The AI Revolution: Awareness of and Readiness for AI-based Digital Tools and Technologies in Business Education

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Abstract

There are few studies assessing the AI awareness or AI readiness of business educators, and little research about the integration of AI-based tools such as GenAI into education using a theoretical perspective. The purpose of this study, which was informed by the TPACK framework, was to assess the current state of AI awareness and AI readiness of secondary and higher education business educators to understand how and why educational administrators, educators, policymakers, and other stakeholders can help business educators understand the implications of adopting AI-based tools in their education institutions.

The research design was a non-experimental, descriptive study, and the methodology was quantitative using survey research. The sample was business educators in United States' secondary and post-secondary business programs. Descriptive and correlational statistics were used to analyze data.

While a majority of business educators want to incorporate the latest AI-based tools into their instruction, there is a lack of knowledge on how to apply technologies. Business educators are using AI-based tools for their personal use but do not know how to use them in classroom instruction to help students learn. Business educators are not worried that AI-based tools could replace their jobs; however, this could be because they are unaware of the potential of AI-based tools in classroom instruction.

Keywords: artificial intelligence; AI awareness; AI readiness; AI-based tools; GenAI; digital tools and technologies; business education; TPACK; educational innovation

The fast pace at which ChatGPT, Google Gemini (formerly Google Bard), and other generative AI (GenAI) tools exploded into education resulted in feelings of panic and uneasiness (Morris, 2024; Roose, 2023), including fears of widespread student plagiarism (Hadi Mogavi et al., 2024) with little time to understand its full capabilities. It has been called a "disruptive technology" (Păvăloaia & Necula, 2023) causing educators uncertainty about what these technologies mean for teaching and learning. One example of educational panic was the New York State Education Department's decision to block ChatGPT in all New York City public schools. Students, teachers, and staff could not access it on school-owned devices or networks (Elsen-Rooney, 2023). Access was restricted due to the potential negative impacts on student learning, safety and privacy issues. Additionally, there were concerns about students losing the ability to problem-solve and think critically if ChatGPT was allowed.

While AI (GenAI) in education is not new, it has adapted to technological advances that have changed teaching and learning (i.e. the scientific calculator and smartphones). With the explosion of GenAI tools, some educators leveraged its capabilities rather than disregarding it as a potential teaching tool. There are numerous AI-based tools available to educators such as voice assistants (i.e. Siri or Alexa), hardware devices (i.e. robots and drones), and grading and feedback tools. According to Diliberti et al. (2024), 18% of K-12 teachers reported using AI tools in their classroom, and those that did used virtual learning platforms, adaptive learning systems, and chatbots on a weekly basis. It is promising that GenAI is emerging as a helpful teacher resource. Teachers surveyed at the end of the 2023-2024 school year indicated 46% of satisfied teachers use AI more than their unsatisfied (26%) counterparts (Business Wire, 2024).

Educators have always been responsible for teaching and learning the digital tools needed to support advancing students' technology skills. AI-based tools can be implemented in curriculum that not only supports student learning but also prepares students for college and career readiness. Early in the AI Revolution, Walia and Kumar (2022) coined the terms *AI Awareness* and *AI Readiness.* AI awareness is the knowledge that "AI is already all around us and is impacting society as it continues to become integrated into more and more computer programs, apps, and processes" (Anders, 2023, p. 13). Equally important is AI readiness, which is the transition from understanding what AI is and can do to being able to understand what it can achieve based on educational needs (Luckin et al., 2022). However, continuous changes coupled with a lack of understanding are major determinants of accepting new technologies (Walia & Kumar, 2022), so educators are tasked with taking a proactive approach in adopting new technologies to help prepare an innovative workforce.

Preparing the American Workforce for Jobs of the Future

Business education prepares the workforce for jobs of the future. The need for AI talent is coming from business leaders who have problems for AI to solve (EY LLP Limited, 2018). While computer science and engineering programs have been offering AI courses for several years (Xu & Babaian, 2021) business education is lagging. One of the current problems in business education is a lack of curriculum development. Most AI-related curricula are technical and not written for a business audience.

