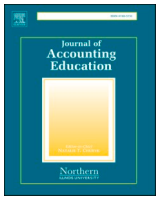
Journal of Accounting Education 68 (2024) 100917

Contents lists available at ScienceDirect

Journal of Accounting Education

journal homepage: www.elsevier.com/locate/jaccedu



Exploring verbal, interpersonal, and visual intelligences in accounting education: Effects on student learning and performance

Shahriar M. Saadullah *, Sameh Ammar, Abdulsamad Alazzani

Qatar University, Doha, Qatar

ARTICLE INFO

Keyword:
Accounting Assessment
Accounting Education
Accounting Information Systems
Multiple Intelligence
Student Perception
Student Performance
Student Learning Experience

ABSTRACT

We examine the relationship between three dimensions of Multiple Intelligence (MI) and student performance using two assignments. Utilizing mixed research design, we not only confirm the existing relationship between selected MIs and student performance, but also unfold three themes (adaptable, enjoyable, and experiential) of learning experiences informed by student reflections that explain this relationship. These patterns illustrate challenges faced, excitement experienced, and experiential learning gained by students. We find that incorporating MI in teaching and assessing accounting students is likely to hone their soft skills in addition to the logical or mathematical skills that are engaged in most accounting courses.

1. Introduction

Conventionally, teaching and assessment in modern schooling systems have predominantly focused on two types of intelligence: verbal (linguistic) and logical (mathematical) (Gardner, 2011; Pritchard, 2017). However, this narrow focus may disadvantage students who lack verbal or mathematical abilities and possess other forms of intelligence. The concept of intelligence itself is multifaceted and subject to debate, with various models proposing different approaches to recognize and accommodate these diverse intelligences and learning styles in education (Briggs, 1976; Fleming and Baume, 2006; Gardner, 2011; Honey & Mumford, 1982; Kolb, 2014, 1984; Pritchard, 2017). Among these, Gardner's Multiple Intelligence (MI) Theory (1983, 2011) stands out by identifying nine distinct forms of intelligence that could be leveraged to enhance individual students' learning experiences. Therefore, this notion of intelligence extends beyond traditional metrics, challenging conventional understanding and inviting a broader perspective.

Gardner (1983, 1993, 2011) holds that while each of us possesses all the different dimensions of intelligence, certain individuals are high in particular dimensions, leading to different performance in a given area while only demonstrating ordinary results in others. Consequently, assessing individuals only for verbal or logical abilities when they have high intelligence in a different dimension is a disservice to the individual and the society. The concept of intelligence being limited to verbal and logical abilities is too narrow and it does not incorporate the wide range of human intellectual functioning (Davis et al., 2011; Gardner, 1993; Gardner & Moran, 2006).

Despite its flexibility and effectiveness, MI theory has met with varying levels of acceptance. It is widely embraced globally, with numerous publications demonstrating its efficacy (Armstrong, 1994; Chen et al., 2009; Davis et al., 2011; Kornhaber, 2004; Shearer, 2004), yet there are few studies in accounting education that utilize MI theory. Conventional assessments involve logical and verbal dimensions of intelligences. The MI theory (Gardner, 1983, 1993, 2011) proposes nine dimensions instead of two. Studies in accounting education are limited and primarily address the logical dimension of MI (Chang, 2006; Ker & Ee, 2016; Pehlivan & Durgut, 2017). Therefore, the concept of MI challenges conventional views of intelligence and advocates for the integration of Multiple Intelligence (MI) theory into accounting education to better accommodate a broader range of student abilities. We choose these three dimensions as our assessment facilitates their engagement. Our study aims to fill this gap by employing multiple intelligences in accounting assessments to hone students' soft skills and understand the relationship between multiple intelligences and students' performance and learning experiences.

We compare the students' performance in a generic assessment with one where MI dimensions are employed. In our initial exploratory quantitative analysis, we find a relationship between MI dimensions and student performance. Due to the absence of a control group and limited analysis, our understanding of the relationship between student performance and MI remains constrained. Therefore, to understand whether and how engaging MI contributed to performance, we conduct

* Corresponding author.
E-mail addresses: ssaad@qu.edu.qa (S.M. Saadullah), sammar@qu.edu.qa (S. Ammar), alazzani@qu.edu.qa (A. Alazzani).

https://doi.org/10.1016/j.jaccedu.2024.100917
Received 17 August 2023; Received in revised form 7 August 2024; Accepted 7 August 2024
Available online 22 August 2024

qualitative analysis of student reflections on their learning experience. Three themes (Adaptable, Enjoyable, and Experiential) emerged from our analysis that bring to surface elements likely to have contributed to performance. The comments in the adaptable theme indicate the initial resistance of students followed by their adaptation to the new form of learning and assessment. The enjoyable theme includes comments from students who enjoyed the process from the beginning and learned from the assignment. The experiential theme highlights the comments of students who related their tasks in the MI driven assignment to real-life work.

Our study contributes to accounting education in four meaningful ways. First, we introduce MI theory to the mainstream accounting education literature. A few accounting education studies attempt to incorporate MI theory but none of them deeply explore the relationship between MI and student performance. We also do not find any studies involving MI published in the six journals specializing in accounting education.[1] In discussing the stagnation in accounting education research, Rebele and Pierre (2015), identify the usage of the same underlying theories as one of the reasons of stagnation. We respond to this concern and introduce a widely accepted theory into mainstream accounting education research. However, it is not a mere introduction of a theory to the accounting discipline, but also a contribution to MI theory through development of narratives that explain and unfold interactions between MI and performance.

