

A Pedagogical Approach to Building 21st Century Skills

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Abstract

Teachers might assume that students will connect the many classroom activities and content to big picture ideas without assistance (Wiggins & McTighe, 2008). At times, this assumption leads teachers and students astray. For instance, students in foreign language courses who rely heavily on machine translation devices to complete assignments can undermine its purpose of, using their own linguistic resources. Yet, the process of completing the assignment can be as important as the product for achieving course goals. However, students might misunderstand the intent of using activities and covering certain content, not because they want to undermine them, but because they do not understand their purpose of the activity or content in relation to the big picture ideas concerning language learning. In this paper, we expand further on this issue of assuming students, and other stakeholders, can accurately connect the overall course goals and big picture ideas to classroom activities and content without the assistance of teachers. Next, we define the concepts of expertise and transfer, then explain how teachers can use Fries et al.'s (2020) practicing-connections hypothesis to teach National Education Association's (2015) 21st century skills of critical thinking, collaboration, creativity, and communication.

Keywords: practicing-connections hypothesis, expertise, transfer, course design

1. Introduction

There are problems with not connecting activities and content to overall course goals. These problems can be separated into categories of stakeholders such as students, policymakers, employers, parents, and teachers. For the sake of brevity, we focus on students, policymakers, and teachers. With regards to students, as mentioned, they might unintentionally undermine the purpose of an activity because they do not understand how it connects to the overall course goals. In addition, the cognitive processes students need for connecting activities and content to overall course goals, such as analyzing information and applying it, necessitate the use of higher order critical thinking skills. Eliciting higher order critical thinking skills from students might require scaffolding to help them construct understandings. Without the scaffolding or explanation of purpose from teachers, some students might wonder whether this activity or content is relevant or useful. Holmes et al. (2019) states that if students cannot uncover the usefulness of the content, then students are more likely to have difficulties understanding the information in a way that is meaningful. However, they state that for the information to be relevant, "it does not have to be useful in a concrete way; it may be useful for solving an

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abstract problem or understanding a confusing idea” (Holmes et al., 2019). Teachers should also explain why solving an abstract problem or a confusing idea relates to the big picture course goals such as critical thinking and communication to help students understand the relationship.

This lack of connections for students is a problem also for policymakers. At this stage the focus is on creating curricula that equip students with skills to help them succeed outside the classroom (DeLong, 2014; Pasquerella, 2019). DeLong (2014) who writes in the Harvard Business Review about the attack on liberal arts education states that the lack of connection to real-world success leads policymakers to question the relevance of certain subjects; particularly, subjects in the liberal arts sector. The knowledge and skills that students acquire in the liberal arts classroom can at times seem distant from the knowledge and skills required for employability. For example, in an art history course, perhaps some students do not associate the ability to interpret historical pieces of artwork to other non-art related contexts where they can use such critical thinking skills. Ferrall (2019) finds that liberal arts institutions in America offer more vocational schooling than previously because real-world relevance of courses such as firefighting, social services, or public administration are immediately apparent to stakeholders. DeLong (2014) maintains that defining and communicating how the skills are acquired through these degrees to employers is important. Defining and communicating relevant skills are particularly important for courses whereby the real-world relevance is not as apparent as vocational courses.

In addition to the difficulty policymakers face at the university level, teachers at the primary and secondary levels might struggle with the ability to connect course goals. Based on a study conducted in China to assess the opinions of in-service teachers on the national English language policy implemented in schools, Li (2010) writes that teachers describe their roles in the classroom to be passive as they implement the decisions of administrators and policymakers. Li (2010) states that teachers are not so involved in the planning process, which often results in a disconnect between the curriculum objectives, the students’ capabilities, and usefulness of skills for students. For instance, textbooks are often assembled without teacher involvement. As a result, in Li’s (2010) study, some teachers mention that they alter the syllabus to use more effective materials. Perhaps teachers new to the profession might not make alternations, and therefore, a disconnect occurs between the curriculum objectives, the students’ capabilities, and usefulness of skills for students. Teachers in Li’s (2010) study who do report that they alter the syllabus to use more effective materials describe their created materials as more authentic, level appropriate, and connected to students’ needs. This problem of control over the curriculum also seems to extend to the United States, as Honda and Milgram-Elcott (2016) call for greater involvement of teachers throughout the policy making process.

