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INTRODUCTION

We are now over one-fifth of the way through the twenty-first century and our world is much different than it was one hundred years ago. Rapid advances in technology have provided greater access to information and ways to connect with other humans than previously thought possible. At the same time, we may be more deceived by misinformation and make fewer deep connections with others because of the busyness and automation of this age. Moreover, many lack the knowledge and skills to negotiate the advances that new technologies afford.[1] As technology—and especially artificial intelligence—continues to transform education, we need to be clear about our desires and goals for the future of education. Alongside the development of our technological society there has been a growing consensus that today's students need to learn how to think critically, be creative problem-solvers, and effectively communicate and collaborate with others to be thoughtful,

1. See Newport, *World Without Email*.

productive, and caring citizens in this digital age. Some may argue that we can use AI-driven systems to teach needed skills, but it is more important for us to adapt our human-focused educational systems to ensure that current and future students have the skills and frameworks necessary to flourish in an increasingly automated world. The chapter explores four concepts important for learning and AI in the twenty-first century—creativity, critical thinking, communication, and collaboration (the "4Cs")—as well as reflections on the theological significance of creativity and community.

TWENTY-FIRST-CENTURY LEARNING SKILLS

It could be argued that for all of the advances made by humans during the last one hundred years, the system of schooling remains relatively unchanged.[2] Students take courses in four or eight subjects per term. The most popular method of teaching is lecturing, where the typical interaction is teacher-to-student communication. Learning is mainly assessed through exams where students recall what they have been told. Is this the type of learning that helps students prepare for careers that may not yet exist, or for a world being transformed by new and emerging technologies? Some predict that over the next fifteen years, forty percent of current jobs will be taken over by AI and robots.[3] Should students in school today be prepared to compete for jobs with AI, which will be designed to replace them? Alternatively, and more appropriately, students should be adaptable for a changing future and be prepared to create and thrive in jobs that have not even been thought of yet. How can this be accomplished? In addition to learning core subjects as part of a liberal arts education, students should learn what the Partnership for 21st Century Learning (P21), a coalition of educators, policymakers, and businesses, calls "21st Century Learning Skills."[4] These skills include what are commonly referred to as the 4Cs—critical thinking, creativity, communication, and collaboration—which help students learn how to learn, preparing them to participate in and shape an unknown future.[5] In a sense, by having a solid liberal arts education and learning these skills, students may future-proof their professional lives against AI.[6] They will also learn how to leverage AI for a better future.

2. See Barnum, "XQ Is Taking Over TV."
3. See Lee, *AI Superpowers*.
4. See https://www.battelleforkids.org/networks/p21.
5. See Ross, "It's Time to Reassess Our Understanding of the 4Cs."
6. See Aoun, *Robot-Proof*.

For the present education system to integrate the 4Cs into curricula, there will need to be leadership, cooperation, and change from all stakeholders, including school leaders, teachers, and students. Unfortunately, many school leaders lack training to determine the professional development needed to help teachers modify curricula to incorporate the 4Cs.[7] However, P21 has collaborated with other non-profit educational organizations to define and design this much-needed professional development; their work can help teachers understand how to modify their current instruction to integrate the 4Cs.

The 4Cs can help students move from rote learning to deep learning.[8] A study by Katherine Landon indicated that there is a great need for teacher professional development in this area. Many students reported that they did not experience the teaching or practice of the 4Cs in their classes. Of the students surveyed, ninety-four percent indicated that communication is a necessary skill to learn for their future, yet only fifty-four percent of students indicated that they were being taught or asked to practice communication skills as part of their coursework. In the study, eighty-five percent of students reported collaboration to be an essential skill to learn, with sixty-eight percent reporting that it was being taught or used in assignments. Collaboration was the most commonly taught of the 4Cs in the survey, which is perhaps the most straightforward for teachers to incorporate into curricula. The study reported that eighty percent of students thought schools should integrate critical thinking into curricula, yet only forty-one percent of students reported experiencing it in their learning. Creativity was highly desired by students in the study—eighty-nine percent of students thought it was an important skill to teach. However, it was also the least experienced of the 4Cs in the classroom, with only thirty-nine percent of students experiencing it as part of instruction or practice. While this study makes it clear that administrators and teachers have their work cut out for them, it is encouraging that students are interested in having the 4Cs integrated into their coursework.[9]