Second, we delve into student reflections about their learning experience to understand how they employ MI in their learning journey. Research on accounting students' perception of how assessments affect the quality of their learning is relatively limited (Babu & Barghathi, 2020; Watty et al., 2010). Yet student reflections have an important effect on their learning approaches (Entwistle and Entwistle, 1991; Ramsden, 1997; Struyven et al., 2005; Watty et al., 2010). Past studies on accounting student perspectives explores, *inter alia*, their beliefs about peer and self-assessments (Babu & Barghathi, 2020), open-book assessments (Kruger, 2020), benefits of knowing accounting theory and research (Baker & Wick, 2020), and subject knowledge versus skills development (Healy et al., 2014). The present study not only endorses the limited existing literature in providing depth to the association between MI and performance, but it also advances the relevant literature by developing three narratives that illustrate challenges students face, excitement students feel, and real life simulation students undergo respectively.

Third, we engage individual student intelligences through designing and implementing custom-tailored assessments. Involvement with assessments motivates students to engage with the learning process affecting the learning outcome, as is evident from past studies (Devadoss & Foltz, 1996; Durden & Ellis, 1995; Krohn and O'Connor, 2005; Perera, Nguyen & Watty, 2014). Among the elements of quality assessment is the influence of assessments on student motivation for learning (DeMong, Lindgren & Perry, 1994; Hand et al., 1996; Perera et al., 2014). In this study, we examine the students' strengths (i.e., verbal, visual, and interpersonal intelligences), educate them on the utility of engaging their strengths, and provide them with the opportunity to exercise their strong suits through custom-tailored assessments. As discussed later, this resulted in an enjoyable learning experience and better performance. While custom-tailoring assignments is time-consuming and can only be adopted with suitable content, we have pioneered this effort and reported our findings for fellow academics to consider in the future.

Fourth, we use a mixed method that enables us to explain in detail through the qualitative analysis the limited finding from the quantitative analysis. While prior studies report association between MI and performance (Cabrera & Fernando, 2009; Chang, 2006; Gómez & Monroy, 2018; Ker & Ee, 2016; Pehlivan & Durgut, 2017), the present study advances our understanding of this association through unfolding the operationalization between MI and performance. The qualitative analysis endorses significant, moderate, and insignificant associations between MI and performance at different stages of the learning experience. Also, the qualitative analysis enabled us to understand student perception of the learning process even though our second hypothesis was rejected in our initial quantitative analysis. Such discoveries are beyond the capabilities of quantitative analysis only.

The rest of the paper is organized as follows. First, we review the literature and develop our hypotheses. Second, we discuss the methodology and design of the study. Third, we provide a quantitative analysis of the data. Fourth, we qualitatively analyze student reflections with an MI-driven assessment. Last, we conclude with a discussion of overall findings from the study, followed by implications and limitations.

2. Literature review and hypotheses development

In this section, we first discuss MI theory and its implications. Second, we discuss accounting research that incorporate MI theory. Third, we discuss assessment in accounting education and the value of MI-driven assessments. Fourth, we lay out our hypotheses.

2.1. MI theory and its implication on education

Howard Gardner propounded MI theory (Gardner, 1983) and defined intelligence (Gardner, 1983, 1993) as "… the ability to solve problems, or to create products, that are valued within one or more cultural settings." Gardner (1983) contrasts the view of intelligence as an innate trait that can only change marginally (Herrnstein & Murray, 2010; Jensen, 1980, 1998) with his theory that advocates intelligence as "… a combination of heritable potentials and skills that can be developed in diverse ways through relevant experiences" as put by Davis et al. (2011). MI theory suggests nine dimensions of intelligence that each individual possesses to some degree (Davis et al., 2011; Gardner, 2011). Each dimension relates to certain aspects, preferences, and learning for individuals, as summarized in Table 1 (Davis et al., 2011; Gardner, 2011; Pritchard, 2017) and described in the following:

1. Verbal Intelligence: It relates to linguistic abilities. Verbally intelligent individuals prefer writing, story-telling etcetera. They learn best though seeing words.
2. Logical Intelligence: It relates to reasoning and numerical abilities. Logically intelligent individuals prefer doing experiments, working with numbers etcetera. They learn best through categorizations and patters.
3. Visual Intelligence: It relates to images. Visually intelligent individuals prefer drawing, designing, etcetera. They learn best through visuals and pictures.
4. Musical Intelligence: It is related to sounds and rhythms. Musically intelligent individuals prefer signing, playing instruments etcetera. They learn best through listening to rhythmic patterns.
5. Kinesthetic Intelligence: It relates to physical movement. Individual high in kinesthetic intelligence prefer moving around, touching etcetera. They learn best through interacting with space.
6. Interpersonal Intelligence: It relates to communication with others. Interpersonally intelligent individuals prefer taking to people, joining-groups etcetera. They learn best through relating and sharing.
7. Intrapersonal Intelligence: It relates to self-awareness. Intra-personally intelligent individuals prefer working alone. They learn best through individualized projects.

[1] The six journals are *Accounting Education, Issues in Accounting Education, Journal of Accounting Education, Advances in Accounting Education: Teaching and Curriculum Innovations, The Accounting Educators' Journal,* and *Global Perspectives on Accounting Education.*

Table 1
MI dimensions in brief.