Another challenge for teachers is adapting to curriculum reforms. Leung’s (2008) study focuses on the introduction of a new curriculum for all primary schools in Hong Kong. While investigating the effects of the changes and teachers and students’ perceptions, Leung (2008) finds that teachers highlighted the difficulty of teaching a curriculum geared toward developing real-world skills. They report that the difficulty of teaching a curriculum geared toward developing real-world skills is due to a lack of clarity on the syllabus, insufficient

resources, and not enough professional development. In this section, we discussed the potential problems with connecting classroom activities and content to overall course goals from the viewpoints of students, policymakers, and teachers. In the next section, we explain a hypothesis by Fries et al. (2020) that helps to bridge the gap between materials, real-world contexts, and course goals.

1.1 Practicing-connections hypothesis

According to Fries et al.'s (2020) practicing-connections hypothesis, students should make connections between core domain concepts, key representations, and real-world contexts. Core domain concepts are key skills or content central to any domain (Fries et al., 2020). These core domain concepts are what Wiggins and McTighe refer to as the big picture ideas. For example, in terms of the debate courses, the three core domain concepts are to increase students' critical thinking, communication, collaboration, and research abilities. For this debate course, we also consider the improvement of these core domain concepts are also the overall course goals as they are transferrable to other contexts. On the other hand, key representations are important relational domain structures (Fries et al., 2020). For debate courses, relational structures are the preparation and performance stages of debate. These are important relational structures because students can use debate's core domain concepts at different stages of the preparation and performance structures. Real-world contexts are situations whereby students use core domain concepts outside of the classroom (Fries et al., 2020). For instance, students can use the core domain concepts of 21st century skills of critical thinking, communication, collaboration, and creativity for many types of careers such as working as an engineer, nurse, lawyer, or scientist.

1.2 Transfer and expertise

Holmes et al. (2019), from the Center for Curriculum Redesign, state that transfer has always been the goal of education; however, teachers should re-define the relationship between expertise and transfer. Transferring knowledge from one context to a similar, but different context, entails the ability to use knowledge "creatively, flexibly, fluently in different settings or problems" (Wiggins & McTighe, 2008). On the other hand, experts have a sophisticated understanding of domain knowledge, which seems to be due to their extensive practice and quality of that practice (Ericsson et al., 2007). Traditionally, students amass domain knowledge to achieve a sophisticated understanding and thereby, acquire a certain level of expertise. Once students reach a high level of understanding, they can then transfer that domain knowledge creatively and flexibly to other domains or contexts. In their re-definition of the relationship between expertise and transfer, Holmes et al. (2019) state that students can transfer their domain knowledge to new contexts while they build expertise gradually in a "deliberate, systematic, comprehensive, and demonstrable way." While the traditional procedure was to wait until students achieved a certain level of expertise before giving them activities to help with the process of transfer, Holmes et al. (2019) suggest that opportunities for transfer should be implemented throughout the process of gaining expertise.

In a traditional model, Holmes et al. (2019) write that expertise, or amassing of domain knowledge, can consume teachers' focus. Neglecting transfer is problematic because in the

traditional procedure, in primary and secondary schools, textbooks typically cover the domain basics of subject matter. Therefore, students are not deemed to have amassed enough expertise to transfer (Holmes et al., 2019). For this reason, the probability that students transfer their understanding to relevant contexts are low. Yet, if students have constructed meaningful relationships between the course activities and content, students can clearly see where new pieces of information outside content covered in class can be connected (Holmes et al., 2019). Fries et al.'s (2020) practicing-connections is a deliberate and systematic way that can allow students to demonstrate their ability to create these meaningful relationships. However, these types of activities are usually not included in textbooks, so teachers need to create their own practicing-connection activities. Many courses are designed to build 21st century skills. For this reason, we provide examples of practicing-connections activities. Before presenting activities, we define 21st century skills in the following section because the definitions and frameworks provided are used in the activities we created.