As we think about the 4Cs, we should consider the role of AI in the future of teaching and learning. It appears inevitable that AI will increasingly influence education. One recent study projected the use of AI in US education to grow by about fifty percent over the next five years.[10] What will be the role of AI? AI is already employed in several areas that are beneficial

7. See Wagner, *Creating Innovators*.
8. See Bitter and Loney, "Deeper Learning."
9. See Landon, "Student Perceptions of Learning."
10. See "Artificial Intelligence Market in the Education Sector in US."

to learners, such as using AI to generate automatic transcriptions for online class meeting recordings.[11] While this transcription service is not yet a perfect substitute for students who need captioning because of a disability, it does benefit students who primarily speak and read in another language. It also makes videos searchable for students who want to quickly re-watch a specific video segment. An example of a controversial use of AI in education is in the area of virtual exam proctoring. Video cameras feed data to an AI system that monitors students and attempts to determine whether they are violating an institution's honor code. However, this use of AI has led to concerns about equity. During the pandemic, issues arose with such systems being unable to identify students of color, resulting in those students not being able to take an exam.[12] This error may have been caused because the AI software was not designed by or tested with people of color.[13] But even if these system were to operate accurately, other ethical concerns remain about such automated forms of surveillance and the vendors that license them.

Given ever-increasing uses of AI among various professions, today's students need to learn and practice the 4Cs to be able to interact with a changing workplace and world. It is essential to teach students how and why each of the 4Cs is beneficial. Students will need to learn and practice skills related to their ability to think and act creatively, to make good decisions based on reason, to share thoughts and ideas in different ways, and to work with others to achieve common goals. The Partnership for 21st Century Learning provides various resources for educators, including indicators for skills and assessments for mastery, and many states, school districts, and universities have incorporated these skills into a larger set of standards for students to master.[14] An example of this from Washington State is in table 7.1.[15]

11. See Tung, "Microsoft Teams Is Getting This New Feature."

12. See Flaherty, "No More Proctorio."

13. See Hardesty, "Study Finds Gender and Skin-Type Bias."

14. See Partnership for 21st Century Learning, "Framework for 21st Century Learning Definitions."

15. Washington Office of Superintendent of Public Instruction, "Washington Career and Technical Education 21st Century Leadership Skills."

Table 7.1: Washington Career and Technical Education 21st Century Leadership Skills	
1. Creativity and Innovation	
1.A Think Creatively Student Outcome: The student will be involved in activities that require applying theory, problem-solving, and using critical and creative thinking skills while understanding outcomes of related decisions.	
1.A.1	Use a wide range of idea creation techniques (such as brainstorming)
1.A.2	Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3	Elaborate, refine, analyze, and evaluate their own ideas in order to improve and maximize creative efforts
1.B Work Creatively with Others Student Outcome: The student will demonstrate the ability to incorporate and utilize the principles of group dynamics in a variety of settings.	
1.B.1	Develop, implement, and communicate new ideas to others effectively
1.B.2	Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work
1.B.3	Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas
1.B.4	View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes
1.C Implement Innovations Student Outcome: The student will demonstrate skills that assist in understanding and accepting responsibility to family, community, and business and industry.	
1.C.1	Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur
2. Critical Thinking and Problem Solving	
2.A Reason Effectively Student Outcome: The student will analyze, refine, and apply decision-making skills through classroom, family, community, and business and industry (work-related) experiences.	
2.A.1	Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
2.B Use Systems Thinking Student Outcome: The student will demonstrate an understanding of complex inter-relationships (systems). This means that the student understands social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems.	
2.B.1	Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

