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Chapter

Modern Teacher Education - Supporting the Vast Landscape of 21st Century Pedagogy

Joshua C. Elliott and Craig S. Tunks

Abstract

Learners have changed; Teaching has changed; Expectations have changed. How to best support modern learners is the challenge of all educators at all grade levels. The students of today are sophisticated users of technology, they are multitasking constantly and can sometimes be more comfortable with the technology than they are interacting with teachers and peers in the real world. Marc Prensky described them as “Digital Natives” over 10 years ago implying that they are efficient users of technology. This is not always the case. While they are exposed to various technologies and can successfully use them outside the classroom their use of these same tools as learning support tools can be lacking. Digital natives have different learning styles and different concerns than previous students. Educators need to keep up with this changing landscape and need to learn, develop and innovate new ways to support today’s learners. Supporting today’s learners now requires more than just educating them in a specific content area but also includes supporting them in the use of technology tools in an education setting. Supporting educators through areas of primary training such as teacher preparation programs and degree programs are one way to accomplish this but also the many credible teacher training programs that provide experience, peer support or certifications are also excellent tools. Through this chapter we will take a close look at pedagogy, learning styles, support tools, and the skills needed to be a modern educator.

Keywords: 21st Century Education, Hybrid Pedagogy, Online Pedagogy, ISTE, ISTE Standards for Educator, Online Teaching, SAMR, TPACK, Triple E, CoSN

1. Introduction

How to best support modern learners is the challenge of all educators at all grade levels. The students of today are sophisticated users of technology, they are multitasking constantly and can sometimes be more comfortable with the technology than they are interacting with teachers and peers in the real world. Marc Prensky described them as “Digital Natives” over 10 years ago implying that they are efficient users of technology. While they are exposed to various technologies and can successfully use them outside the classroom their use of these same tools as learning support tools can be lacking. Digital natives have different learning styles and different concerns than previous students. Educators need to keep up with this

changing landscape and need to learn, develop and innovate new ways to support today's learners. Supporting today's learners now requires more than just educating them in a specific content area but also includes supporting them in the use of technology tools in an education setting. Supporting educators through areas of primary training such as teacher preparation programs and degree programs are one way to accomplish this but also the many credible teacher training programs that provide experience, peer support or certifications are also excellent tools. Through this chapter we will take a look at techniques, strategies and programs that can support both in-service and pre-service teachers in their success in 21st century pedagogy.

2. Learner definitions

For the purposes of this chapter, there are two classifications of teachers. The first is pre-service and the second is in-service. Pre-service teachers are students in teacher certification programs. They may or may not have completed a methods course or their student teaching assignment. Although they may have an idea, they do not have confirmed employment with a school district. Because of this, they do not know who their learners are or what resources they have access to. These resources include specific technologies a district uses. In some cases, this could mean which tool is used. For example, a district may choose to use Microsoft technologies while another may choose Google Apps for Education. Resources could also include tools that may or may not be found in other districts. Examples include specific subscription-based tools (Newsela, Turn It In, etc.) or 1-1 device programs.

In-service teachers are employed by a public school district or independent school. These teachers know their learners and the resources available to them and their students. However, these teachers are actively engaging with students. Their time constraints are more structured and constrained because of their professional obligations and duties. Their focus is on teaching whereas a pre-service teacher is hopefully more focused on learning.

2.1 Learning differences in pre-service and in-service programs

Active teachers (In-service) will often attend professional development as a group within their district. This has several benefits. The goals and the needs of the district can be considered in advance. What is lacking, however, is the opportunity to collaborate with others from other educational environments.

Pre-service teachers must learn how to operate in an educational community that they do not know yet. Although there are times when pre-service teachers complete an internship that transitions into a full time position.

3. Educational technology integration models

Not all pre-service or in-service teachers are strong users of technology. Technology integration happens at many levels. Technology can be an afterthought or an intimidating factor for some teachers. Even worse, learning how to use technology effectively can be one more thing added to a teacher's already busy schedule. It is more important to make educational technology approachable for teachers than it is to impress them. This opens the question of how we frame technology in a way that works for busy teachers and helps them optimize learning. Three theoretical frameworks and theories help educators approach technology in a systematic and effective manner. They are the SAMR Model, TPACK model and the Triple E Framework.