1.3 21st century skills

According to the National Education Association (2015), 21st century skills comprise critical thinking, creativity, collaboration, and communication, which are otherwise known as the 4Cs. The aim is to help students build mental processes of the 4Cs so that they can adapt to and improve on their future working environment (Stauffer, 2021). These constructs are complex, so we examine definitions and models to build a better understanding and to help with creating practicing-connections activities.

Paul and Elder (2022) define critical thinking as the process that requires intellect and discipline to actively and adeptly conceptualize, apply, synthesize, analyze, or evaluate information sources. These include reflection, experience, observation, and act as a guide to actions and beliefs. Aspects of critical thinking include: “clarity, accuracy, precision, consistency, relevance, depth, breadth, fairness, and sufficiency” (Paul & Elder, 2022). Below they provide intellectual standards of critical thinking (Paul & Elder, 2006) that teachers can use to help students identify and practice critical thinking.

Table 1: Paul and Elder's (2006) intellectual standards of critical thinking

Element	Critical thinking question
Clarity	Could you elaborate?
Accuracy	How could we find out if that is true?
Precision	Could you be more specific?
Relevance	How does that relate to the problem?
Depth	What are some complexities of this question?
Breadth	Do we need to consider another point of view?
Logic	Does what you say follow from the evidence?
Significance	Is this the most important problem to consider?
Fairness	Is my thinking justifiable in context?

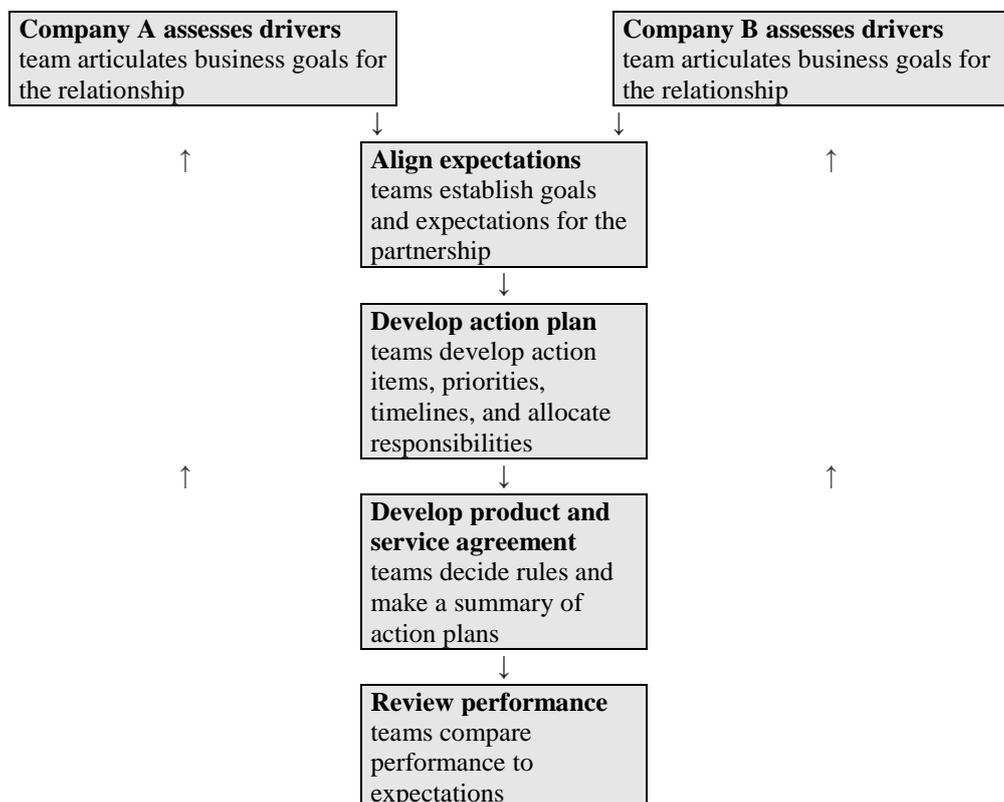
Source: (Paul & Elder, 2006)

