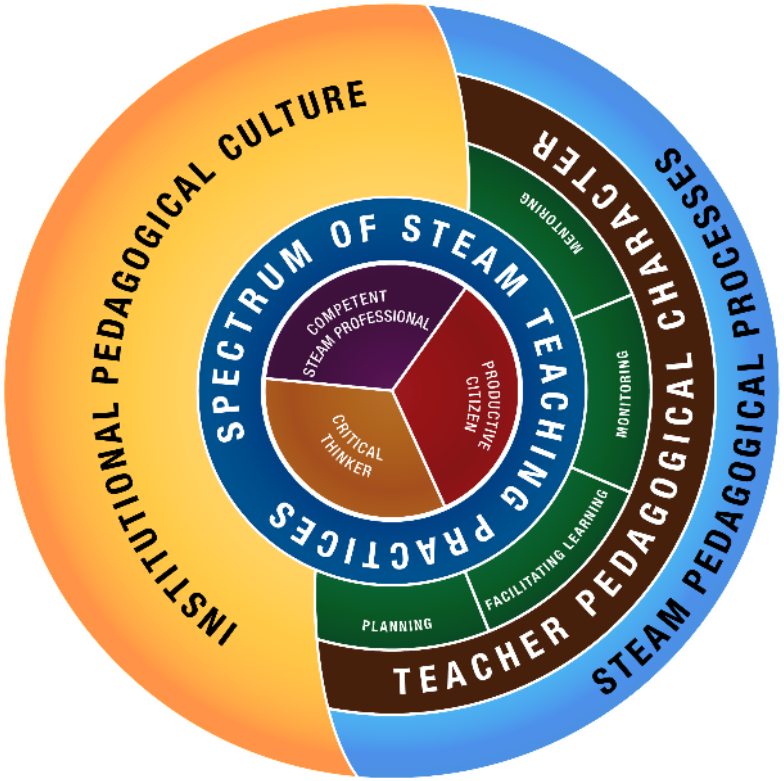
5. *Designing the Philippine STEAM Education (PSE) Model.*



Aiming at TPACK framework…

Objectives	Validated Assessment Model-T2 (Final)
5. Designing the Philippine STEAM Education (PSE) Model.	

Aiming at TPACK framework…

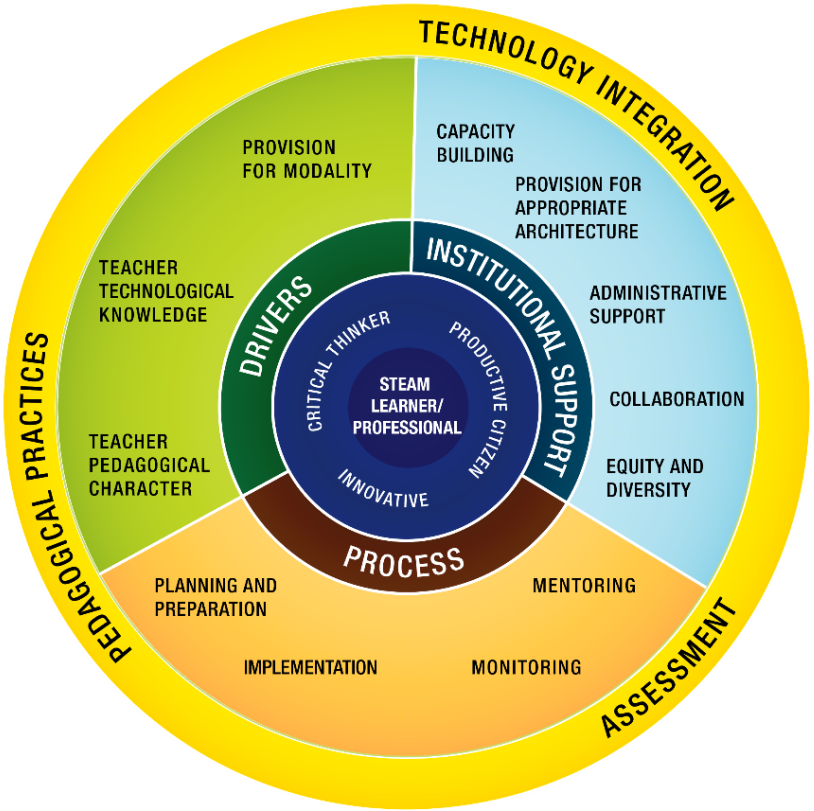
Objectives	Validated Pedagogical Model-T2 (Final)
5. Designing the Philippine STEAM Education (PSE) Model.	

Aiming at TPACK framework…

Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

Validated PSE Model-T2 (Final)