3.1 SAMR model

The SAMR model can be considered an entry point model for those educators most uncomfortable with educational technology [1]. There are four steps to the model; substitution, augmentation, modification and redefinition. Substitution describes a scenario where a teacher simply replaces one tool with another with no discernible improvement in learning. Augmentation describes a scenario where the chosen technology allows the learning task to be redesigned to somewhat improve learning. Technology serves as a direct replacement for the previous learning activity with clear improvement at the modification stage. Redefinition describes a situation in which technology allows for learning activities that would not be possible previously. Although very approachable, the linear design of the SAMR model can be simplistic in some situations.

3.2 TPACK model

This model is much more comprehensive than other models discussed. There are three main parts to the model; Technological Knowledge (Knowing how to use the technology), Content Knowledge (Knowing the content or subject matter being taught, and Pedagogical Knowledge (Knowledge of teaching) [2] (**Figure 1**).

3.3 Triple E model

Triple E is the most recent of the discussed models. This model was created by Liz Kolb in 2020 in her book, Learning First, Technology Second [3]. There are three stages to the Triple E Framework: Engagement, Enhancement, Extension. These stages can be described as follows:

- Engagement: the chosen technology allows students to focus on the assignment.

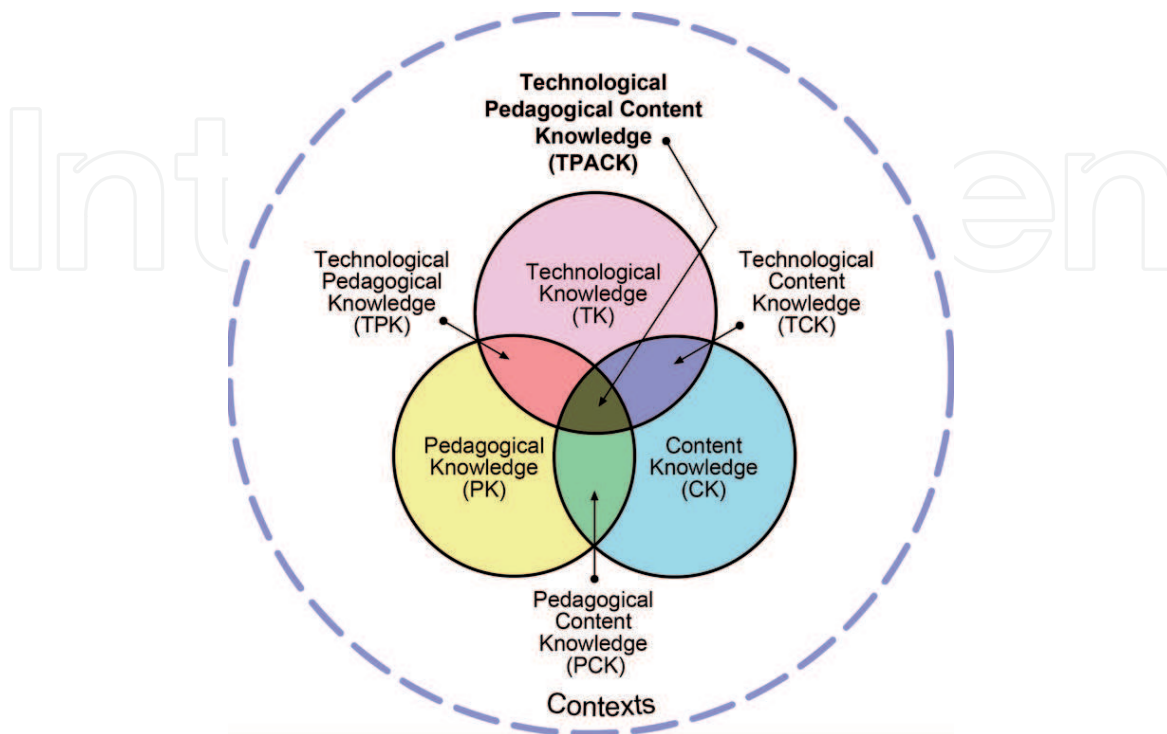


Figure 1. TPACK framework. Retrieved from: <https://commons.wikimedia.org/wiki/File:TPACK-new.png>

- Enhance: The technology allows students to gain a deeper understanding and make it easier to understand the content.
- Extend: The technology allows learning to move beyond the school day and into their own lives.