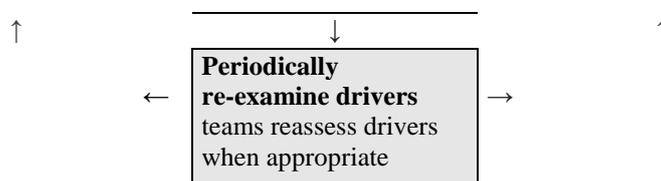
Thinking processes that underlie critical thinking are necessary for another one of the 4Cs, creating. The process of creating is at the highest level of the revised Bloom's taxonomy. Anderson and Krathwohl (2001) consider it to be the most unclear, ill-defined, and complex of

the taxonomy. In his book on human motivation, Franken (1994) defines creativity as the proneness to construct or identify ideas, possibilities, or substitutions that might be of use for the purposes of solving problems, entertainment, or communication. Creative people are motivated to solve problems, experience new or complex situations, or communicate values (Franken, 1994). On the other hand, Ostroff (2016) defines creativity as “imagination in action.” Stobaugh (2019) writes that for classroom purposes, students can re-arrange information in a novel way to create a product. The thinking process involved for creating a product requires students to (a) brainstorm novel ideas (b) decide the best one, (c) plan the product development, then (d) design a new solution (Stobaugh, 2019). In other words, the process entails conceptualizing, applying, synthesizing, analyzing, and evaluating information sources, which are aspects of critical thinking. Often the creation process necessitates that student demonstrate their ability to transfer knowledge or skills to real-world situations (Stobaugh, 2019).

In Lambert and Enz’s (2013) dyadic case-study on managing and calculating the co-creation of value in business-to-business (B2B) relationships, they explore a framework for collaboration. They write that managers need a framework for collaboration to assist them with cultivating effective B2B relationships and the subsequent implementation of value co-creation drives (Lambert & Enz, 2013). We believe that their framework can be useful not only for B2B collaborations, but also for classroom purposes between classmates who collaborate on a project. Table 2 below shows Lambert et al. (2010).

Table 2: Lambert et al. (2010) the collaboration framework



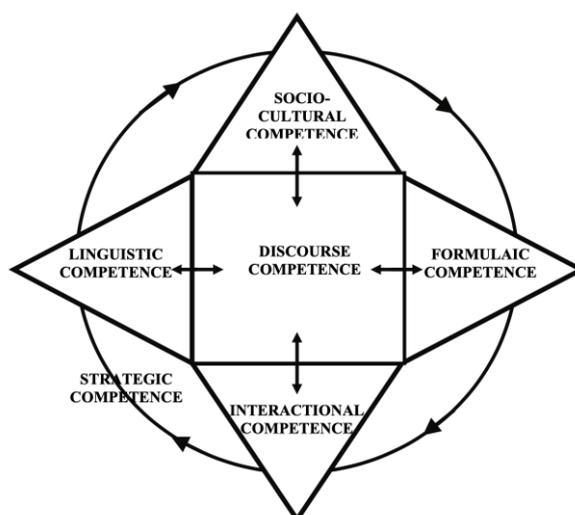


Source: (Lambert et al., 2010)

In Lambert et al.'s (2010) framework of collaboration, they include articulating individual goals for the collaboration, establishing expectations, developing a plan of action, developing the product, reviewing performance, and re-examining drivers or goals (Lambert et al., 2010). Students can use this framework for their classroom project collaborations.

One aspect important for collaboration is communication, which is one of the four 21st century skills. Figure 1 below shows a revised model of communicative competence by Celce-Murcia (2007) based on Celce-Murcia et al. (1995) which is in the field of applied linguistics.