Additionally, the AI field is developing so quickly that it is difficult to keep up with the technologies. Once AI is integrated into the curriculum, it may soon be out of date (Xu & Babaian, 2021). The 2024 Higher Learning Commission's *Trends in Higher Education* publication strongly encouraged professional development in AI and emphasized the impact of AI on the future of education ("2024 Trends in Higher Education," 2024). AACSB, a worldwide accreditor for business schools and programs, has not recommended any model AI curriculum, although it has called on business schools to embrace AI curriculum (Whitwell, 2020). Coursera, one of the Massive Open Online Courses (MOOC) programs, has many AI courses, but they are not, in general, designed for business students (Xu & Babaian, 2021).

There is a dichotomy between the expected productivity gains GenAI is expected to have and the potentially catastrophic job loss that could occur. Goldman Sachs (2023) estimates that GenAI could eventually raise global Gross Domestic Product (GDP) by 7% in the next decade by raising labor productivity, decreasing labor costs, and increasing the pace of economic growth. McKinsey Digital (2023) reports that GenAI could add $2.6 to $4.4 trillion annually to the global economy. Goldman Sachs (2023) estimates GenAI could potentially impact 300 million full-time jobs worldwide. Additionally, Goldman Sachs (2023) estimates that one-fourth of current work tasks performed in the US could be automated by GenAI. The five work tasks most likely to be GenAI-automated are administrative professions, legal professions, architecture and engineering, life, physical and social science, and business and financial operations. In addition to potential job loss, there are positive impacts GenAI is likely to have on worker productivity. For example, GenAI could lessen the time it takes workers to search for information (McKinsey Digital, 2023), and it is being used to reduce or eliminate repetitive tasks done by humans (Microsoft-EY, 2018a).

Literature Review

Business Educators' Awareness of AI

AI surrounds us in everyday computer programs and apps and the use of AI continues to grow. Before AI can be used effectively in the classroom it is necessary for educators to understand AI and its capabilities. Artificial Intelligence (AI) is a computer simulation of human intelligence and "uses complex algorithms trained on trillions of words and images from the open internet to produce text, images and audio" (De Vynck, 2023, para. 4). In a recent study, educators in Austria and Hungary were part of an international project titled Education and Awareness for Intelligent Systems (ENARIS). The project aimed to foster AI awareness and understanding of AI concepts among K-12 educators (Kandlhofer et al., 2023). Over two years, workshops were offered to strengthen awareness of AI as well as help educators incorporate AI into their classes. Pre- and post-tests were used to analyze the level of AI awareness in the workshops. Compared to the results of the pre-tests (m=52.83, SD= 22.88) the teachers showed significant gains in AI awareness and knowledge after the workshops (m=74.85, SD=21.62).

While positive progress toward educator AI awareness is being made, there is still a significant number of educators who lack awareness. In the "2023 Educator AI Report", Hallowell (2023)

identified “66% of teachers who have not yet adopted generative AI cite a lack of familiarity [awareness of] as their primary impediment to implementation and 28% remain uncertain about its advantages and disadvantages” (p. 5). Therefore, there is an opportunity to increase awareness of AI among educators.

Business Educators’ Readiness for AI

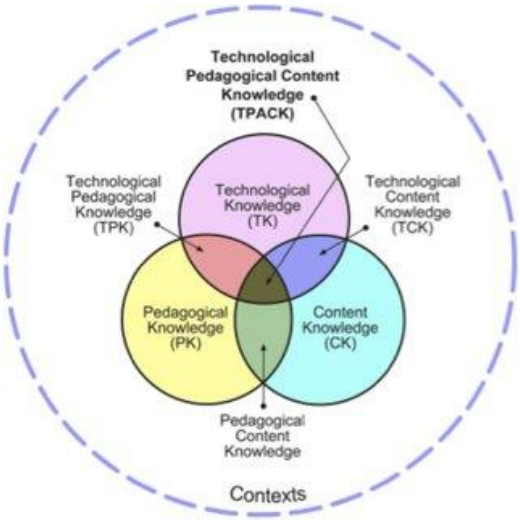
Building on AI awareness is the ability for educators to implement AI-based tools in their teaching. This concept of implementing AI-based tools is known as AI readiness. Wang et al. (2023) studied the effect of primary school Chinese teachers’ AI readiness on their perception of the threat from AI, AI-enhanced innovation, and job satisfaction. AI readiness in this case was considered across four components: cognition, ability, vision, and ethics in the use of AI. Survey results found that teachers who believed they had high levels of AI readiness perceived AI as less of a threat. They also exhibited higher job satisfaction. AI readiness supports the appropriate use of AI-based tools in education.