Kolb expands on her theory with a greater focus on applications in her follow up book, *Learning First, Technology Second in Practice: New Strategies, Research and Tools for Student Success* [4]. Kolb successfully finds a balance between research and real world applications that educators can use in their own classes.

3.4 Comparison of the three models

All three models have their own merits. The SAMR model is probably used most frequently with classroom teachers. It is fairly straightforward and easy to understand. This makes it a good fit for framing the use of technology in the classroom for new teachers. Possibly because of this, it can also be a little simplistic at times also. The TPACK model offers much more detail. However, this can make it difficult to unpack for some. The Triple E Model falls somewhere in between the SAMR and TPACK model in terms of complications and capability. It is a linear model so it is easy to follow. However, it is more approachable for teachers who are more comfortable with technology. The model focuses on learning first and on what technology to use second. All three models are excellent resources for framing the use of technology in the classroom. It is possible that deciding which model to use could be contingent who is using the model. Pre-service or in-service educators who are not entirely comfortable with educational technology may benefit most from the SAMR model. Educational technology leaders looking to do a deep dive may want to choose the TPACK model. Educators with a solid educational technology base who are looking to optimize learning will most likely want to choose the Triple E model.

3.5 Applications to teaching

The question at this point becomes how can teachers be trained to best use technology in the classroom for improved learning. This is where a new type of new variation of digital divide becomes relevant. Originally, the phrase digital divide referred to those who have access to technology and those who do not [5]. A variation of the phrase has branched off though that refers to the gap between those who know how to use technology productively and those who do not [6]. If teachers can be trained to use technology effectively, then they are better prepared to teach their students. Proper teaching of effective technology use can also serve as a model of best practices for in-service and pre-service teachers.

4. Professional growth and development

Professional Learning Communities (PLC) are a very important and popular tool in education to support all faculty and staff members. PLC are groups of educators that look to support each other through common areas of interest in a collaborative and needs-driven environment. Professional Learning Communities can be developed around topics of interest, grade levels, subject areas or other commonalities that can be supported through peer support.

When selecting or developing professional learning communities it is important to consider the following questions:

- What do you want to learn?
- How will you know that you have learned it?
- What support will you receive while you are learning?
- What support do you need while you are learning?

Two additional areas to consider are the structure and the convenience of the various programs available. Elliott demonstrated that these are the key priority areas for both individual educators as well as administrators when selecting online professional learning [7, 8].

4.1 Developing professional learning communities

There are a variety of ways to establish and maintain professional learning communities. We will be reviewing both free and paid membership services. This wide range of services are available to both in-service teachers and pre-service teachers.

When evaluating the various Professional Learning Communities and the various services consider these areas [9]:

- **Focus on Learning** - focus and commitment to the learning of each student.
- **Collaborative Culture** - members working interdependently to achieve a common goal of learning for all.
- **Collective Inquiry** - enabling team members to develop new skills and capacities which in turn lead to new experiences and awareness.
- **Commitment to Continuous Improvement:** gathering evidence of student learning, developing strategies and building on strengths, implementation, analysis and application.
- **Learning by Doing:** turning aspirations and visions into action
- **Results Orientation:** all efforts must be addressed on the basis of results rather than intentions

Research from Hur and Brush show five primary reasons that teachers seek to participate in online professional learning communities [10]. These include sharing emotions, utilizing the advantage of online environments, combating teacher isolation, exploring ideas, and experiencing a sense of camaraderie. These reasons clearly demonstrate the benefits and contributions that professional learning communities offer to both in-service and pre-service teachers.

Below we articulate systems that can be used for professional learning communities. Selecting the correct platform requires the individual to reflect on the areas

listed below and the benefits that can be derived from participation. While many areas are important, two areas that should not be overlooked are teacher emotional sharing and methods to strengthen teachers' self-esteem and support teachers' confidence. These areas are becoming increasingly important as technology integration can often create added stressors for teachers.