Dimension	Related to	Preferences	Learns best through
Verbal	Language	Reading; Writing; Story Telling	Saying; Hearing; Seeing Words
Logical	Reasoning; Numbers	Doing Experiments; Working with Numbers	Categorizing; Working with Abstract Patterns
Visual	Visual Images	Drawing; Designing	Visualizing; Working with Pictures
Musical	Sounds; Rhythms	Singing; Playing Instruments	Listening especially to Rhythmic Patterns
Kinesthetic	Physical Movement	Moving Around; Touching	Touching; Interacting with Space
Interpersonal	Communication with Others	Talking to People; Joining Groups	Relating and Talking; Sharing
Intrapersonal	Self-Awareness	Working Alone; Day Dreaming	Individualized Projects
Naturalist	Awareness of Natural World	Working Outdoors	Relating Activities to Natural World
Existentialist	Big Questions such as Life, Death, Love, and Being	Thinking about Big Questions	Finding Meaning and Connecting to Big Questions

Table 2
Strongest MI dimensions (N=157).

Strongest dimension	Number of students
Verbal	3
Visual	55
Interpersonal	67
Verbal-Visual	3
Verbal-Interpersonal	2
Visual-Interpersonal	25
Verbal-Visual-Interpersonal	2

8. Naturalist Intelligence: It relates to awareness of the natural world. Naturalists prefer working out-door. They learn best through activities relating to the nature.
9. Existentialist Intelligence: It relates to big questions such as life, love etcetera. Existentialists prefer to think about big questions. They learn best through finding meaning and connecting to big questions.

The dimensions of intelligences emerged from a set of empirical studies in multiple disciplines (Davis et al, 2011; Gardner, 1983, 1993; Gardner & Moran, 2006). MI theory contrasts the widely accepted single conception of intelligence, based on which many IQ tests assess only verbal and logical intelligences (Davis et al., 2011). Gardner (1983, 1993, 2011) holds that while each of us possesses all the different dimensions of intelligence, certain individuals are high in particular dimensions, resulting in extraordinary performance in a given area while only demonstrating mediocre results in others. Therefore, assessing individuals only for verbal or logical abilities when they have high intelligence in a different dimension is a disservice to the individual and the society. The concept of intelligence being limited to verbal and logical abilities is too narrow and it does not incorporate the wide range of human intellectual functioning (Davis et al., 2011; Gardner, 1993; Gardner & Moran, 2006).

One of the purposes of MI theory, Gardener (1983) specified, is examination of its educational implications. In his own words, "I wish to examine the educational implications of a theory of multiple intelligences. In my view, it should be possible to identify an individual's intellectual profile (or proclivities) at an early age and then draw upon this knowledge to enhance that person's educational opportunities and options." Over the decades, the academic community has accepted the MI-theory globally, resulting in MI principles-based missions, curricula, and pedagogy in several schools, and several books (in various languages) have also been written on the relevance of MI theory (Chen et al., 2009; Davis et al., 2011). When curriculum and assessments are tailored based on students' MI dimensions, it utilizes their strengths, resulting in better understanding of complex material and thus enhanced performance (Davis et al., 2011; Emig, 1997; Özdermir, Güneysu & Tekkaya, 2006; Pritchard, 2017). Furthermore, a sense of responsibility, positive self-image, and intrinsic motivation is kindled in students (Davis et al., 2011; Teele, 1996). Additionally, it provides instructors with a framework for making instructional decisions (Davis et al., 2011; Özdermir et al., 2006). While many studies have shown the positive influence of MI theory on educational practices, we only find a handful of studies in accounting education, as discussed below.

2.2. MI theory in accounting education

The primary and obvious intelligence dimension of accounting students' performance is logical (mathematical) intelligence. Pehlivan and Durgut (2017) found this relationship at two different universities in Turkey. In addition, Chang (2006) found the same at an Australian offshore franchise business degree program. In addition to the logical dimension, Cabrera and Fernando (2009) found verbal and visual dimensions to be predictors of performance in financial management and cost accounting courses in the Philippines. The study does not discuss how verbal and visual intelligences contribute to performance but only discusses the usefulness of these dimensions in public accounting. In a detailed case study of one Malaysian accounting student's performance, Ker and Ee (2016) found that the student struggled with an accounting course due to their high score (20 on a scale of 0 to 25) in the kinesthetic dimension. The student's logical intelligence was 15 on the same scale. Gómez and Monroy (2018) studied the effects of games such as Kahoot in teaching accounting students. In their introduction, they compare the MI dimensions with skills public accountants need, but they do not use MI dimensions to predict or explain their findings.

Chang (2006) provides insights into how some MI dimensions other than logical can be utilized in teaching accounting students. Individuals with interpersonal intelligence might perform well in group projects where students are interdependent yet evaluated individually, while students with intrapersonal intelligence might do well in self-paced individual assessments. A naturalist student may be drawn to social and environmental accounting. Visually inclined students might take a greater interest in assignments involving diagrams such as concept maps, which are depictions of mental connections and association of patterns (Cross & Angelo, 1988). Verbally intelligent students are likely to do well in case study analysis. Role-plays, simulations, and games might enhance student performance with kinesthetic intelligence.