An understanding of the AI readiness components is key to enhanced educational opportunities (Wang et al., 2023). There are four components of AI-readiness: cognition, ability, vision, and ethics (Wang et al., 2023). The study found these four components, when used in education, were positively related to ethical considerations. Cognition is a sufficient understanding of how AI functions in education, the knowledge about which AI-based tools to use, and when to use it in instruction. Ability is enhancing one’s AI competency and skill. In terms of vision, educators can explore how AI is revolutionizing the field of education through its capabilities and potential risks. Wang et al. (2023) concluded that the ethical awareness of the responsible use of AI is driven mostly by the relationship between vision and ethics, while cognition and ability can support an educator's AI-enhanced innovative teaching practices. The idea of innovative teaching practices is grounded in an evidence-based theoretical framework.

Theoretical Framework

The theoretical framework for this study was based on the TPACK (technological pedagogical and content knowledge) framework, as seen in Figure 1 (Mishra et al., 2011). The TPACK framework was one of the first models in teacher education to include technology alongside knowledge of content and pedagogical knowledge. In the 1980s, computers and computer software entered the U.S. education system. At first, these technology tools were considered to be their own body of knowledge. The TPACK framework connected advanced technologies with pedagogy and content knowledge and was built on the premise that technology must be integrated with pedagogy and content knowledge for teaching and learning to be effective. Content knowledge is the subject matter that is taught and includes the facts, theories, concepts, frameworks, and procedures within a given subject (Shulman, 1986). Pedagogical knowledge includes teaching and learning methods including curriculum planning, instruction, assessment, and classroom management (Shulman, 1986).

Figure 1: The TPACK Framework



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Educators have had to learn to use digital tools, teach students how to use the tools and learn how to incorporate the tools into their teaching. The TPACK model helps encourage educators to continuously develop their knowledge as technologies evolve (Archambault & Barnett, 2010), and it is a useful model for measuring educators' AI awareness and readiness in the new and growing world of AI-based digital tools and technologies. While the TPACK framework has been widely used to inform educational research in content areas including social studies, science, music, mathematics, and physical education (Mishra et al., 2011), it has been used much less in business education. Because TPACK is technology agnostic (Mishra et al., 2011), it is a useful framework for considering how AI-based tools can support teaching and learning without debating the tools themselves.

Purpose of the Study and Research Questions

Many business educators at all educational levels have a lack of awareness about the benefits and challenges of AI. AI is a complex topic and most often found in the disciplines of computing and engineering, while other disciplines are behind in implementing AI education (Xu and Babaian, 2021). Additionally, Stine et al., (2019) found that business school faculty expressed concerns about the ability to adapt to a swiftly-changing environment. At the same time, there are few studies assessing the AI readiness of educators and even fewer assessing the AI readiness of business educators (Walia & Kumar, 2022). Additionally, there is little research on the integration of AI-based tools into education using a theoretical perspective (Celik, 2023). It is important to explore how AI can benefit student learning, and how AI is changing the role of educators. The purpose of this study was to assess the current state of AI awareness and AI readiness of secondary and higher education business educators to understand how and why

educational administrators, educators, policymakers, and other stakeholders can help business educators understand the implications of adopting AI-based tools in their education institutions.

This study may benefit several stakeholders. High school and higher education business educators at all educational levels and in many sub-disciplines of business will be able to understand, at this point in time, the level of AI awareness and readiness in business education, which may inform their instructional practice. High school, community college, and university IT departments can use the findings to recognize the need to make AI-based tools and resources available to business educators. Instructional designers can assist business educators in designing curriculum that optimizes the use of AI-based tools to help students learn. Findings may also help high schools, community colleges, and universities plan professional development for their faculty. Finally, because of the predicted economic impacts of AI on job loss that are still mostly unknown, educational policymakers can use the findings as one resource for preparing business education for a world that now contains AI. How this will impact the broader economy is difficult to predict but is something educators and policymakers need to consider as they prepare educators for the future. The research questions for this study were:

1. Among high school and higher education business educators, what is the degree of AI **awareness**?
2. Among high school and higher education business educators, what is the degree of AI **readiness**?
    a. Sub-RQ: Is there a correlation between any of the combinations of the four AI-readiness constructs (vision, ability, cognition, ethics)?
    b. Sub-RQ: Is there a correlation between any of the four AI-readiness constructs and AI-awareness?

Research Design and Methodology

The research design of this study was a non-experimental, correlational study. The methodology was quantitative using survey research. Institutional Review Board (IRB) approval was obtained from all three researchers' universities.