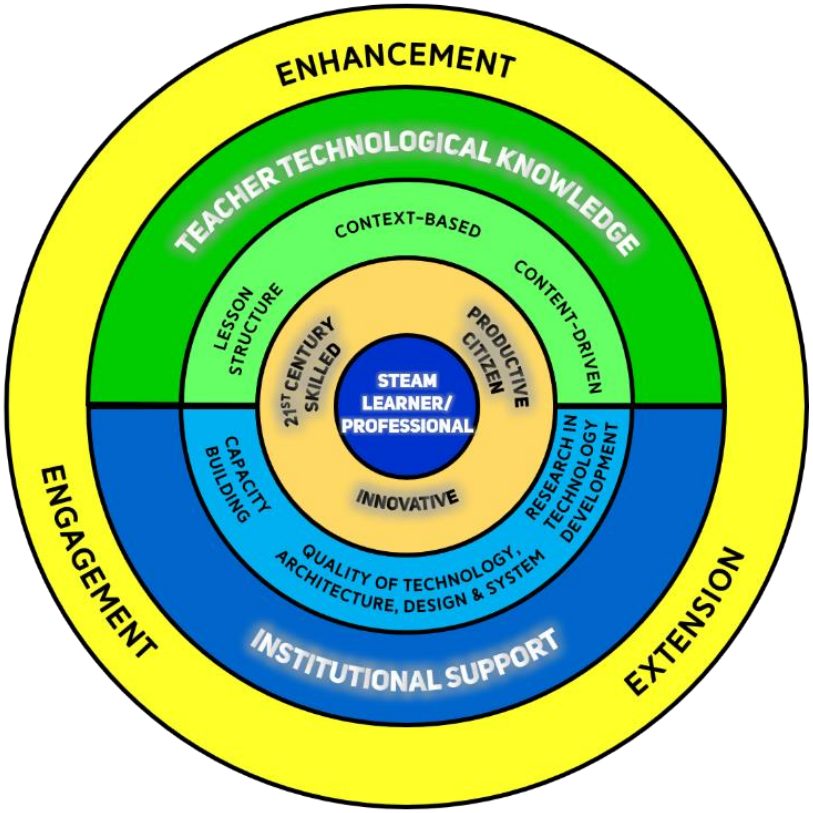


Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

Emerging Tech Integration Model-T2 (Final)



Aiming at TPACK framework…

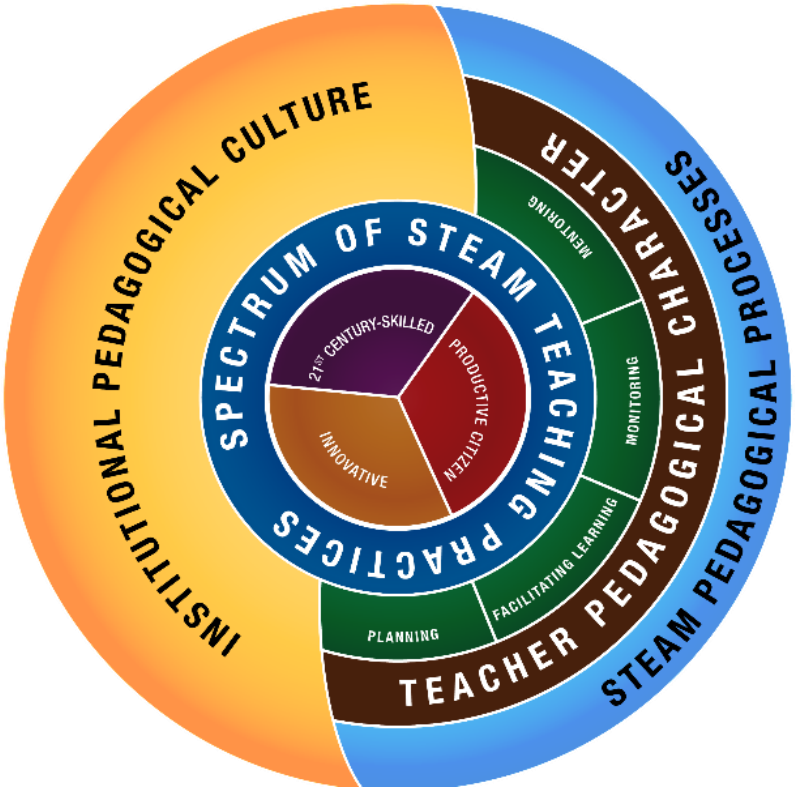
Objectives	Emerging Assessment Model-T2 (Final)
5. Designing the Philippine STEAM Education (PSE) Model.	

Aiming at TPACK framework…

Objectives

5. *Designing the Philippine STEAM Education (PSE) Model.*

Emerging Pedagogical Model-T2 (Final)