2.3. MI and accounting assessments

While articulating the use of MI in education, Gardner (2011) identifies the use of diverse forms of assessments to accomplish educational goals, given that the goals are oriented toward disciplinary understanding. Generally, assessments can be divided into two broad categories: traditional and authentic (Conrad & Openo, 2018; Herrington, Reeves & Oliver, 2006; Nkhoma, Nkhoma & Tu, 2018). Traditional assessments in accounting involve exams that test the students' ability to solve a series of problems demonstrating their understanding of accounting concepts, principles, standards, and practices (Nkhoma et al., 2018). While traditional assessments are necessary, they may not necessarily cultivate critical thinking among students; as a result, there has been an interest in developing a framework in accounting curriculum that incorporates critical thinking (Bonk & Smith, 1998; Garcés, 2013; Kimmel, 1995; Nkhoma et al., 2018; Springer & Borthick, 2004;

Table 3
Descriptive statistics.

Demographics	N	Statistics
Male	165	54
Female	165	111
Accounting Majors	165	134
Management Majors	165	14
Marketing Majors	165	7
Finance Majors	165	6
MIS Majors	165	3
Economics Majors	165	1
Junior	107	27
Senior	107	79
Second Bachelor's	107	1
Average GPA	104	2.84
Average Age	106	23.52

Table 4
Paired *t*-test: projects A and B grades (N=161).

	Project A	*Project B*
Mean	83.63	89.20
Variance	93.61	96.15
Observations	161	161
Pearson Correlation	0.1250	
Hypothesized Mean Difference	0	
df	160	
t Stat	−5.4841	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6544	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.9749	

Thompson & Washington, 2015). Authentic assessments require students to apply their knowledge in practical contexts demonstrating their skills and competencies (Ashford-Rowe, Herrington & Brown, 2014; Gulikers, Bastiaens & Kirschner, 2004; Larkin, 2014; Sridharan & Mustard, 2015). In a review of authentic assessments in accounting courses, Nkhoma et al. (2018) listed portfolios, reports, reflective journals, presentations including video presentations, self and peer evaluations, and work-integrated learning. Authentic assessments require students to use their skills and knowledge to produce an outcome while facilitating critical reflections, self-evaluation, and self-development (Ashford-Rowe et al., 2014; Nkhoma et al., 2018). Traditional assessments in accounting test students' ability to solve accounting problems engaging their logical dimension only. However, authentic assessments such as reports, video presentations, and visual assignments (such as posters) are likely to engage verbal, interpersonal, and visual dimensions, facilitating enhanced performance and learning experience.

2.4. Hypotheses development

Conventional assessments involve logical and verbal dimensions of intelligences. The MI theory (Gardner, 1983, 1993, 2011) proposes nine dimensions instead of two. Studies in accounting education are limited and primarily address the logical dimension of MI (Chang, 2006; Ker & Ee, 2016; Pehlivan & Durgut, 2017). We engage accounting students' verbal, interpersonal, and visual dimensions in the present study. We choose these three dimensions as our assessment facilitates their engagement. Other dimensions could be equally important and can be explored in future studies.

In discussing the abilities of individuals with different intelligences, Gardner (2011) elaborates on how these strengths manifest in practice. He highlights four aspects related to verbal intelligence. The first is the rhetorical aspect of the language used to convince others. The second is the mnemonic potential of language to help remember information. A third aspect is the role of language in explanation, which is widely used in teaching and learning: Even mathematical findings are explained using language. Last is the ability of language to reflect upon language. This manifests when the listener asks the speaker a question such as, "Did you mean A or B?" causing the speaker to reflect upon the previous language. Combining these strengths facilitates the articulation and presentation of material, making it clear for the audience. Several studies find positive effects of verbal intelligence on student writing skills (Solehah, 2017; Suharni, 2016; Mulyaningsih, Rais & Sulistyawati, 2013). A student with a high degree of verbal intelligence is likely to excel in writing a report detailing the various aspects of an assignment.

Visual intelligence is the ability to invoke the recognition of objects and scenes in both original surroundings and altered settings (Gardner, 2011). It is engaged while working with two- or three-dimensional graphics and diagrams, maps, or geometrical shapes. Two other aspects of visual intelligence (Gardner, 2011) are: (1) sensitivity to aspects such as tension, balance, or composition in art or other visual displays, and (2) the ability to recognize the resemblance between two seemingly disparate forms, materializing in examples or metaphors. Students with high visual intelligence perform better in assessments involving diagrams instead of language or logic (Gunawan, Supriatna & Fauzi, 2021). They also learn better with visual contents such as charts and mind maps (Šafranj & Zivlak, 2018). Furthermore, they excel when innovative teaching tools such as video games are utilized (Rico Clavellino, 2020). Therefore, a student high in visual intelligence is likely to perform better in a visual presentation assignment (such as a poster) than writing a report.

Interpersonal intelligence is the ability to recognize other individuals' temperaments, moods, intentions, and motivations (Gardner, 2011). This ability equips individuals to communicate and influence others, as seen in skilled politicians, religious leaders, teachers, parents, and counselors. Presenting thoughts is a preferred delivery mode of individuals high in interpersonal intelligence (Davis et al., 2011; Gardner, 1993; Gardner & Moran, 2006). Past findings indicate that interpersonal intelligence in students not only enhances their oral communication skills (Handayani, 2016) but also facilitates language skills such as vocabulary, grammar, and reading (Behjat, 2012; Hajebi, Taheri & Noshadi, 2018; Mobashshernia & Aghazadeh, 2018), further influencing communication skills. Therefore, students with high interpersonal intelligence would likely stand out if asked to orally present their findings in an assignment, either live or in a recorded video format.