The sample was business educators in United States' secondary and higher education business programs, and the sampling frame was current members of the National Business Education Association (NBEA). The NBEA consists of secondary and higher education business educators including post-secondary (community/technical college, bachelor's-level, and master's-level) business educators and administrators. There were 2,257 members of the organization as of July 2023.

Research Instrument

The research instrument used in the present study was adapted from an existing survey of Indian business educators that assessed their AI awareness and readiness (Walia & Kumar, 2022). Additional questions were added based on a review of existing literature, especially from Luckin et al. (2022) and Delponte (2018). The survey, using questions on a five-point Likert-style scale, consisted of five statements about AI awareness and 14 statements about AI readiness. The scale for the questions about AI awareness and AI readiness ranged in responses from "1=completely disagree" to "5=completely agree". The only demographic question included in the survey asked respondents to identify the academic level of their primary teaching role as either high school (grades 9-12), trade/technical/vocational (non-degree seeking), associate's degree (degree seeking), bachelor's degree, or master's degree.

Data Collection and Analysis

Participants were sought by emailing the NBEA membership an invitation to participate and link to the survey, followed by a reminder email seven days later, and a final reminder email another seven days later. An informed consent was the first question on the survey, and participants were asked not to proceed with the survey unless they gave informed consent. Data was collected using the Qualtrics electronic survey tool, and Microsoft Excel was used to analyze the data. The sample size was 2,257 and 71 people responded, for a 3.15% response rate. This is not an abnormal response rate for an email survey of this nature.

The research questions were descriptive, meaning they asked what or which questions, so the statistical analysis followed those statistics suitable for a descriptive research design. Descriptive analysis is an appropriate statistical method for summarizing and describing the characteristics of a sample (Gall et al., 2007). Cronbach's (1951) alpha was calculated for the scaled questions and was 0.84, which is good internal consistency for descriptive survey research. Descriptive statistics including frequency distributions and percentages were calculated from the data. Spearman's rank-order Correlation Coefficient (Freund & Wilson, 2003), the appropriate statistical test for measuring the association of two ordinal variables, was calculated on the four AI-readiness constructs using each construct as a ranked variable. Additionally, Spearman was calculated on the four readiness constructs and the mean of overall AI-awareness.

Results

For the demographic question, 63.38% of respondents reported the academic level of their primary teaching role was high school (grades 9-12), and 36.62% reported that their academic level was higher education. Of the higher education business educators, 1.41% taught primarily trade/technical/vocational (non-degree seeking) students, 4.23% taught primarily associates degree (degree seeking) students, 16.90% taught bachelor's degree-seeking students, and 14.08% taught master's degree-seeking students.

The first research question asked, “Among business educators, what is the degree of AI awareness? Frequency statistics were calculated for each of the five awareness statements. On a scale of 1=completely disagree to 5=completely agree, results showed that 81.69% of respondents agreed that AI-based instruction was implemented using digital-based technologies. Additionally, 69.01% agreed that AI-based instruction is a combination of classroom and web-based teaching, and 57.75% agreed that AI-based instruction is a personalized form of instruction using digital technologies. See Tables 1-3.

Table 1: AI Awareness - AI-based instruction is implemented using digital technologies

	All Educators Degree of Awareness	
Answer	n	%
Completely Agree	19	26.76%
Agree	39	54.93%
Neither Disagree Or Agree	9	12.68%
Disagree	3	4.23%
Completely Disagree	1	1.41%
Total	71	100.00%

Table 2: AI Awareness - AI-based instruction is a combination of classroom and web-based teaching

	All Educators Degree of Awareness	
Answer	n	%
Completely Agree	12	16.90%
Agree	37	52.11%
Neither Disagree Or Agree	15	21.13%
Disagree	6	8.45%
Completely Disagree	1	1.41%
Total	71	100.00%

Table 3: AI Awareness - AI-based instruction is a personalized form of instruction using digital technologies

	All Educators Degree of Awareness	
Answer	n	%
Completely Agree	11	15.49%
Agree	30	42.25%
Neither Disagree Or Agree	20	28.17%
Disagree	6	8.45%
Completely Disagree	4	5.63%
Total	71	100.00%

Two of the awareness questions yielded mixed results. While 46.48% agreed that AI-based instruction being delivered via artificially intelligent systems can replicate human intelligence, 30.99% did not agree, and 22.54% neither agreed or disagreed. While 38.02% agreed that AI-based instruction is remote-based instruction via any medium, 38.03% disagreed and 23.94% neither agreed or disagreed. See Tables 4-5.