Figure 1: Schematic representation of communicative competence (Celce-Murcia, 2007, p.45)



Source: (Celce-Murcia, 2007)

Celce-Murcia (2007) states that the ability to communicate effectively relies on six types of competences: discourse, socio-cultural, linguistic, formulaic, interactional, and strategic. At the core of communicative competence is discourse competence, which indicates the cohesion and coherence of the message. The success of discourse competence is dependent on the amalgamation of the other aspects of the communicative competence model. Socio-cultural competence reflects the ability to use language appropriately based on the formality of the context or situation. Misunderstanding of the socio-cultural context can generate conflict among the participants. Linguistic competence consists of lexicogrammatical knowledge such as the phonological, lexical, morphological, and syntactic aspects of language. This competence forms the foundational basis for the ability to initiate conversation. Formulaic competence refers to routine uses of the language such as forms of greetings, parting words, collocations, and idioms. Formulaic knowledge can make everyday interactions smooth and without hesitations. Interactional competence comprises the ability to conduct a conversation

with appropriate verbal and non-verbal cues using their knowledge of common conversational interactions and turn-taking skills to avoid breakdowns in communication. According to Celce-Murcia (2007) the outer four competences develop more complex and unified uses of language, in other words, discourse competence. Strategic competence is the approach to language learning and communication. The strategy can be used to develop language abilities and non-verbal skills that assist with communication. As seen in the figure above, this encircles all other competences because applying strategies can foster development of other components of communicative competence.

2. Discussion

In this section, we provide some example activities, then list additional suggestions for using Fries et al.'s (2020) practicing-connections hypothesis when teaching 21st century skills. We realize that different subjects such as science, history, and foreign language have different emphasis on the 4Cs, and we understand that teachers teach different ages and proficiencies. For that reason, teachers can revise the suggestions we make below.

Figure 2 below exemplifies a practicing-connections activity whereby students read an example self-reflection on task performance, which they can analyze for strengths and weaknesses of each 21st century skill so according to Fries et al.'s (2020) practicing-connections hypothesis, they connect the key representation of their debate performance with the core domain concepts-

Figure 2: Example of a practicing-connections activity

Instructions: Read Daniel's self-reflection of his debate performance in terms of the course goals of critical thinking, communication, collaboration, and research skills. Answer the questions below.	
	<i>"We did not win the debate because our arguments were not strong enough to beat the other team. We should have conducted more research. Also, using our key examples in the rebuttal would make the debate stronger. However, our main ideas were very good. We were also able to ask many questions to the other team and answer all the questions they asked immediately. Our teamwork was also very good, but we can divide the preparation work more clearly next time."</i>
<ol style="list-style-type: none"> 1. What are Daniel's strengths in terms of each of the course goals? 2. What are his weaknesses in terms of each of the course goals? 3. What should he do to improve his weak points? 4. Overall, was Daniel effort successful? Why or why not? 	

Source: Canva.com image by Sketchify

Question 4 in Figure 2 of "Overall, was Daniel's effort successful? Why or why not?" can be a way for teachers to emphasize the importance of genuine self-reflection and process over product. For instance, even though Daniel's team lost, he does a great job thinking of his strengths and weaknesses as well as what he can do to improve in terms of 21st century skills, and for that reason, his effort can be considered successful.

Figure 3 below exemplifies the fourth task from Table 3 whereby students read a description of a potential career path so that they can connect the roles and responsibilities to each 21st century skill. According to Fries et al.'s (2020) practicing-connections hypothesis, students connect core domain concepts with real-world contexts.