4.2 Social media

Social Media is an excellent tool for developing Professional Learning Communities both in-service and pre-service teachers can participate in these programs. Social Media tools such as Instagram, Facebook and Twitter or platforms that support the easy sharing of user created content. Most often we consider these platforms for personal use such as communicating with family and friends and sharing photos of relatives. In recent years that have become very powerful in the ability to provide a platform for educators to collaborate across the world. The sharing of best practices on such a broad scale allows for collaboration and learning that was previously unobtainable through traditional professional development. Most social media platforms are free to use which make these types of PLC very affordable to all. But the format as explained more directly below will require the participants to be actively involved with curating the content they are interested in.

Twitter is an online social media platform that allows users to "tweet" short amounts of information including links to websites and videos. This information can be followed and sorted in multiple ways. First a user can follow a specific user. These users could be industry subject matter experts and participants can receive this knowledge and interact with the poster. In addition to following specific users Twitter uses hashtags to categorize information. There are a number of trending hashtags on Twitter to support education. These hashtags can be divided in larger buckets such as instructional practice, 21st century skills, education technology, equality, specific subject areas, specific grade levels, education policy and many more. There are many available websites and lists that show the current trending hashtags. To use this tool effectively faculty should identify hashtags and users that are relevant to areas they would like to learn more about and participate as not only knowledge consumers and knowledge constructors.

Facebook is a social media platform that allows users to create profiles, connect with family, friends and colleagues both directly and through the use of groups to share information in a wide range of media formats. The use of Facebook as a PLC is focused on the use of the groups feature. Groups which can be created by any user can be themed on specific subjects or areas of interest. Many groups related to education currently exist and offer a wide range of topics and participants. For example, a number of groups appeal to educators across the globe allowing for perspectives that would not otherwise have been available.

Instagram is a popular social media platform that is owned by Facebook. This platform focuses on the sharing of photos and videos. While Instagram is still an emerging platform interest is growing in its use for sharing professional learning opportunities. For example, many professional organizations, conferences and presenters make video streams and recordings available on the platform.

4.3 Professional organizations

There are a number of professional organizations that are available to support faculty and administrators. Two key national organizations are the International Society for Technology in Education (ISTE) and Consortium of School Networks (CoSN). Participants in these organizations open up many opportunities for

educators to participate in both virtual and physical professional learning communities.

ISTE is a nonprofit organization that supports educators who are interested in the use of technology in education. The focus of the organization is on classroom teachers and instructional leaders. ISTE offers membership for both in-service and pre-service teachers. Through membership in this organization many resources and professional learning learning communities are available. A wide range of PLCs are available including topics such as online learning, computational thinking, technology student standards and more. These PLCs are normally available online and some provide additional research based resources to those that participate.

CoSN is a nonprofit organization that supports education technology leadership. In addition to their role in professional development they also have a strong advocacy group that seeks to bring awareness to the need to support education technology and to bridge the digital divide by ensuring all students have access to high speed Internet access.

4.4 Schools and local PLCs

Very often the best professional learning communities are created from the professionals immediately around you. In-service teachers will often find commonality with their peer education. Fellow faculty and staff members in partnership with industry professionals and parent organizations can often create a knowledge base of information that can support innovation and advancement in education. These groups are often the groups that then focus on the development of professional learning opportunities in schools and school districts.

Very often these groups emerge through the collaboration of faculty with like interests. It is easy to see how this is possible for in-service teachers. But pre-service teachers are also able to take advantage of this through partnerships with fellow students. An example of this can be seen through two graduate students from Fairfield University. Through their coursework they developed a professional learning community and a free resource aimed at supporting teachers' use of technology. Tech4teachers.info is an online guide designed to help faculty provide instruction in an online or hybrid format.

4.5 Professional growth and development

Plans for professional growth and development (PGD) are important factors for in-service teachers. Pre-service teachers are guided through their educator training programs. All too often once a teacher is employed the availability of PGD becomes limited. Many factors can contribute to this depending on the school or district. One of the biggest challenges are often around financing and time. PGD time for in-service teachers can be limited. When this occurs teachers often are not able to prioritize their own learning when having to balance the needs of their students. The funding for PGD can also be a factor in the availability of professional learning. In these cases it is important for teachers to have the opportunity to use free services and social media to support their learning.