Table 4: AI Awareness - AI-based instruction is delivered via artificially intelligent systems that can replicate human intelligence

	All Educators Degree of Awareness	
Answer	n	%
Completely Agree	9	12.68%
Agree	24	33.80%
Neither Disagree Or Agree	16	22.54%
Disagree	14	19.72%
Completely Disagree	8	11.27%
Total	71	100.00%

Table 5: AI Awareness - AI-based instruction is remote-based instruction via any medium

	All Educators Degree of Awareness	
Answer	n	%
Completely Agree	7	9.86%
Agree	20	28.17%
Neither Disagree Or Agree	17	23.94%
Disagree	13	18.31%
Completely Disagree	14	19.72%
Total	71	100.00%

The second research question asked, "Among business educators, what is the degree of AI readiness? Frequency statistics were calculated for each of the 15 readiness statements in the ability, cognition, vision, and ethics constructs using a scale of 1=completely disagree to 5=completely agree. For the ability construct, results showed that 76.06% of respondents agreed they do their best to incorporate the latest technologies in their classroom instruction. However, 66.20% of respondents disagreed that they know how to apply AI in their courses. Surprisingly, 90.14% disagreed that they regularly used AI-based hardware devices (i.e. robots, drones, autonomous cars) in their teaching. Finally, 80.28% do not regularly use AI-based tools like voice assistants, and 54.93% do not regularly use generative language tools. See Tables 6-9.

Table 6: AI Readiness - Ability Construct: I try my best to incorporate the latest technologies in my classroom instruction.

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	14	19.72%
Agree	40	56.34%
Neither Disagree Or Agree	10	14.08%
Disagree	5	7.04%
Completely Disagree	2	2.82%
Total	71	100.00%

Table 7: AI Readiness - Ability Construct: In my teaching, I regularly use AI-based hardware devices (i.e. robots, drones, autonomous cars).

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	2	2.82%
Agree	1	1.41%
Neither Disagree Or Agree	4	5.63%
Disagree	18	25.35%
Completely Disagree	46	64.79%
Total	71	100.00%

Table 8: AI Readiness - Ability Construct: In my teaching, I regularly use AI-based tools like Voice Assistants (i.e. Siri; Amazon Alexa).

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	2	2.82%
Agree	4	5.63%
Neither Disagree Or Agree	8	11.27%
Disagree	27	38.03%
Completely Disagree	30	42.25%
Total	71	100.00%

Table 9: AI Readiness - Ability Construct: In my teaching, I regularly use generative language tools (i.e. ChatGPT).

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	9	12.68%
Agree	14	19.72%
Neither Disagree Or Agree	9	12.68%
Disagree	20	28.17%
Completely Disagree	19	26.76%
Total	71	100.00%

Frequencies were also calculated on the cognition construct. Results showed that 50.70% disagreed that they know how to use AI to help their students learn. For their personal use, 81.69% disagreed that they regularly use AI-based hardware devices for their personal use, although a majority (59.15%) regularly use AI-based tools like voice assistants. There were mixed results on whether respondents use generative language tools, as 40.85% agreed and 45.07% disagreed. A majority of respondents (69.01%) disagreed that AI-based tools could replace their job. See Tables 10-14.

Table 10: AI Readiness - Cognition Construct: I know how to use AI to help my students learn

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	5	7.04%
Agree	19	26.76%
Neither Disagree Or Agree	11	15.49%
Disagree	22	30.99%
Completely Disagree	14	19.72%
Total	71	100.00%

Table 11: AI Readiness - Cognition Construct: For my personal use, I regularly use AI-based tools like Voice Assistants (i.e. Siri; Amazon Alexa)

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	19	26.76%
Agree	23	32.39%
Neither Disagree Or Agree	5	7.04%
Disagree	14	19.72%
Completely Disagree	10	14.08%
Total	71	100.00%

Table 12: AI Readiness - Cognition Construct: For my personal use, I regularly use generative language tools (i.e. ChatGPT)

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	12	16.90%
Agree	17	23.94%
Neither Disagree Or Agree	10	14.08%
Disagree	15	21.13%
Completely Disagree	17	23.94%
Total	71	100.00%