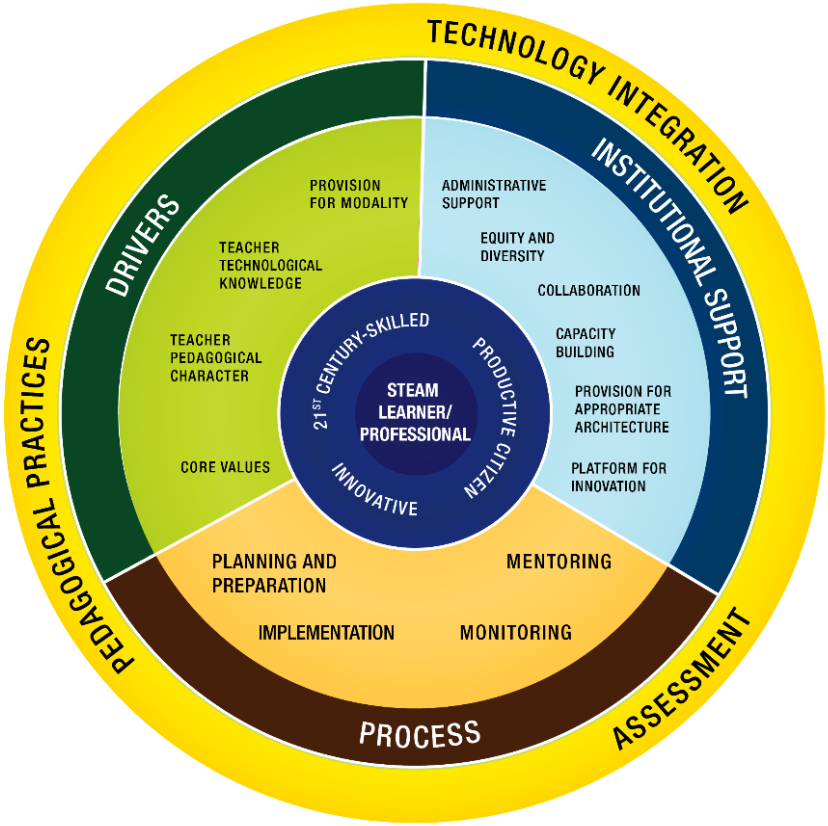


Aiming at TPACK framework…

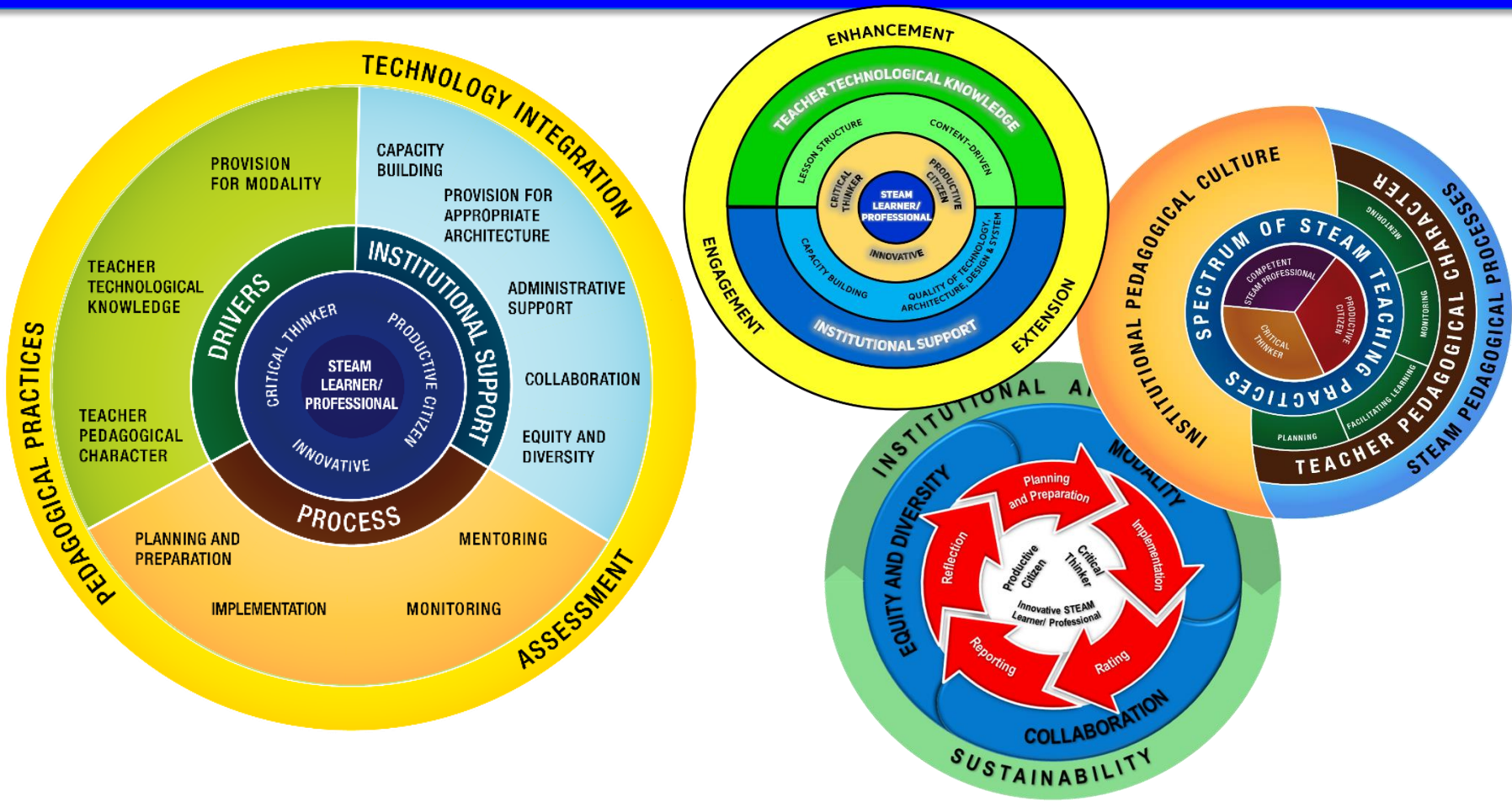
Objectives

5. Designing the Philippine STEAM Education (PSE) Model.

Emerging PSE Model-T2 (Final)