2.C Make Judgments and Decisions Student Outcome: The student will analyze, refine, and apply decision-making skills through classroom, family, community, and business and industry (work-related) experiences.	
2.C.1	Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2	Analyze and evaluate major alternative points of view
2.C.3	Synthesize and make connections between information and arguments
2.C.4	Interpret information and draw conclusions based on the best analysis
2.C.5	Reflect critically on learning experiences and processes
2.D Solve Problems Student Outcome: The student will be involved in activities that require applying theory, problem-solving, and using critical and creative thinking skills while understanding outcomes of related decisions.	
2.D.1	Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2	Identify and ask significant questions that clarify various points of view and lead to better solutions
3. Communication and Collaboration	
3.A Communicate Clearly Student Outcome: The student will demonstrate oral, interpersonal, written, and electronic communication and presentation skills and understands how to apply those skills.	
3.A.1	Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts
3.A.2	Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions
3.A.3	Use communication for a range of purposes (e.g., to inform, instruct, motivate, and persuade)
3.A.4	Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5	Communicate effectively in diverse environments (including multi-lingual)
3.B Collaborate with Others Student Outcome: The student will communicate, participate, and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.	
3.B.1	Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2	Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3	Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Having such a list of standards is an excellent first step, but it will not lead to change unless many teachers modify their curricula to incorporate standards related to the 4Cs. One possible way to encourage educators to incorporate standards for the 4Cs into curricula would be to fund teacher trainings that help them integrate standards in ways that can maintain or raise academic achievement. In other words, teachers would be more likely to embrace this change if these essential skills can be taught while maintaining or increasing students' understanding of course content. Another possibility would be to require teachers to integrate these standards. This widely-used method may be met with resistance and, when implemented, taught using less authentic practices. A third possibility would be to explore how AI may help in this process. We will consider this idea as we define and describe each of the four 4Cs.

In the next part of this chapter, we will define each of the 4Cs, share examples of how they can be taught, and identify benefits and challenges associated with AI. For each of the 4Cs, we want to examine what the role of AI might be in the teaching and learning process. To be beneficial, AI should help students have greater agency in their learning. A less effective or possibly problematic use of AI may be when it is used primarily as an efficiency tool for educators to monitor students or automate assessment of knowledge.[16]

CREATIVITY

The Partnership for 21st Century Learning defines creativity as the ability to develop meaningful new ideas using various strategies. Creative learners collaborate with others on innovative projects by being open and responsive to diverse ideas and approaches.[17] Students demonstrate thinking creatively during class projects by generating new and meaningful ideas using techniques such as brainstorming or mind mapping. These ideas are then improved through individual and group analysis and refinement. Students demonstrate an ability to work creatively with others by developing strategies to communicate new ideas with team members effectively. This group work can be facilitated by developing group norms that include essential elements such as being open to diverse perspectives, showing willingness to share ideas, and utilizing feedback.

16. See Selwyn, *Should Robots Replace Teachers?*

17. See Partnership for 21st Century Learning, "Framework for 21st Century Learning Definitions."

As part of learning the skill of creativity, students need to understand that failure within the project is part of the cyclical process of creation. Rather than being the end of the project, failure indicates a need to change and try again. If a team shares brainstormed project ideas with the teacher and is told that none fit the project's scope, the team does not quit. The team adjusts and generates more ideas. This is a place where technology and AI specifically excel; AI systems receive feedback about failures, modify algorithms, and repeatedly try without frustration until a goal is reached.[18] However, the use of AI in creative learning can be ambiguous. Consider an example in which students work with AI as a collaborator to brainstorm ideas for a project.[19] In such a situation the teacher would need to determine the role of AI in this process, as it may come up with excellent or inappropriate ideas. To master a standard for creativity, students could instead primarily focus on analysis and refinement of AI contributions.