Table 13: AI Readiness - Cognition Construct: For my personal use, I regularly use AI-based hardware devices (i.e. robots, drones, autonomous cars)

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	2	2.82%
Agree	2	2.82%
Neither Disagree Or Agree	9	12.68%
Disagree	23	32.39%
Completely Disagree	35	49.30%
Total	71	100.00%

Table 14: AI Readiness - Cognition Construct: I think there is a possibility that AI could replace me/my job

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	2	2.82%
Agree	9	12.68%
Neither Disagree Or Agree	11	15.49%
Disagree	25	35.21%
Completely Disagree	24	33.80%
Total	71	100.00%

Frequency statistics were calculated on the vision construct which consisted of two statements. A majority of respondents (87.32%) thought the idea of teaching using AI was interesting and a majority of respondents (56.34%) disagreed that they were uncomfortable thinking about future uses of AI in business education. Frequency statistics were also calculated on the ethics construct, which consisted of one question. Results showed that 64.79% of respondents feared that AI generative language tools would be used by their students to cheat. See Tables 15-17.

Table 15: AI Readiness – Vision Construct: I think the idea of teaching using AI is interesting

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	34	47.89%
Agree	28	39.44%
Neither Disagree Or Agree	6	8.45%
Disagree	3	4.23%
Completely Disagree	0	0.00%
Total	71	100.00%

Table 16: AI Readiness – Vision Construct: I am uncomfortable thinking about future uses of AI in business education

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	7	9.86%
Agree	9	12.68%
Neither Disagree Or Agree	15	21.13%
Disagree	24	33.80%
Completely Disagree	16	22.54%
Total	71	100.00%

Table 17: AI Readiness – Ethics Construct: I fear that AI generative language tools (i.e. ChatGPT) will be used by my students to cheat

	All Educators Degree of Readiness	
Answer	n	%
Completely Agree	11	15.49%
Agree	35	49.30%
Neither Disagree Or Agree	16	22.54%
Disagree	4	5.63%
Completely Disagree	5	7.04%
Total	71	100.00%

Spearman's rank correlation was computed to assess the relationship between the AI Readiness Ability Construct and the AI Readiness Cognition Construct. There was a positive correlation between the two variables, r(69) = .80, p = .00. The result is significant at p < .05, and the correlation is very strong at 0.801997239. See Table 18.

Table 18: AI Readiness Ability Construct and AI Readiness Cognition Construct Correlation

Spearman correlation coefficient (rs)	0.801997239
N	71
T-Stat	11.15282108
df	69
p-value	0.00000

The result is significant at p < .05

Correlation is Very Strong (.80-1.0:)

Additionally, Spearman's rank correlation was computed to assess the relationship between AI Awareness and AI Readiness Cognition Construct. There was a positive correlation between the two variables, r(69) = .42, p = .0.000245. The result is significant at p < .05, and the correlation is moderate at 0.422216449. See Table 19.

Table 19: AI Awareness and AI Readiness Cognition Construct Correlation

Spearman correlation coefficient (rs)	0.422216449
N	71
T-Stat	3.868960171
df	69
p-value	0.000245

The result is significant at p < .05

Correlation is Moderate (.40-.59)

Findings and Discussion

Two findings help answer the research questions. The first finding is from the ability construct, which is the enhancement of AI competency and skills (Wang et al., 2023). While a majority of business educators want to incorporate the latest technologies in their instruction, there is a lack of knowledge on how to apply the technologies. Important discussion points about this finding are misconceptions, lack of knowledge about the positive benefits of AI-based digital tools for student learning and teacher satisfaction, and considerations using the TPACK framework. The second finding addresses the cognition construct, which is an understanding of how AI functions in education. Business educators are using many AI-based tools for their personal use but do not know how to use them in classroom instruction to help students learn. The second finding warrants three important discussion points: the lack of use of AI-based tools in classroom instruction, lack of awareness of potential job loss, and lack of confidence in technological pedagogical knowledge.

A lack of knowledge is contributing to the misconception that AI-based digital tools negatively impact student learning (Mormando, 2024). In late 2022 and early 2023, there were bans on digital tools such as ChatGPT in schools at all educational levels (Nolan 2023; Rosenblatt, 2023). Additionally, educators were understandably concerned that GenAI hallucinates (Alkaissi & McFarlane, 2023) in a very confident way, generating incorrect facts, and making up references and dates in a way that sounds like the truth. Moreover, it was difficult to determine when GenAI created facts or hallucinated (Chan & Hu, 2023) which made it difficult for educators to assess student learning.