Figure 3: Example of the fourth task type from Table 3

Instructions: Read Elise’s explanation of her work-related responsibilities as a software engineer. Answer the questions below.	
	<p>“Hello! I work as a software engineer for a large tech firm. My roles and responsibilities include designing, developing, and testing new software. As I work for a company that designs smartphones, I try to think of innovative ways to make the phone more efficient and user-friendly without making it too slow. Once I have some ideas, I talk to other engineers on my team, and we come up with ideas to design these improvements and start working on creating them for our customers. After we develop the new software, we take turns testing it and give each other feedback and discuss how to solve any problems. Finally, after the new software has been tested, we ask a few customers to judge the new changes and based on their comments, we make further changes or release the new version to everyone. ”</p>
<ol style="list-style-type: none"> Does Elise need... <ul style="list-style-type: none"> critical thinking skills? Why or why not? communication skills? Why or why not? creativity? Why or why not? collaboration skills? Why or why not? Overall, do you think that Elise understands her career responsibilities? Why do you think it is important to reflect on your performance in terms of the four Cs of critical thinking, communication, creativity, and collaboration? 	

Source: Canva.com image by Sketchify

Question 2 in Figure 3 of “Overall, do you think that Elise understands her career? Why or why not?” can be a way for teachers to emphasize the importance of analyzing and reflecting on work-related responsibilities to better understand one’s career. Teachers can also highlight the importance of practice to continue to improve because people do not instantly become great at their professions. Once again, this answer emphasizes the importance of valuing the process of gaining expertise. Question 3 also gives students the chance to explain why this self-reflection process is important. Figures above are examples that can be adapted depending on the subject, proficiency, interests, and ages of students. By working with students, they can gain a greater understanding of core domain concepts and how these concepts relate to classroom tasks and projects as well as real-world contexts.

In Table 3 below, we share activities to implement practicing-connections hypothesis as well as the rationale for doing so:

Table 3: Practicing-connections tasks with rationale

No.	Task description	Rationale for teachers to implement the task
1	Before students do the task or activity, provide not only examples of task performance, but examples of post-task self-reflections (See Figure 2 above)	The self-reflection can incorporate an explicit reflection on 21 st century skill use so that students can connect core domain concepts use to the task. Teachers can consider creating their own examples of self-reflections rather than using their previous students’ self-reflections. Post-task, teachers can assign the same self-reflection task.
2	Present definitions and models of each of the 21 st century skills such as Paul and Elder’s (2006) framework (Table 1)	These activities deconstruct each skill (i.e., core domain concept) into its sub-skills to help students gain a greater understanding of meaning of each construct. Students can use the models to guide them with making their own self-reflections.
3	Present organizational structure to show steps or stages of class projects and tasks such as Lambert et al.’s (2010) model of collaboration (Table	Students discuss where within the organization structure they use 21 st century skills, which helps them to focus on the process or steps to help them with task completion. In other words, they are connecting core domain concepts to key representations.

	2)	
4	Share real-world examples that focus on 21 st century skill use (e.g., employee descriptions of their work responsibilities)	Students can connect core domain concepts with real-world contexts to help students to determine where, when, and how 21 st century skills are used in contexts outside of the classroom.
5	Construct activities that allow students to reflect on their own present and past 21 st century skills use	Students can connect core domain concepts to relevant real-world contexts, which helps to emphasize a need for the development of these core domain concepts.
6	Build activities that help students to reflect on their personal or professional goals and discuss relationship to 21 st century skills (See Figure 3 above)	This activity helps students to connect core domain concepts to real-world contexts that are meaningful to them (i.e., connect their personal or professional goals to 21 st century skills).
7	Make activities for students to reflect on their task performance in terms of 21 st century skills	Students can discuss their strengths and weaknesses of core domain skills. They also can help students having difficulty to connect these core domain skills to their task performance.

3. Conclusion

In conclusion, stakeholders such as students, teachers, and policymakers do not always understand the connections between the overall course goals to classroom activities and content. For this reason, making connections might improve students' understanding of course goals as well as their ability to transfer their knowledge and skills from one context to another context. Fries et al.'s (2020) hypothesis provides a solution to helping students connect the rationale behind covering content and classroom activities in a systematic and demonstrable way. However, textbooks usually do not include these activity types, so teachers need to create and incorporate their own practicing-connection activities.