In the present study, we give all students a generic assignment (Project A) requiring preparation of a written report to present their findings. Then we assign a similar assignment (Project B) by dividing the students into groups based on their visual and interpersonal intelligences. The students' MI dimensions are identified using an established instrument.[2] The students high in visual intelligence are asked to prepare a poster, and those high in interpersonal intelligence are asked to make a video to report their findings. Based on the discussion in the literature review section, we hypothesize the following:

H1: The performance of students as measured with grades will be better in Project B than in Project A
H2: The students will report higher satisfaction with Project B than with Project A as measured by survey ratings

Our hypotheses are logically derived. However, we do not use a control group and our quantitative analysis is limited. Therefore, we perform qualitative analysis of student comments to discover how MI-based assignments improved their performance to enhance our understanding of the associations we hypothesized.

[2] We used McKenzie's Multiple Intelligence Inventory instrument (1999). It includes 10 questions for each of the 9 MI dimensions. The instrument is provided in Appendix A and described further in the methodology section.

Table 5
Paired *t*-test: Projects A and B grades.

	Male		Female		Accounting majors		Other majors	
	Proj A	*Proj B*	*Proj A*	*Proj B*	*Proj A*	*Proj B*	*Proj A*	*Proj B*
Mean	84.78	88.52	83.07	89.54	83.72	89.01	83.00	90.58
Variance	46.91	145.16	116.21	72.89	93.80	97.58	96.67	88.38
Observations	53	53	108	108	141	141	20	20
Pearson Correlation	0.2452		0.0920		0.1202		0.1746	
Hypothesized Mean Difference	0		0		0		0	
df	52		107		140		19	
t Stat	−2.2127		−5.1214		−4.8352		−2.7438	
P(T<=t) one-tail	0.0157		0.0000		0.0000		0.0065	
t Critical one-tail	1.6747		1.6592		1.6558		1.7291	
P(T<=t) two-tail	0.0313		0.0000		0.0000		0.0129	
t Critical two-tail	2.0066		1.9824		1.9771		2.0930	

3. Research methodology and design

We adopt a mixed method to examine the relationship between MI, and performance and learning experience. First, we quantitatively compare student performance between an MI-driven assessment and a generic one. Then, to understand how an MI-driven assessment affects student-learning, we qualitatively analyze student reflections. Past studies mostly use quantitative analysis to test the relationship between MI and performance. Our study furthers our understanding of how this relationship materializes through qualitative analysis.

4. Quantitative method and analysis

We conduct the study in five steps. First, we assess the students' Multiple Intelligence dimensions using an established instrument (McKenzie, 1999) and group students based on their intelligence type. Second, we test student performance using a generic project (Project A). Third, we test student performance using a project tailored to the students' MI dimensions (Project B). Fourth, we survey the students to gather their perceptions of their experience with both projects, using questions from Clikeman (2012), and Saadullah and Elsayed (2020). Fifth, we compare student performance between projects A and B and analyze student perceptions of both projects. The university Institutional Review Board (IRB) pre-approved the MI instrument and the survey.

4.1. Step one – MI dimensions

We gather information on students' multiple intelligence dimensions using McKenzie's Multiple Intelligence Inventory instrument[3](1999). The students answer "yes" or "no" to ninety-one statements.[4]

We assigned a score of one to every positive statement ("yes") and a score of zero to every negative statement ("no"). The range of possible scores for each dimension was zero to ten. The three dimensions of interest to us were Verbal, Visual, and Interpersonal. A student was categorized in the dimension in which they scored the highest (for instance if at student scored 9 out of 10 in the visual dimension and that score was higher than the scores in either verbal or interpersonal dimensions, then the student was classified as visual). Table 2 shows the number of students and their strongest MI dimensions among the three dimensions of interest. Only three students were strongest in the Verbal dimension, and another seven had Verbal and one or both of the other two dimensions as their strongest. The Visual and Interpersonal dimensions were strongest in 55 and 67 students respectively, while 25 were equally strong in both the dimensions. The students were briefed on MI theory, the stages of the study, and their MI profile.

4.2. Step two – Generic project (Project A)[5]

We assigned the students a generic project in the Accounting Information System (AIS) course, requiring a written report that engaged their Verbal intelligence. The assignment required the students to research cutting-edge technology currently available and propose a practical use for it in one or more of the four steps in the Revenue Business Cycle: Sales Order Entry, Shipping, Billing, and Cash Collection. The students were required to describe in detail the following in the report:

1) The technology
2) Its use in the revenue cycle
3) Its benefits
4) Its disadvantages

During the content delivery of the revenue cycle, the contemporary mainstream technology utilized by businesses were discussed. The students' assignment was to propose a technology not currently utilized in the revenue cycle. The students were also allowed to present a future concept not currently utilized. The students were instructed to use books, articles, the internet, and other available sources to collect information, while properly citing each source.

4.2.1. Group formation

The students were grouped in teams of four based on their MI dimensions provided in Table 2 in the following manner:

(a) First, students higher in visual dimension were put in the same groups while those higher in interpersonal dimension were grouped together.
(b) Second, in cases[6] where a student had the same score for both dimensions (interpersonal and visual), we arbitrarily assigned them to a team to ensure the assignment of four students in each team.
(c) Third, the student in each group with the highest to-date grade was assigned as the group leader responsible for coordinating the group effort and communicating with the instructor.

Grouping students based on their MI scores is instrumental in achieving the aims of the study. When students had identical scores for

[3] The instrument (see Appendix A) is available at https://surfaquarium.com/MI/inventory.htm.