There is also a lack of knowledge about the positive benefits of AI-based digital tools on student learning. Tools such as Elicit (Kung, 2023) help learners in the research and writing process by brainstorming research questions, summarizing relevant literature, and synthesizing findings. AI-based digital tools can be used to provide just-in-time automated feedback that helps learners complete an assessment (Zawacki-Richter et al., 2019), and can provide accurate, objective, and efficient grading on completed assessments (Owan et al., 2023).

Bryant et al., (2020) also suggested positive benefits on teacher satisfaction from the AI automation of tasks, stating, “some of this time, hopefully, will be given back to teachers themselves-to spend time with their families and their communities-thus increasing the attractiveness of teaching as a profession” (p. 5). They suggested that 20-40 percent of current American K-12 teacher hours are spent on tasks that could be automated. This could save teachers approximately 13 hours per week, time that could be redirected towards more direct engagement with students in areas such as social and emotional learning skill development, direct instruction, and coaching outcomes that may lead to higher student learning. Reducing teachers’ workload could have a positive impact on teacher burnout, which develops in response to chronic work stress (Maslach & Jackson, 1981) that is particularly prevalent in the teaching profession (Iancu et al., 2018). AI-based digital tools can also help human educators reduce their workload by automating time-consuming tasks such as modifying or personalizing tests and quizzes for students with specific learning needs (Zawacki-Richter et al., 2019). Research found that students “taught by a teacher suffering from burnout tend to perform worse on exams, tests, and receive lower cumulative grades, than those taught by teachers not experiencing burnout” (Madigan & Kim, 2021, p. 9).

The TPACK framework (Mishra & Koehler, 2006) helps consider how GenAI can be used to support educators in raising their knowledge about AI to be better prepared to use and teach it. To address the technological knowledge part of TPACK, educators need to understand that GenAI is different from existing technologies in two primary ways. First, GenAI tools are generative which means that they respond to prompts uniquely, by building on patterns in real-time, and do not respond to identical prompts in the same way each time (Mishra et al., 2011). Secondly, GenAI tools are social, but in different ways than social media tools are used. While social media tools are social because humans interact with other humans in ways that create connections and relationships, GenAI is social because it is human-like. Users input prompts and the GenAI tools generate unique responses that can continue to be regenerated and refined using different prompts.

The second finding is that business educators are using many AI-based tools, including GenAI, for their personal use but do not know how to use them in classroom instruction to help students learn. Additionally, the majority of business educators are not worried that AI-based tools could replace their jobs, but this may be because they are unaware of their potential applications in classroom instruction. This is similar to research conducted with 180 Hong Kong university educators from various academic disciplines. The educators were asked whether they believed technologies like ChatGPT would replace teachers in the future. Respondents reported low belief (mean = 2.26 out of 5.0) that teachers would be replaced (Chan, 2023).

It is not enough for educators to know how to use the GenAI technologies; they must also address the technological pedagogical knowledge part of the TPACK framework. For example, when prompted correctly, GenAI tools create assessments such as tests and quizzes. Because students can also use GenAI tools to answer tests and quizzes, educators must rethink their assessments. Educators continue to evaluate student learning to include student use of AI-based digital tools instead of banning them. As another example of pedagogical knowledge,

educators are increasing their knowledge of "prompt engineering", which is an emerging set of instructional strategies that focus on guiding GenAI tools to generate the outputs that are desired. Poor prompts can result in vague or incorrect output, while good prompts make the output more effective and efficient ("What is prompt engineering?", 2023). Best practices in prompt engineering are being developed ("What is prompt engineering?", 2023) that will help educators understand prompt engineering and know how to teach prompting strategies to learners.

Implications for Business Educators

There are three implications for business educators to consider. Given student use of AI-based tools in education coupled with the lack of educator utilization in their courses, a focus on professional development is warranted. Additionally, business educators should consider the impact of GenAI on student learning and career development. Finally, educational policies and accountability conversations are imperative at the secondary and post-secondary levels to reduce uncertainty among educators.