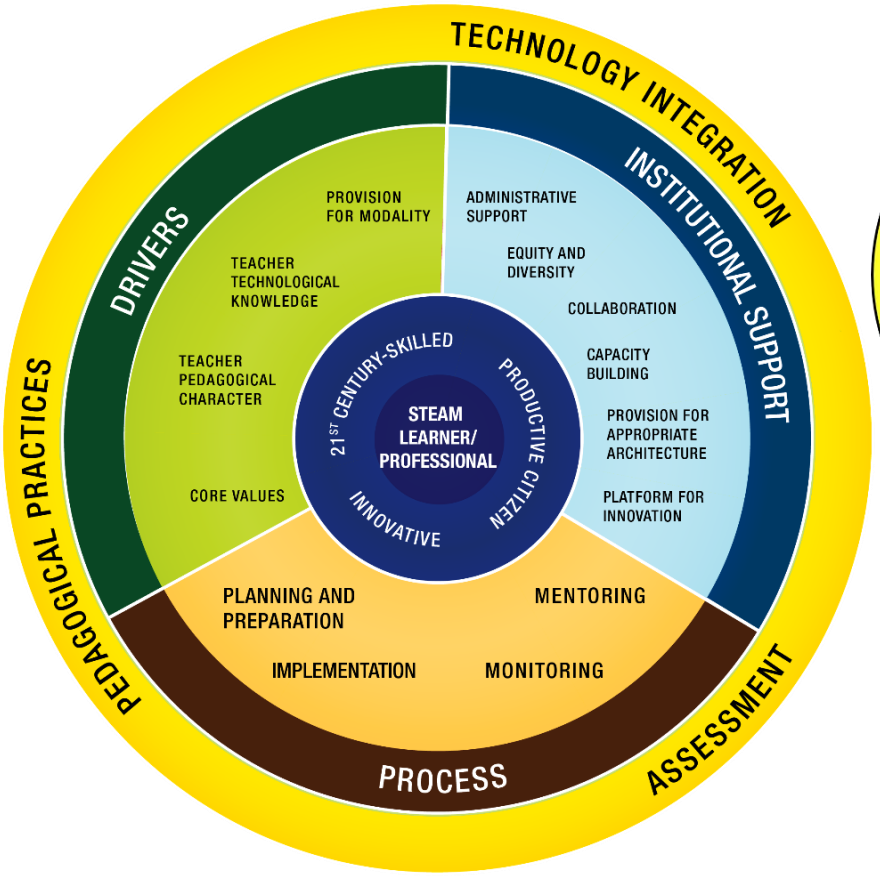


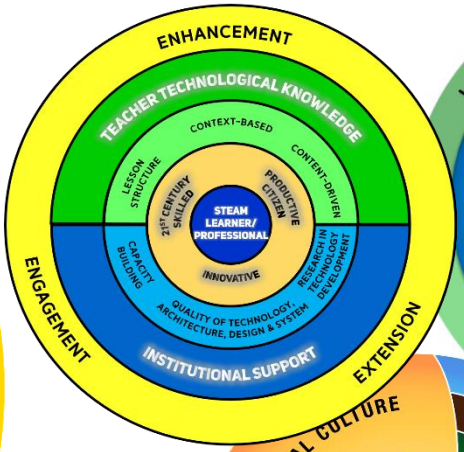
Our Products…

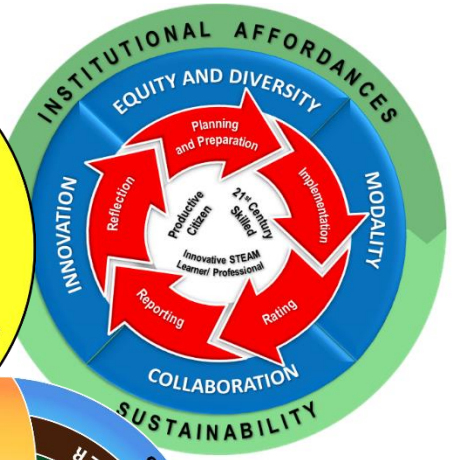


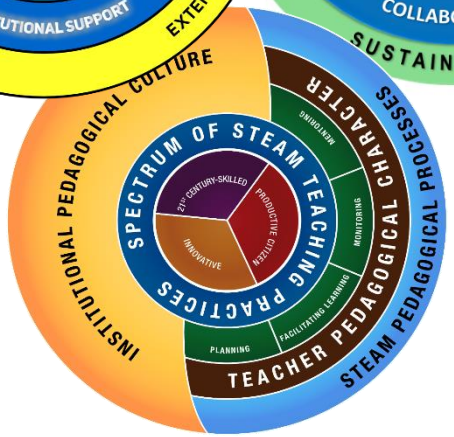
Validated Models…

Our Products…





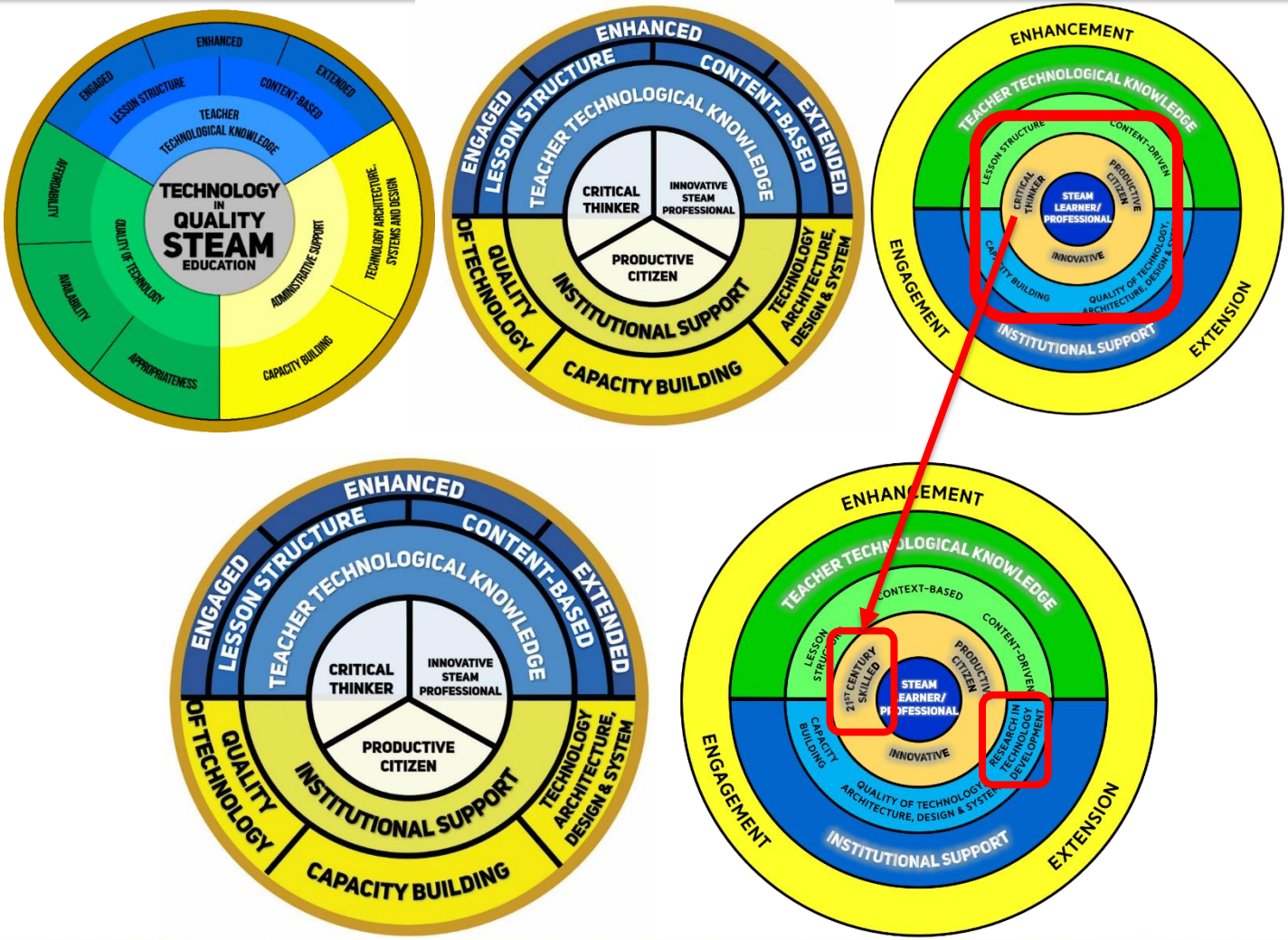




Emerging Models…

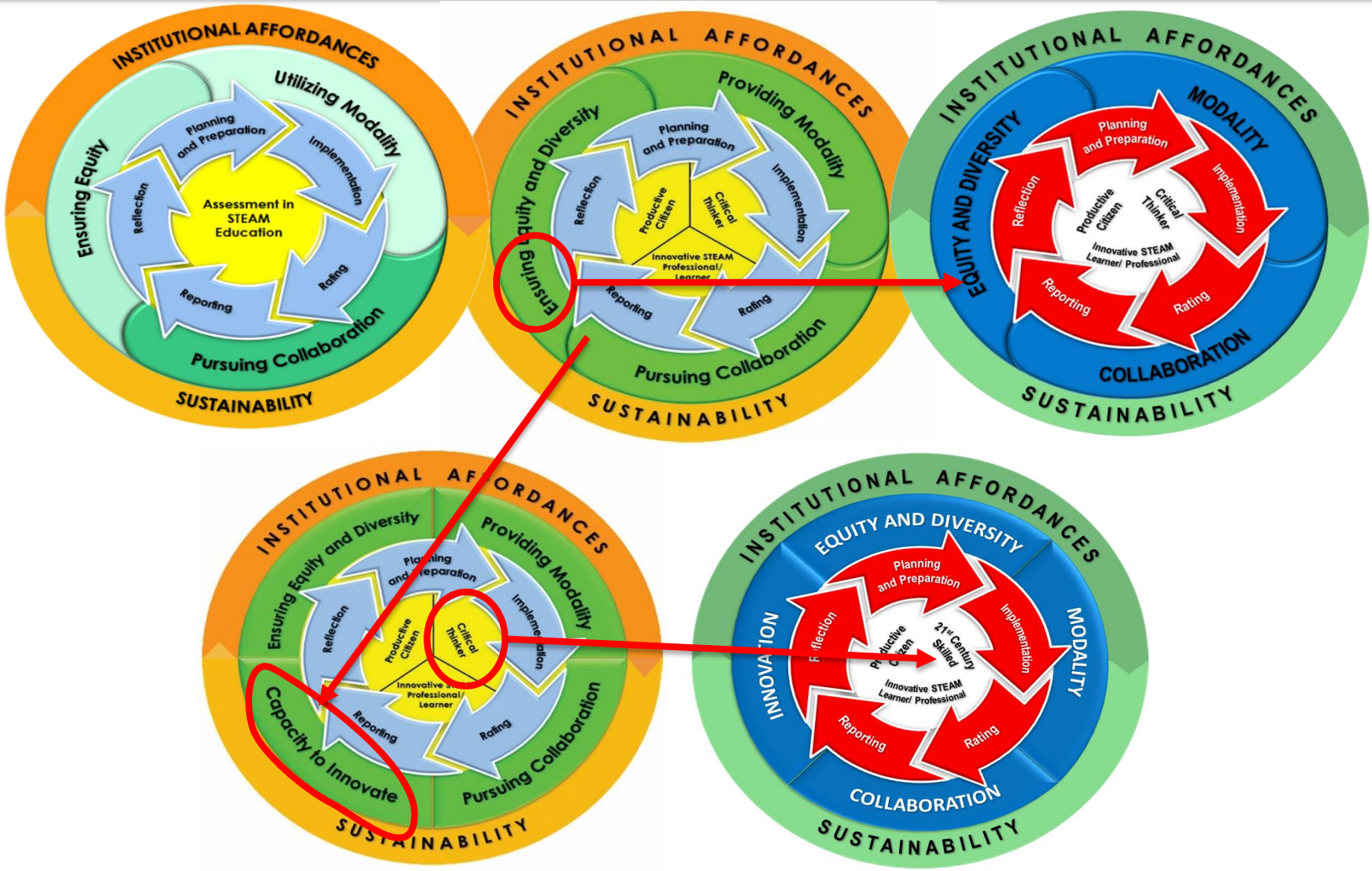
Analyzing our Products…

Technology Integration Model…



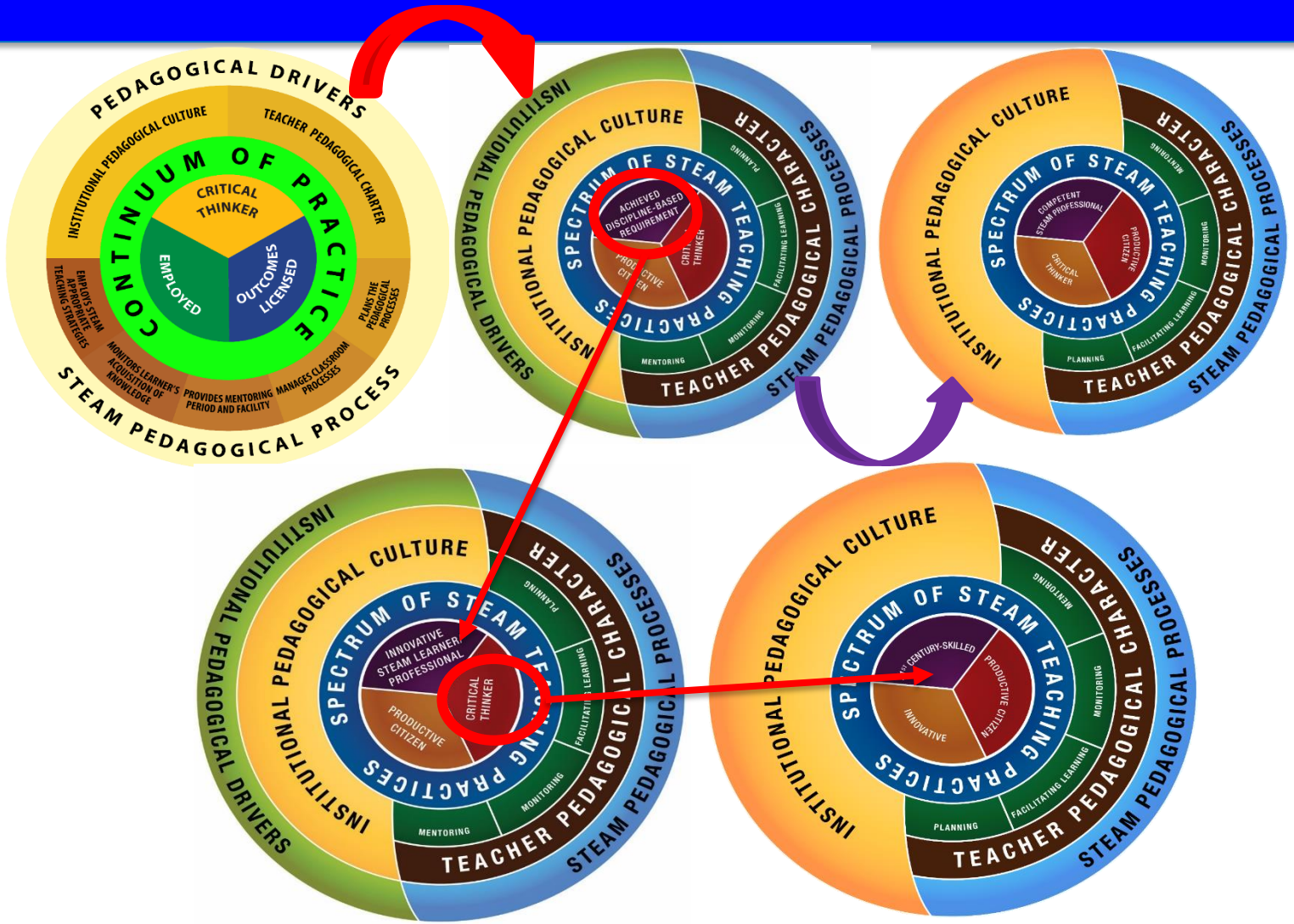
Analyzing our Products…

Assessment Model



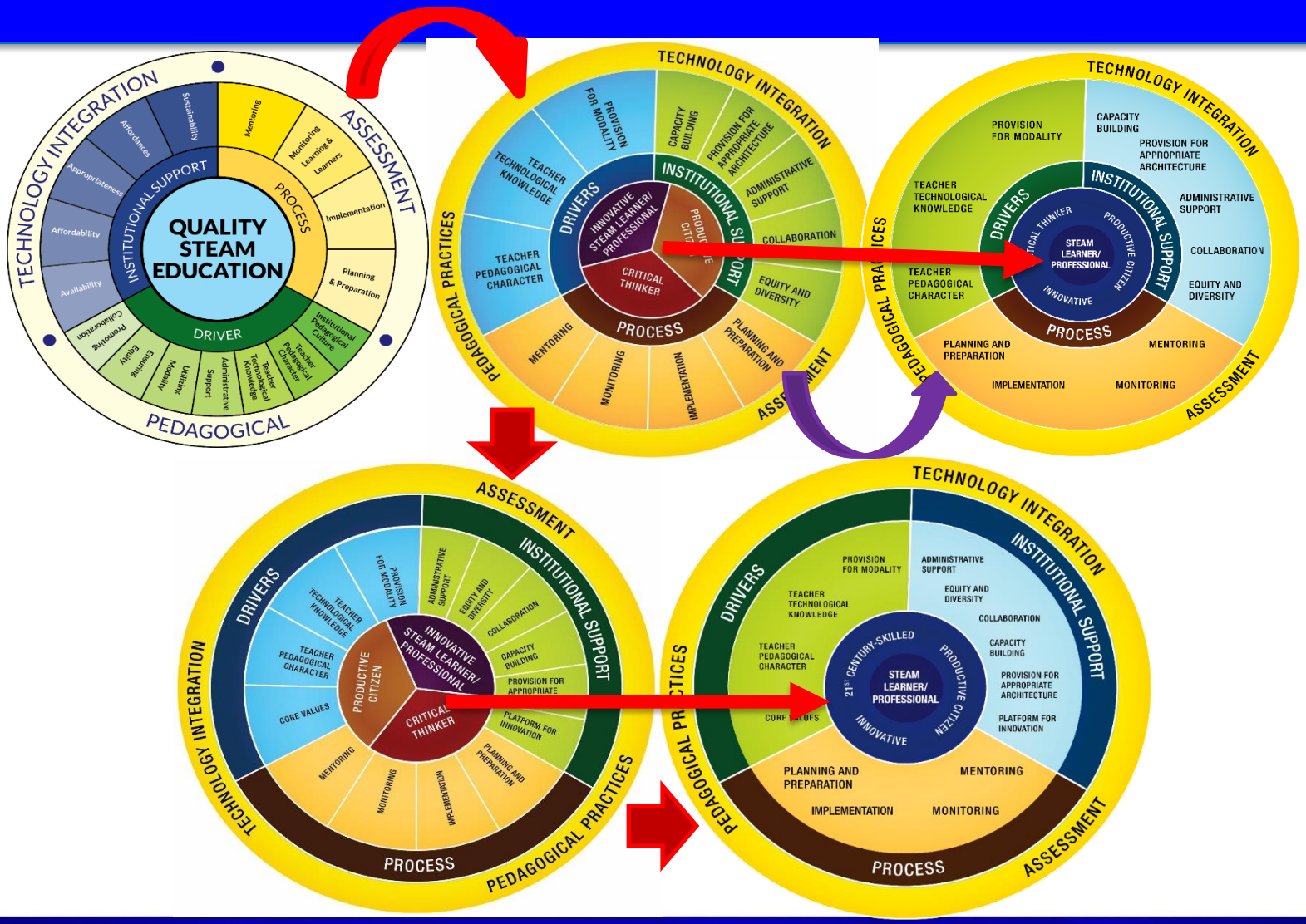