4.6 Impact on professional development on technology integration

Technology related Professional Growth and Development programs are an essential part to support both pre-service and in-service teachers. Technology training is still needed today by many teachers. Teacher training programs in technology integration is important to the implementation of technology in

classroom lessons [11]. Over the 3 years of the study, “The Infusion of Technology’s Influences on Teacher’s Use of Technology in the Classroom” it was clearly demonstrated that the increase in technology PGD caused a significant increase in technology infused lessons. During the first year of the study .9 percent of the lessons conducted infused technology by the conclusion of the study 5.4 percent of the lessons conducted infused technology. This showed a direct relationship between the increase in technology PGD [11].

The value of technology Professional Growth and Development and Professional Learning Communities remains an important aspect of supporting today’s in-service and pre-service teachers. To ensure this school leadership should ensure that opportunities for this type of PGD is made available to faculty and staff. Additionally in-service teachers should prioritize these training to support their instruction to ensure they are introduced to current and trending technology tools.

5. Online and hybrid learning

Online and hybrid learning is an upcoming trend in education. While it has been a mode of instruction delivery at the university level for many years it is still new to the k-12 education world. The new learning and instructional delivery models have caused the need to define how teachers do things in a new way. A focus on the Community of Inquiry Framework (COI) by Michael Moore provides excellent guidelines to the best practices in the areas of online and hybrid learning. This model considers instruction delivery as an interaction between content, instructors and classmates.

5.1 Content

Interaction with content refers to intellectual engagement with course concepts that results in changes in the student’s understanding, skills, or perspective. Examples of interaction with content in online courses include: watching video lectures, solving problem sets, taking notes on textbook readings, participating in a game based on course content, or completing chapter quizzes. Interaction with content is the only sort of interaction in self-regulated and on-demand courses, but most online courses include at least one more type of interaction.

5.2 Instructors

The second type of interaction identified by Michael Moore was interaction with instructors; i.e. the interaction between a student and a more expert teacher who stimulates and maintains the student’s interest, motivates the student to learn, provides direct instruction, organizes the student’s application of concepts and/or practice of skills, supports and encourages the student, and assesses his or her learning. Most online courses include this type of interaction. Examples include: teacher facilitation of an online discussion forum, virtual classes, ongoing journaling with students, teacher created study-guides, reflection, faculty recorded videos (Loom) and feedback on student work.

5.3 Classmates

Interaction with peers refers to student-to-student interactions among two or more members of an online class. Moore remarked that interaction with peers was something new in distance education made possible by online learning. He also

noted that it can be an extremely valuable, in some cases an essential, resource for learning. Constructivists would agree. Indeed, some scholars argue that interaction with peers and constructivist approaches are what separates online learning from distance education [10]. Examples of interaction with peers in online courses include: asynchronous discussion forums in which students link course concepts to their experiences, small group work on projects, group wikis and blogs, peer review of classmates' papers, and student led discussions.

5.4 Differentiation

Differentiation strategies center around a focus on personalizing learning in order to allow everyone an optimal learning experience. Educational programs should teach pre-service educators relevant instructional approaches, and academic-support strategies that are intended to address the distinct learning needs, interests, aspirations, or cultural backgrounds of individual students. Districts should provide similar professional development opportunities. Personalized learning is intended to facilitate the academic success of each student by first determining the learning needs, interests, and aspirations of individual students, and then providing learning experiences that are customized—to a greater or lesser extent—for each student.

5.5 Equity, diversity and inclusion

Culturally relevant teaching is a pedagogy that crosses disciplines and cultures to engage learners while respecting their cultural integrity. It should accommodate the dynamic mix of race, ethnicity, class, gender, region, religion, and family that contributes to every student's cultural identity [12].

Educational technology should incorporate a strong focus on equity as the integration of technology very quickly made equity issues centered on financial differences evident. The digital divide remains an ongoing struggle to ensure the appropriate integration of technology into instruction as well as the availability of appropriate training for in-service and pre-service teachers. Tools selection should include thinking about possible accessibility issues resulting from availability and access to devices and Internet.

5.6 Software & tool review

These areas should be a focus of software review. Software selection can have a significant impact on a student experience. Consider the following definitions when reviewing software [13]:

- Diversity - Real or perceived difference in attributes related to one's identity that influence their behaviors and relationships.
- Equity - The extent to which individuals in an organization feel safe, valued and able to express themselves authentically in the workplace.
- Inclusion - Is the implementation of fair policies, practices and procedures in a company such that resources are distributed based on individual's contributions.