Does the future of all group work include asking AI for project possibilities instead of human-only brainstorming? Artificial intelligence may help us come up with ideas we would have never considered, but AI may also limit ideas to a narrow or specific viewpoint, depending on the data to which it has access. Problems with insufficient, flawed, or problematically biased datasets should make us consider how much of the creative process we should turn over to AI. This is not a simple concern, such as when math teachers worried about allowing calculators in the classroom. Understanding the data as well as algorithms used in a particular AI application is necessary for understanding how it will contribute to the learning process. Marcus Du Sautoy argues that, to the extent that creativity can be broken down into code, machines will be "creative."[20] Can simple human brainstorming be converted to an algorithm and done by machines? Brainstorming software enhanced by AI is already being used by design firms and in other fields.[21] Nevertheless, humans must stay engaged in creative processes, always thinking critically about machines' "creative" contributions. Joseph Aoun argues that creativity is one area where humans can distinguish themselves from machines, and he encourages us to do everything we can to learn and cultivate creativity.[22]

18. See Domingos, *Master Algorithm*.

19. See Syverson, "Rules of Brainstorming Change When Artificial Intelligence Gets Involved."

20. See Du Sautoy, *Creativity Code*.

21. See Syverson, "Rules of Brainstorming Change When Artificial Intelligence Gets Involved."

22. See Aoun, *Robot-Proof*.

CRITICAL THINKING

Critical thinking, the second of the 4Cs, can be defined as learning how to reason effectively to make sound judgments and decisions.[23] Critical thinking empowers students to evaluate sources of information, make well-reasoned determinations, and be confident about actions that need to be taken.[24] The standard for critical thinking can be broken down into four parts: effective reasoning, systems thinking, making judgments and decisions, and solving problems. All parts are worthy of exploration, but here we will focus on effective reasoning.

Students can be taught how to improve inductive and deductive reasoning skills to aid them in decision-making. They can learn top-down techniques (deductive) to improve decision-making when given a rule or theory. As long as the rules are trustworthy and applied correctly, deductive reasoning can be accurate and helpful. For example, the proper use of a math formula and its data can make a trustworthy deductive decision. Students can also learn bottom-up techniques (inductive) to improve decision-making when, for example, they are given specific observations about which to make broad generalizations. The accuracy of these generalizations may not be entirely precise, but students need to learn how to make the best possible decisions based on available data. For example, if students want to get degrees in fields with a strong job market, they can use employment data to help them make that determination. However, top-down factors, such as macroeconomic and other trends, should also be considered to improve the accuracy of bottom-up decisions. Learning how to improve inductive and deductive reasoning will benefit students throughout their lives.

Early versions of AI tools from the 1950s were good at deductive reasoning.[25] These types of AI, called expert systems, are computer programs that integrate established rules or theories from authoritative sources to make decisions. An expert system receives input from a user, such as a question, and evaluates this input using programmed rules to decide on and provide an answer. This decision-making can be relatively simple, such as the answer to a trivia question, or it can be more complex, such as when a person inputs a series of chess moves and the expert system outputs countermoves. In the latter case, the expert system could be designed to mimic the moves of a specific world chess champion or a typical novice player. Expert systems can be comparatively better at deductive reasoning than

23. See Landon, "Student Perceptions of Learning."
24. See Kay and Greenhill, "Twenty-First Century Students Need 21st Century Skills."
25. See Littlefield, "Human Skills AI Can't Replace."

humans, who may forget rules and may take longer to process them and provide answers.

Until recently, humans were thought to be better at inductive reasoning than AI. However, with advanced processing power and extensive cloud storage, AI can now be faster and more accurate at some forms of inductive reasoning than humans. A form of AI called deep learning organizes large amounts of data and uses inductive reasoning models to develop general rules to make decisions.[26] An example of this is speech recognition on a smartphone, where the AI is continually developing new general rules for what words are being "heard" while the speech recognition tool is in use. In an academic setting, this might mean that a web meeting AI-based captioning system "learns" new words or new uses of words based on the conversations of previous meetings and makes general rules that result in better accuracy of transcripts.