References

- Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives* (Complete ed.). New York: Longman.
- Brown, C. E. (2015, June). Making Classrooms Work. U. S. News. Available: <https://www.usnews.com/opinion/knowledge-bank/2015/06/24/why-teachers-should-be-involved-in-education-policy-decisions>
- Celce-Murcia, M. (2007). Rethinking the role of communicative competence in language teaching. In E. A. Soler & M. P. S. Jordà (Eds.), *Intercultural language use and language learning* (pp. 41-47). Springer.
- DeLong, D. (2014, February). How Liberal Arts Colleges Can Stop Fueling the "Skills Gap". Harvard Business Review. Available: <https://hbr.org/2014/02/how-liberal-arts-colleges-can-stop-fueling-the-skills-gap>
- Ericsson, K. A., Prietula, M. J., & Cokely, E. T. (2007, July). The Making of an Expert. Harvard Business Review. Available: <https://hbr.org/2007/07/the-making-of-an-expert>

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- Ferrall, V. E. (2019, May). Are these the Dying Days of Genuine Liberal Arts Education? Times Higher Education. Available: <https://www.timeshighereducation.com/opinion/are-these-dying-days-genuine-liberal-arts-education>
- Franken, R. E. (1994). *Human motivation*. Pacific Grove, Calif: Brooks/Cole Pub.
- Fries, L., Son, J. Y., Givvin, K. B., & Stigler, J. W. (2020). Practicing connections: A framework to guide instructional design for developing understanding in complex domains. *Educational Psychology Review*, 33(2), pp. 739-762. Available: <https://doi.org/10.1007/s10648-020-09561-x>
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching & learning*. Boston, MA: Center for Curriculum Redesign.
- Honda, M., & Milgrom-Elcott, T. (2016, December). Bringing Teachers into the Policymaking Process. The Hill. Available: <https://thehill.com/blogs/congress-blog/education/309667-bringing-teachers-into-the-policy-making-process>
- Lambert, D. M., & Enz, M. G. (2012). Managing and measuring value co-creation in business-to-business relationships. *Journal of Marketing Management*, 28(13-14), pp. 1588–1625. Available: <https://doi.org/10.1080/0267257X.2012.736877>
- Lambert, D. M., Knemeyer, A. M., & Gardner, J. T. (2010). *Building high performance business relationships*. Sarasota, FL: Supply Chain Management Institute.
- Leung, W. L. A. (2008). Teacher concerns about curriculum reform: The case of project learning. *The Asia-Pacific Education Researcher*, 17(1), pp. 75-97.
- Li, M. (2010). EFL teachers and English language education in the PRC: Are they the policy makers? *The Asia-Pacific Education Researcher*, 19(3), pp. 439-451.
- National Education Association. (2015). Preparing 21st century students for a global society: an educator’s guide to the “Four Cs”. Available: https://www.academia.edu/36311252/Preparing_21st_Century_Students_for_a_Global_Society_An_Educators_Guide_to_the_Four-Cs_Great_Public_Schools_for_Every_Student
- Ostroff, W. L. (2016). *Cultivating curiosity in K-12 classrooms: How to promote and sustain deep learning*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Pasquerella, L. (2019, September). Yes, Employers Do Value Liberal Arts Degrees. Harvard Business Review. Available: <https://hbr.org/2019/09/yes-employers-do-value-liberal-arts-degrees>
- Paul, R. W., & Elder, L. (2006). *Critical thinking: Tolls for taking charge of your learning and your life* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
- Paul & Elder (2022). *Critical thinking: Tolls for taking charge of your learning and your life* (4th ed.). New York, NY: Rowman & Littlefield.

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Prague, Czech Republic**

Stauffer, (2021, January 13). What are 21st century skills? Applied Educational Systems.
<https://www.aeseducation.com/blog/what-are-21st-century-skills>

Stobaugh, R. (2019). *Fifty strategies to boost cognitive engagement: creating a thinking culture in the classroom*. Bloomington, IN: Solutions Tree Press.

Wiggins, G. P., & McTighe, J. (2008). *Understanding by design*. Alexandria, Virginia: Association for Supervision and Curriculum Development.