[4] The instrument included ten statements for each of the nine dimensions with the exception of Musical. The instrument had eleven statements for Musical. This would potentially make the data on the dimensions inaccurate if we were to use Musical as one of the variables in our study. However, since we did not, this flaw in the instrument did not pose any problems in our study.

[5] The full version of project A is provided in Appendix B.

[6] There were 25 such instances as shown in Table 2.

Table 6
Student perceptions.

No.	Statement Related to the Projects	N	Project A: Revenue cycle		Project B: Expenditure cycle	
			Mean	Std. Dev	Mean	Std. Dev
1	Improved my understanding of the steps in the Business Cycle	105	4.17	0.75	4.25	0.74
2	Made me familiar with the documents related to the Business Cycle	105	4.14	0.79	4.19	0.81
3	Helped me understand the use of technology to enhance the Business Cycle	105	4.31	0.80	4.27	0.82
4	The time allowed was appropriate	105	4.22	1.05	4.16	1.12
5	The instructions given were clear	105	4.41	0.95	4.22	0.99
6	The 7.5 % course weight assigned was appropriate	105	4.09	0.99	4.12	1.03
7	The learning experience was enjoyable	105	4.15	0.93	4.17	0.95
8	Should be used in the future	105	4.23	0.90	4.11	0.99

Table 7
Comparison with a neutral response of 3 (N=8).

	Project A	**Project B**
Mean Difference	1.21	1.19
Standard Deviation	0.10	0.06
t-stat	32.94	60.98
Two-Tail p-value	0.0000	0.0000
95 % CI of Mean Difference	1.13, 1.30	1.14, 1.23

both interpersonal and visual dimensions, they were assigned to teams in a way that ensured each team comprised four members. This approach facilitated the creation of balanced groups, enhancing the collaborative dynamics necessary for the study's success.

Leadership roles within each group were assigned with a clear focus on coordinating the group's efforts and maintaining effective communication with the instructor. The primary responsibilities of the group leader included organizing group activities, ensuring all members contributed to the tasks, and serving as the main point of contact between the group and the instructor. This role was pivotal in facilitating smooth group operations and aligning the group's progress with the study's objectives.

4.2.2. Grading of project a

While the students worked on the project as a group, one requirement was to assign one of the four parts of the project (as listed above) to each student. Each student was graded partly for individual effort as evident from their part and partly for group effort as evident from the overall project. The overall project was graded out of 15 points as detailed below and then converted to 7.5 % to be included in the overall course grade:

1) Four points for content write-up (individual)
2) Two points each for organization, language, and grammar as detailed below (individual):
   a) Organization: Sentences and paragraphs are organized logically. The ideas conveyed are interconnected and flow smoothly.
   b) Language: The words and phrases used are appropriate.
   c) Grammar: The sentences are grammatically correct without any spelling mistakes.
3) Five points for originality and presentation (group)

In addition, the students were instructed to work cohesively and asked to report any conflicts to the instructor for prompt resolution.

We acknowledge the complexity of mapping individual characteristics to group outcomes, as the actual outcomes are influenced by a myriad of factors including group dynamics, individual engagement, and external variables. While individual MI scores provided a basis for group formation, we recognize that the interplay of these factors can significantly affect the effectiveness and success of each group.

In our nuanced interpretation of the findings, we emphasize that while individual characteristics are crucial in shaping group composition, the real-world outcomes depend on how well these characteristics interact within the group setting. This includes how students communicate, collaborate, and adapt to challenges, as well as the overall cohesiveness and motivation of the group. By detailing these considerations, we aim to provide a comprehensive understanding of the factors that contribute to successful group outcomes in the context of our study.

4.3. Step three – Project tailored to MI dimensions (Project B)[7]

We assigned the students a project similar to project A involving the three steps of the Expenditure Business Cycle: Ordering, Receiving, and Paying. We introduced the contemporary mainstream technology businesses use in the expenditure cycle. We asked the students with higher scores in the interpersonal dimension to report their findings in a video while asking those who scored higher in the visual dimension to prepare a poster.

4.3.1. Grading of project B

The grading scheme for project B was similar to project A with the exception of the second item. The posters and videos were graded individually[8] for each student based on the following rubrics:

Poster: Two points each for presentation, language, and graphics as detailed below:

a) Presentation: The content is visually appealing. The ideas are easy to follow.
b) Language: The words and phrases used are appropriate. The sentences are grammatically correct without any spelling mistakes.
c) Graphics: The use of graphics is adequate and relevant to the content.

Video: Two points each for oral presentation, visual presentation, and originality as detailed below:

a) Oral Presentation: The oral presentation is clear and easy to follow. The presenter speaks smoothly.
b) Visual Presentation: The video quality is good, and the contents presented are relevant to the topic addressed.
c) Originality: The overall presentation of the video demonstrates originality of thought and delivery of content.

We would like to highlight that prior to the marking process, the three authors (instructors) thoroughly discussed and agreed upon a standardized evaluation method to ensure consistency across all groups.

[7] The full versions of project B is provided in Appendices C and D.

[8] The entire poster or video was assigned to a group based on compatible intelligences. However, the students were graded individually on the part they prepared of the poster or the part of the video they presented.

After grading, we engaged in discussions to reflect on our grading experiences to ensure uniformity. This pre- and post-evaluation process aimed to minimize bias.

4.4. Step four – Survey questionnaire to gather perception

We adopted survey questions from Clikeman (2012), and Saadullah and Elsayed (2020) and tailored them to our study to gather student perceptions on both the projects. The survey asked the students to rate eight statements (provided in Table 6) on a scale of 1 to 5 and provide comments on their experience with both projects. The students completed the survey instrument after completing the second project.