Humans have a distinct advantage over AI in a third type of reasoning called abductive reasoning.[27] Abductive reasoning is defined as examining an incomplete set of observations and choosing the likeliest explanation.[28] Whereas deductive reasoning involves certainty, and inductive reasoning uses probability to infer a correct choice based on data, we use abductive reasoning frequently in our daily lives when we make a best guess based on limited data. For example, we might decide to give a student more time on a project because we suspect there may be personal reasons why the student could not complete the work on time. Perhaps we are mindful of traumatic events in the world that may be impacting this student, or perhaps the student is late with work due to some unavoidable circumstance. An AI system might make the same decision, but there may not be enough personal data for an inductive decision based on deep learning, or the situation may be too individualized for an expert system's deductive decision. In addition, AI would lack any real empathy for the personal dimension of the problem.[29]

Because educational contexts value evidence-based decisions, it may seem that abductive reasoning has limited application in teaching and learning. Focusing on engineering education, Ciarán O'Reilly argues, however, that abductive reasoning is important because it is the only type of reasoning that allows for the introduction of new ideas, which leads to practicing creative thinking. His study concluded that if abductive reasoning were included as part of project learning outcomes, students would have

26. See Hardesty, "Explained: Neural Networks."
27. See Littlefield, "Human Skills AI Can't Replace."
28. See Sooknanan and Seemungal, "Not So Elementary."
29. See Littlefield, "Human Skills AI Can't Replace."

opportunities to practice critical and creative thinking.[30] Practicing abductive reasoning skills, for example through games, may help students gain confidence in their reasoning skills.[31]

COMMUNICATION

Communication can be defined as sharing and listening to thoughts and ideas with others through digital and analogue technologies, using written, oral, and non-verbal interactions.[32] Over the years, there has been a repeated call from employers for improved communication skills for entry-level workers.[33] A 2017 study showed a significant disconnect between the percentage of employers who thought their entry-level emplyees' oral and written communication skills were proficient (41.6 percent) and the percentage of students who thought their oral and written communication skills were proficient (79.4 percent).[34] Teachers and administrators can address this concern by integrating opportunities for students to practice their communication skills as part of their regular coursework.

According to P21, students should be able to articulate thoughts and ideas effectively; listen and determine meaning; use communication to inform, instruct, motivate, and persuade; use digital technologies to communicate effectively; and communicate in diverse environments, such as in a multi-lingual meeting.[35] With appropriate professional development and time to design curricula, teachers should be able to create authentic, integrated assignments that provide opportunities for students to practice and master these communication skills.

As AI continues to improve, there is no question that some current communication tasks humans are doing will be automated. It is common now for chatbots to be an initial point of contact when contacting a business by phone or online. As chatbots "learn," they will become more human-like in their ability to answer correctly more of the questions being asked of them. In education, some fear that AI will take over the jobs of teachers. A common response to this is that any teacher who can be replaced by AI should be. In any case, AI has the potential to change the role of the teacher.

30. See O'Reilly, "Creative Engineers."

31. See Hwang et al., "Practicing Abductive Reasoning."

32. See Landon, "Student Perceptions of Learning."

33. See Casner-Lotto and Barrington, *Are They Really Ready to Work?*

34. See National Association of Colleges and Employers, "Job Outlook."

35. See Partnership for 21st Century Learning, "Framework for 21st Century Learning Definitions."

It may not be long before we begin to see social robots serving as teaching assistants in classrooms. The teacher's role may become more like that of a manager, overseeing these robots, verifying instructional choices, and providing support when robots are unable to communicate effectively.[36] Rather than looking at this possible change as a problem, we can think of it as a way to free up teachers to work with individual students, plan curricula, provide feedback, or do other tasks for which they currently lack time due to the number of students they teach. This can also help students learn how to communicate with AI agents. Communication skills will always be valued in and beyond the workplace, and students need to learn how to communicate with AI as well as human collaborators.