Many students are using AI-based tools such as GenAI in their studies, while the results of this study indicate business educators are not using AI-based tools in their teaching. This disconnect is a source of concern. ACT Inc. surveyed 4,006 US high school students and reported that 46% are using AI-based tools in their studies. Moreover, while about half of the students used the tools for school work, 62% said teachers did not allow them to use the tools (Schiel et al., 2024). The present study found that 66.20% of respondents disagreed with knowing how to apply AI in their courses, giving rationale to providing more professional development such as resources and workshops.

To address the technological content knowledge of the TPACK framework (Mishra & Koehler, 2006), business educators should consider addressing GenAI's possible impact on preparing the American workforce for jobs of the future, because those jobs are changing. For example, business analysts may not need to learn basic programming skills because GenAI can create code that can analyze data. While business analyst roles that require repetitive work are likely to become automated, we will still need business analysts to use skills in complex problem-solving, critical thinking, and strategic planning because GenAI does not do this well (Marr, 2023). As a university business management professor recently said, "business graduates who understand how to use AI in strategic decision-making could even have an edge over experienced professionals who are currently in the workplace" (Stenard et al., 2024, para. 4).

Researchers investigated whether GPT4 could analyze financial statements similarly to a human financial analyst (Kim et al., 2024). They prompted GPT4 to compute key financial ratios by showing the formula it used and then performing the calculations, interpreting the ratios, and identifying changes in financial statement items. Once the calculations were performed GPT4 was prompted to make predictions about the likelihood of earnings increases or decreases, and write a paragraph that gave the rationale for those predictions. Results showed that GPT4 was more accurate than humans at predicting earnings increases or decreases, and the results were

statistically significant. Notably, GPT4 outperformed predictions made by financial analysts even though it was not given any industry-specific information. Business schools and programs will have to redesign and implement a GenAI-forward curriculum that helps business students learn the skills and competencies needed in today's workforce.

To address the contextual knowledge of the TPACK framework (Mishra & Koehler, 2006), business educators should understand that everything an educator does exists within an educational system that consists of factors such as state and local policies, school budgets, school rankings, and economic and political considerations. Often, educators have little control over these factors but need to understand them (Mishra & Warr, 2021). For example, in a recent survey conducted by EdWeek Research Center (Klein, 2024), 79 percent of K-12 educators indicated their districts do not have an AI policy. The deputy director of the U.S. Department of Education's Office of Educational Technology indicated the lag in AI policy might be attributed to school districts waiting for state or federal policymakers to release AI guidelines (Klein, 2024). Resources are available to assist in creating AI policies. Nichols (2024) suggested gathering information, crafting a statement, discussing academic integrity with school stakeholders, and creating a path for feedback. Without an acceptable use policy related to AI, educators are faced with uncertainty regarding if, how, and when AI can be used by students.

In higher education, various educational policies have been written to support the use of AI; for example, BestColleges found that 56% of college students have used AI on assignments or exams (Nam, 2023). Additionally, 58% of college students reported their school or program had policies about the use of GenAI. Sometimes, policies are inconsistent at the same university, as one study found that students report some courses have policies and others do not (Nam, 2023). Chan (2023) suggested AI policies covering three dimensions. The pedagogical dimension focuses on improved teaching and learning, the governance dimension focuses on policies related to data privacy, security and accountability, and the operational dimension focuses on training and infrastructure. These systemic factors will continue to impact conversations about AI in education.

Limitations and Opportunities for Future Research

The present study has some limitations which lead to opportunities for future research. The sampling frame was members of NBEA, which limited the sample size because not all US business educators in secondary and post-secondary education are members of NBEA. It would be interesting to sample business educators who teach at institutions that are members of associations such as the Association to Advance Collegiate Schools of Business (AACSB), the Accreditation Council for Business Schools and Programs (ACBSP), and/or the Management & Organizational Behavior Teaching Society (MOBTS) to see if findings are similar. While we surveyed current business educators, future research examining the awareness and readiness of pre-service business teachers would be helpful to teacher preparation faculty and administrators.

The present study was a descriptive design using quantitative methodology. Since AI in business education is currently such a large conversation, adding qualitative questions to the survey may have produced a more holistic understanding of the AI awareness and readiness of business educators. A qualitative study investigating various viewpoints is a recommendation for future research. This could include what Darby (2023) described as AI enthusiasts, AI realists, and AI resistors. Finally, while this study focused on the awareness and readiness of secondary and higher education business educators, it did not focus on educational institutions, students, or governments. These stakeholders are important parts of the educational process, and studying their AI awareness and AI readiness could yield important findings.

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No potential conflict of interest was reported by the authors.

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