Response bias to please the researcher is a concern in studies involving questionnaires. We tried to reduce the effect of response bias in three ways. First, we modified and used validated questionnaires from studies published in mainstream accounting literature. Second, we conducted a voluntary online survey where the researcher was not physically present. Third, in addition to the survey, we collected comments that elaborate on survey responses. We found quite a few negative comments, indicating that at least some participants' responses were not in sync with the researchers' expectations.

4.5. Step five – Data analysis

We analyzed the data using both quantitative and qualitative methods. We compared the grades of the two projects to test our first hypothesis that project B grades would be statistically significantly higher compared to project A grades due to utilization of MI dimensions. We also compared the survey scores for each of the eight statements between the two projects to test our second hypothesis that project B survey results would be statistically significantly higher compared to project A survey results. Using a control group would have made our study more robust. However, it would have reduced our small sample size for the statistical analysis further. Our study is exploratory and only tests the association between MI and performance. Future studies could utilize a control group with a larger sample to test causality.

It is difficult to measure the difference in performance between two assessments without noise. To minimize this noise, we designed the two assessments with little variation. First, both the projects are related to business cycles, making the difficulty of the subject matter comparable. However, an argument can be made that this might make Project B easier due to a learning curve. Second, both the projects required similar amount of research and groundwork due to identical requirements. Third, the students received similar instructions on the content of both business cycles. The only variation between the two projects is the reporting method (i.e., written report versus video or poster) based on MI dimensions.

5. Qualitative method and analysis

Qualitative research, as pursued in our study, aims to generate insights for refining or contributing to existing theories rather than establishing universally applicable statistical laws (Scapens, 2004). We recognize the contextual focus of our work and explicitly address the limitations related to the specificity of our student sample in the discussion section, highlighting the nuanced nature of our findings and potential constraints on generalizability.

We adopt a four-step approach to qualitatively analyze student comments as advocated by Mahama and Khalifa (2017). First, using NVivo we explore the data by reading and re-reading the comments. We observe the comments without coding to identify, "emergent themes without losing the connections between concepts and their context" as articulated by Bradley, Curry, and Devers (2007). Second, we organize and code the data to extract themes. Three themes, namely adaptable, enjoyable, and experiential emerged. We continue the coding process driven by the MI framework as the themes began to emerge (Scapens, 2004). Third, we identify relationships as themes of learning experiences became clearer and the insightful story of how MI dimensions affect performance developed. Fourth, we continue to interpret and extract meaning as the three themes emerged.[9]

6. Quantitative data analysis and results

Our study included 165 participating students at large national university in the MENA (Middle East North Africa) Region. The students were divided into five sections of the AIS course taught by three instructors. AIS is a required course for all accounting majors and can be taken as an elective by other business students. Table 3 provides the demographic statistics of the participants who completed the demographic items in the survey. One hundred and thirty four students were accounting majors and the rest were divided into other majors as listed in Table 3. There were 111 females, 54 males, 27 juniors, 79 seniors, and one student pursuing a second bachelor's degree. The average GPA was 2.84, and the average age was 23.52.[10]

One hundred and sixty-one students completed both projects A and B. We perform a paired *t*-test to assess whether the employment of MI is associated with students' performance between the two projects, as shown in Table 4. The mean difference between the grades of the two projects (M=5.57, SD=12.89, N=161) was significantly greater than zero (t-stat = -5.48, two-tail p = 0.0000), providing evidence that the engagement of MI enhanced performance, which supports our hypothesis in H1. A 95 % confidence interval of the mean test score difference was (3.56, 7.57). We performed additional analyses of subsets to test the difference in performance between the two projects. The results hold for males and females students as well as accounting and non-accounting majors. The details of the analyses for the subsets are provided in Table 5. While we find support for our hypothesis, establishing association between engagement of MI and performance remains weak due to our simple statistical analysis and lack of a control group. However, in the next section, we perform qualitative content analysis of numerous comments from students about their learning experience that provide evidence of the relationship between MI and performance.

One hundred and five students completed the survey and responded to the eight questions in Table 6. The student responses demonstrate that both projects improved their learning experience and understanding of the business cycles, made them familiar with the documents used, and helped them better understand the use of technology in the business cycles. In addition, the students testify to the appropriateness of the time allocated for the projects, the course weights assigned to them, and the clarity of instructions provided. Finally, the students enjoyed the projects and recommended their use in the future. We tested and found that the mean differences between the student responses for both projects were significantly greater than zero (Table 7) compared with a neutral response of three (3), indicating positive perception. However, we do not find any statistically significant difference between the survey results of projects A and B. Thus, we do not find support for our hypothesis H2. This finding was surprising and therefore we looked at the qualitative reasoning.

While the relationship between MI and performance confirms prior findings (Cabrera & Fernando, 2009; Chang, 2006; Gómez & Monroy, 2018; Ker & Ee, 2016; Pehlivan & Durgut, 2017), it does not further our understanding of why and how of this relationship. In an effort to better understand the relationship, we asked students to comment on their experience, and a significant number of students provided detailed

[9] Inter-rater reliability checks were conducted among the three authors involved in the study's qualitative analysis. One author performed the initial analysis, and the coding process was subsequently reviewed by the other two authors, leading to refinement in theme assignments.

[10] The age of the students ranged from 19 to 44 with seven students being above 30 and only one above 40.

reflections, as discussed in the next section.