COLLABORATION

As our world has become more connected, the opportunities and needs to work collaboratively have grown rapidly. The COVID-19 pandemic required all of us to learn new ways to collaborate using technology, and many of these are likely to continue long beyond the pandemic. Collaboration can be defined as working with others toward a common goal.[37] In the P21 standards, students are to demonstrate an ability to work effectively with a diverse team, exhibit flexibility and a willingness to compromise to reach team goals, be a responsible teammate, and value the contributions made by all team members.[38]

Looking at the standard closely, it seems evident that the "others" collaborating with students are humans. However, if these standards were updated today, it is likely that collaborators on a student's project could include AI agents. Are AI agents ready to collaborate? Much of the current research has focused on human-AI interaction, but interaction is different than collaboration. As collaboration standards often state, teams collaborate to reach a common goal (see, e.g., table 7.1). Interaction does not require a common goal, which is why there needs to be a shift in AI research from human-AI interaction to human-AI collaboration.[39] A common problem in human collaboration is social loafing, which is when a group member exerts less effort in a group project than when working alone.[40] Social loaf-

36. See Edwards et al., "I, Teacher."

37. See Landon, "Student Perceptions of Learning."

38. See Partnership for 21st Century Learning, "Framework for 21st Century Learning Definitions."

39. See Wang et al., "From Human-Human Collaboration to Human-AI Collaboration."

40. Liden et al., "Social Loafing."

ing is frequently listed as a reason why students do not like group projects. This issue could be eliminated when working with AI agents. Regardless, students need opportunities to collaborate with AI agents on school projects to prepare them for collaborating with AI at work and elsewhere.

As always, the greatest challenges we face require collaboration. A number of AI researchers recently issued a call "to prioritize the development of cooperative intelligence that has the ability to promote mutually beneficial joint action." Cooperative intelligence, they point out, is not an alternative to human or AI autonomy; it goes beyond these to "enable us to achieve much-needed global cooperation in the future." For AI developers, this will require work on AI-AI cooperation, AI-human cooperation, and AI that improves human-human cooperation.[41] For those of us learning to collaborate with artificial agents, this necessitates, in the words of Aoun, cultivating human as well as technological literacies.[42]

THEOLOGICAL REFLECTIONS ON CREATIVITY AND COMMUNITY

Even though AI is at the top of many lists of technologies that is expected to transform education, "its use is just getting under way in teaching and learning."[43] As AI is integrated increasingly into various educational systems and pedagogical practices, from learning management systems to AI tutors, it must be done with "sound educational and societal justification."[44] Artificial intelligence needs to be aligned intentionally with established learning standards, such as those associated with the 4Cs, as well as with ethical principles such as privacy and equity. The 4Cs, which emphasize human ingenuity and relationships, acknowledge that we are fundamentally social and creative beings: Throughout the history of our species, our sociality has been joined with our ability to form abstract concepts and to imagine and create shared futures. The clarity the 4Cs provide about important aspects of human nature can help us find ways to balance instructor, student, and artificial agency. For Christians seeking faithful engagement with AI, theological understandings of creativity and community can provide further resources for reflection.

The artist Makoto Fujimura states that his "identity is rooted in the origin of Creation, and in the loving gaze of the Creator, who sees in us a

41. Dafoe et al., "Cooperative AI," 34, 36.
42. See Aoun, *Robot-Proof*.
43. Pelletier et al., "2021 EDUCAUSE Horizon Report," 13.
44. Selwyn, *Should Robots Replace Teachers?*, 131.

'greater love' before we are even aware: the creative impulse to shape the future." The Christian Bible, a collection of creative literary works, begins with creation and ends with new creation. Within God's creation, humans create new things—through agriculture, construction, musical instruments, metalworking, etc. (Gen 4)—and participate in God's creation of a new world (Rev 21:24–26). "To be human is to be creative," Fujimura concludes, and "unless we are making something, we cannot know the depth of God's being and God's grace permeating our lives and God's Creation." And in knowing God, we discover that God is "making all things new" in Jesus Christ (Rev 21:5). "The Christian narrative is all about the New," Fujimura says, and "part of that ushering in of the New is God's marker in us, called imagination, which makes us unique" and "uniquely defines our role in Creation." "What we build, design, and depict," he adds, "will become part of the future city of God."[45]