It is important to consider these definitions and create appropriate questions as part of the evaluation process to ask when reviewing software and classroom

tools. Providing appropriate training in evaluation of software should be included for pre-service and in-service teachers. Questions that should be asked include:

- Does the visual representations in the software program reflect diverse individuals including those of different race, nationality, religion, etc.?
- Does the software program reflect an equality between genders and races?
- Considering the students that will be using the program will they be able to connect with the culture and representations in the program?
- Is acceptance of different genders, sexualities, races, etc. clearly represented in both the visual representations and the dialog?

These questions should be considered suggestions for a thoughtful conversation and not be considered limiting or exclusionary to any community.

5.7 Tools for the modern educator

As educators we are required to take on a number of responsibilities and roles in the classroom and for our students. We are mentors, listeners, scholars, coaches, community-builders, facilitators, communicators, learners, and helpers to just name a few. As we seek to align our instruction to today's modern learning environment and learner we should reflect on which role we are fulfilling and the tools necessary to meet that role. Teachers learn through experience these roles and how to be successful in them. Often in-service teachers through their participation in professional learning communities will identify tools and begin to use them. Pre-service teachers can receive this information through the course work they take.

There are many tools available for the modern educator. Below are a few that we have highlighted based on the reputation of the tool, feedback from training and our personal use (**Table 1**).

Tool	COI Pillar(s)	Role	Use
Flipgrid	Content Classmates Instructors	Community-builder	<ul style="list-style-type: none"> • Week 1 introductions • Student get to know you questions <ul style="list-style-type: none"> ○ What is your favorite movie? ○ What is your favorite dessert?
Padlet	Content Classmates Instructors	Community-builder	<ul style="list-style-type: none"> • Create shared learning experiences • Small group discussion • Engagement
e-Comments/ Google Classroom	Content Classmates Instructors	Communicator	<ul style="list-style-type: none"> • Provide accurate and personalized feedback. • Actionable feedback that causes students to think.
Calendly	Instructors	Communicator	<ul style="list-style-type: none"> • Office Hours • Streamline tutoring & mentoring

Table 1.
Example tools for the modern education.

Classmates Activities	Content Activities	Instructor Activities
<ul style="list-style-type: none"> List of activities that inspire classmates to collaborate 	<ul style="list-style-type: none"> List of activities to have students interact with various aspects of the curriculum 	<ul style="list-style-type: none"> List of activities to have students interact with the instructor

Table 2.
Community of Inquiry Planning.

6. Conclusion

A review of learner definitions began our review of research, literature and a reflection on past experiences. Through this chapter, we looked at techniques, strategies and programs that can support both in-service and pre-service teachers in their success in 21st century pedagogy. We began with a focus on three education technology integration models. SAMR, TPACK and Triple E Framework are all excellent tools for encouraging the integration of technology into instruction. The three models have the same goal but vary in their approach. This allows for the appropriate approach to be adopted by program or individual teachers to create the best possible outcomes.

To enable these frameworks as well as other technology tools appropriate professional learning needs to be offered to both pre-service and in-service teachers. These opportunities can be offered through structure programs, the development of professional learning communities and social media. Evidence was reviewed on the impact of technology professional development on the integration of technology in instruction.

While the providing of professional development is important through all aspects of education we reviewed specific aspects of online and hybrid learning. Online and hybrid learning are becoming more popular throughout all of education including k-12 education. The focus of this discussion centered around the Community of Inquiry Framework (COI) by Michael Moore. Considering the three pillars from the COI Framework lesson design should include organizing activities into content-based united related to each major concept (**Table 2**).

Using this template will help both in-service and pre-service teachers to develop their instruction to ensure success, student engagement and student learning. This template easily allows integration into the Backwards Design template as described in *Understanding by Design* by Jay McTighe and Grant Wiggins.

Determining software and tool selection is a significant portion of instruction design. When making these selections in addition to the instructional impact there needs to be a focus on differentiation and Diversity, Equity and Inclusion (DEI). We reviewed these points and presented suggestions on reflections points for creating a software review process that includes DEI.

Lastly we suggested tools for the modern educator that connect to the various roles of educators and the COI Framework. These suggestions can present an excellent starting point for both in-service and preservice teachers to learn new tools, develop professional development and growth programs or participate in various professional learning communities.

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