Analyzing our Products…

Pedagogical Model

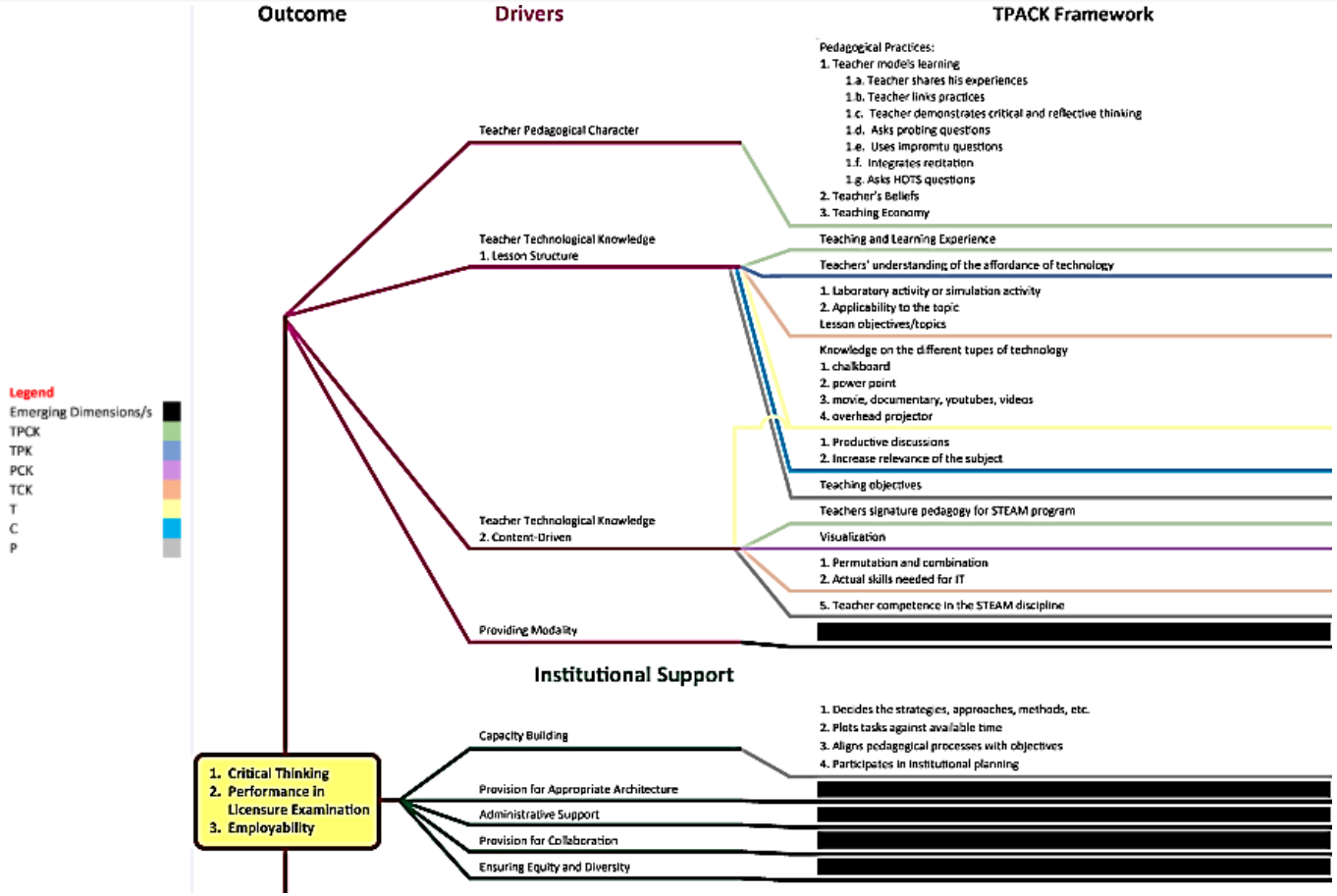


Analyzing our Products…

PSE Model

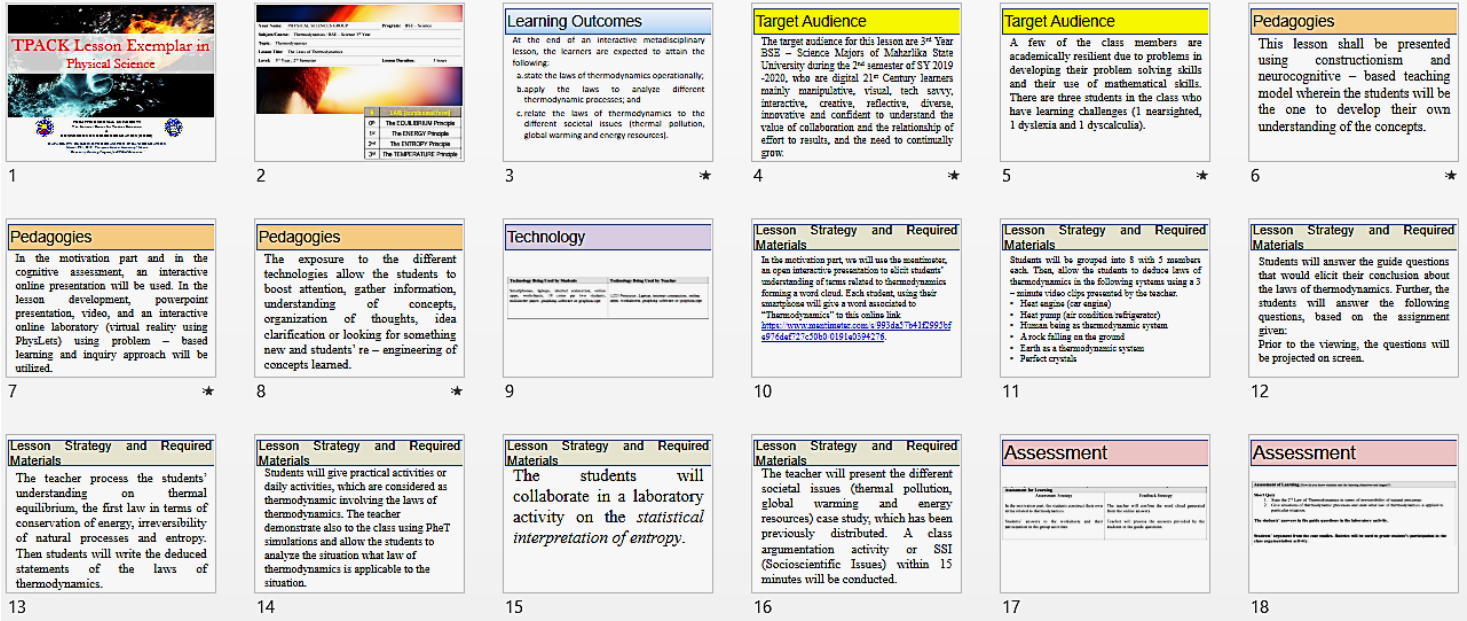


Our Products…



TPACK Framework…

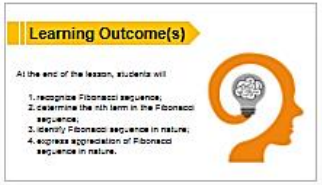
Our Products…



Lesson Exemplar…

Our Products…

1



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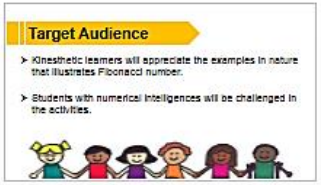

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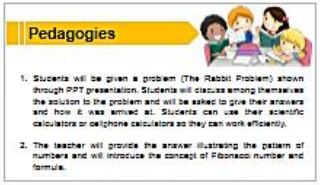