Fujimura sees creativity as a challenge to usefulness, especially the type of rationalized efficiency that often characterizes technological methodology—what Jacques Ellul called "technique." True human creativity, which "echoes God's character," is not utilitarian but gratuitous. God creates out of an abundance of love, and God's ultimate plan is "an imaginative New Creation": "God does not just mend, repair, and restore; God renews and generates, transcending our expectations of even what we desire, beyond what we dare to ask or imagine."[46] Frank Pasquale correctly points out that "a managerial mindset has colonized too much of [educational technology], insisting on the primacy of quantitative measurement." But education "has multiple purposes and goals, many of which cannot or should not be reduced to numerical measures," and we should not let AI "usurp and ultimately dictate our values rather than to serve as a tool that helps us achieve them."[47]

Gratuitous creativity creates community, establishing new and charitable relationships between givers and receivers. At the center of new creation is the body of Christ—the community of those who have received God's gift of love and new life. In the eschatological vision of the city of God (Rev 21–22), in the protological vision of initial creation (Gen 1–2), and in the early life of the Christian church (Acts 2–7), communities respond to God's loving and creative acts by embodying and enacting God's plan—stewarding, developing, and transforming the created world. Within the context of creation, we survive and thrive in creative and caring communities.

45. Fujimura, *Art and Faith*, 1, 6–7, 9, 12, 14.
46. Fujimura, *Art and Faith*, 13, 15, 29, 31.
47. Pasquale, *New Laws of Robotics*, 62–63.

As Norma Wirzba points out, "Life is not simply lived *with* or *alongside* others. It is lived *through* others and *by means of* them. . . . A healthy and flourishing life is always life together." Wirzba continues:

> Though we each exist as individual persons, our identity and agency are entirely dependent on how well we are able to fully face each other, receiving the nurture we need and giving the help we are uniquely equipped to provide. When the love of Jesus is found to be circulating among people, they are enabled to face each other with care and without shame.

Out of God's love we are created, and that same love creates an imagination enabling us to love, create, and live into "a new world governed by joy and peace and resulting in beauty and mutual flourishing."[48] For Christians, the fullest realization of community involves receiving and sharing the self-giving love of Christ. As Dietrich Bonhoeffer explains it, "Christian community means community through Jesus Christ and in Jesus Christ . . . from eternity we have been chosen in Jesus Christ, accepted in time, and united for eternity." "Christian community is not an ideal we have to realize," Bonhoeffer declares, "but rather a reality created by God in Christ in which we may participate."[49]

In education, we invite students to join and participate in a community of learning—to enter a social space where "learning awakens" through imitation, interaction, and collaboration.[50] There is a spiritual dimension to this work, which, in the words of Parker Palmer, concerns "the heart's longing to be connected with the largeness of life."[51] Cultivating creativity and community as AI augments education are significant spiritual priorities as well as learning goals—for these fundamental aspects of our shared humanity enable us to realize the greater possibilities and realities that come from gratuitous creativity and loving community.

The history of educational technology shows that technology alone does not transform education. The agency of teachers, attending to cultural contexts and addressing social inequities, is necessary for truly transformative education. The temptations of AI efficiencies—such as facial and emotional detection systems to monitor student attention and engagement, or automated guidance through and grading of student work—are strong. But at some point, technological utility inhibits human creativity. Another concern, accompanying the elevation of technological efficiency, is "the logic

48. Wirzba, *Way of Love*, 159–60, 162, 184.
49. Bonhoeffer, *Life Together*, 5, 13.
50. Lev Vygotsky, quoted in Darby and Lang, *Small Teaching Online*, 78.
51. Palmer, *Courage to Teach*, 5.

of individualized learning" and "the reorganization of education around the needs, interests, and circumstances of individuals rather than groups, classes, or communities."[52] At some point, individualization compromises community cohesion. Certainly, education about AI is critical and AI can enhance education; but, as Michelle Zimmerman says, "Technology is just one component of preparing learners for a world with AI."[53] The 4Cs, which highlight valuable skills as well as deeper values, can help us create and thrive together in this world.

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