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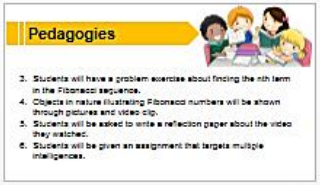

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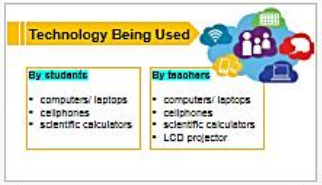

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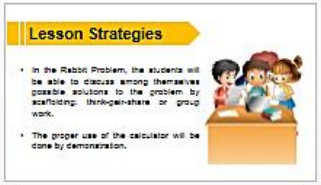

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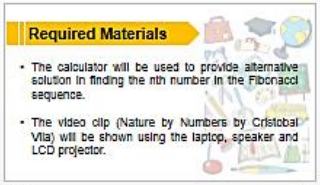

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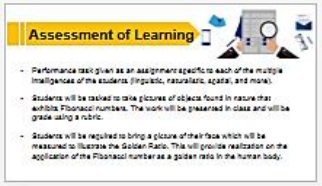

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14

Lesson Exemplar…

We saw…We envision…

- Big shifts from draft model to Tier 1 Validation
- Minimal changes (placement of constructs, colors, constructs, deletion of adverbs/verbs) from Tier 1 to Tier 2 Validation in all models
- Several drastic changes though from Validated to Emerging in Tier 1, specifically in Pedagogical Model and PSE Model.
- Significant changes to encapsulate envisioned STEAM Education are visible from Tier 1-Emerging to Tier 2-Emerging

We envision…

- Influence of the model to Philippine Higher Education STEAM Curricula
- Crafting of policies sourced from the inputs provided by the generated models.
- Consequent programs and projects from the Models
  - Professional Development Programs
  - Research Grants to develop assessment tools and training tools
  - Research Grants to polish STEAM Curricula
  - Research Grants to develop more Lesson Exemplars

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