7. Qualitative analysis and results

We discuss findings from qualitative analysis in light of MI-theory in this section. Three themes related to learning experience and performance emerge from student[11] reflections. The themes are titled, adaptable, enjoyable, and experiential. We utilized MI to form groups and then assign groups of students the appropriate alternative (poster or video) for Project B based on their MI. The student comments revolve around perceived advantages or disadvantages from group formation and project alternative. We discuss how MI affected their learning experiences and performance under the three themes in the following:

7.1. Adaptable learning experience

Student reflections in this theme focus on challenges they faced, possible implications of those challenges on performance, and how they overcame those as they completed the projects. The key challenges of this theme were the group formation process using MI of students and the particular alternative of presenting project B (i.e. video or poster). A student (S0086) did not welcome the group formation due to lack of commitment from previously unknown group members. As they put it:

> *What I did not like is that I was working with new students who I didn't work with before. To be honest I faced a lot of difficulties while working with my team members (convincing them to send me their work on time – do their own parts by themselves) and I convinced them and we managed to do that.*

The student comment demonstrates that they utilized their interpersonal skills (their second strongest MI) to manage the team efforts and performed better in project B, despite their initial discomfort. Student-S6122 deemed the alternative assigned in project B as unfair due to their preference. In their own words:

> *The survey that was used for determining the multiple intelligence was too simple that led to some errors…. […] …I personally do not like making posters and would love to write 10 pages report rather than a simple poster. However, I liked the thought of assigning us a poster as it would add on my skills in field of poster making and it really did.*

The student preferred to write a report that would engage their verbal intelligence but was assigned poster preparation due to their strength in visual intelligence. However, the student admitted the benefit of skill enhancement through the assignment and they performed better in project B. Another student (S1865) upset with group formation stated:

> *First I was upset […] because I was looking to be with my friend in the project but then I figure out that it is useful […]. Also it was interesting to do a* video *as a project and the topic was interesting as well*

The student came around and enjoyed the project. Another student who claimed to have been the group leader in past projects expressed their dissatisfaction. As articulated by the student (S1716):

> *[P]ersonally, I've always been a leader of the group for any of the projects that I've done. I prefer being in charge of the group and I felt that if I had the opportunity to choose my group, I would've been more comfortable as I love delegating the tasks and having a bit of control over the project. […] Overall, it was an enjoyable class and I've learnt a lot about the cycles doing the project!*

The student started with a complaint but adapted to the learning experience and performed better in project B. The statement of another student (S3883) demonstrates transformation from initial dislike to eventual appreciation:

> *…I never worked on making full* video *s and editing them, at first I hated the idea […] but I am really glad that I went into the process and it was beautiful seeing the outcomes of our work…*

In summary, students stressed over unknown colleagues, losing power of leadership, and not attaining the preferred alternative. These challenges may exist in MI-driven assignments that induce fear of failure. However, students adapted and enjoyed new experiences. This illustrates that MI dimensions could be engaged even after initial resistance. While we did not find any difference in student perception between the two projects as hypothesized in H2, the insights from qualitative analysis indicate that perceptions of students changed for the better over the learning experience.

7.2. Enjoyable learning experience

In contrast to the previous one, this theme includes comments of students who enjoyed the experience of group dynamics and assignment alternative. One (S4497) of them said:

> I think this is a great way to make students work on projects. I was more invested in the work because I felt that it matched my way of thinking when it came to project B.

The student was high in interpersonal intelligence and made a video to report their findings from project B. The student's interpersonal intelligence helped with the group dynamics resulting in an equally good score in both projects. Another student (S2632) considered MI informed learning fun and stated:

> *As for Project B, I cannot express how fun it was. I never felt like I was working on a project that would be evaluated. […] Therefore, I strongly suggest to continue assigning students to this type of projects, where they can learn and enjoy at the same time.*

While the student was strongest in visual intelligence, their interpersonal intelligence followed closely, and this may explain the student's openness to others. Another student (S7367) articulated their appreciation as follows:

> *Both projects were fun and was happy to do them […] Also, as an introvert person I am thankful that I wasn't assigned as a leader or a* video *in Project B. It meant a lot to me that my professor [understood] that each person [has] his own capabilities.*

The student clearly saw the benefit of group formation and project alternatives based on MI. Due to being weak in interpersonal intelligence, the student would have struggled with making a video. A student (S2924) found the group members to be cooperative, which resulted in a positive outcome:

> *… I was grouped with […] very cooperative [members] and the idea of the multiple intelligence test was helpful and interesting. …I believe that being assigned by the professor especially by the use of such test can enhance our skills […] where each member can showcase their strongest trait.*

Members with high in interpersonal skills resulted in teamwork, enjoyable experience and better performance in project B. Another student (S2402) perceiving the group formation positively stated:

> *One of the things I admire about working in these projects is how we develop our ability to manage our team while we have equal responsibility of the work and sufficient experience to understand the material to delve into it. This type of project let our willingness to look outside of ourselves and make us around each other better is one of the most valuable contributions that these projects making.*

The positive attitude towards group formation and learning experience resulted in engagement and performance. A student who perceived

[11] The students are identified with the last four digits of their student ID number using the following convention. For example: S9898.

the value of assigning video presentations to students with high interpersonal intelligence stated (S6103):

> I really enjoyed doing the video project. [i]t was something new for me and I have learned a lot from this experience. I do think that giving the students to do projects with something other than writing a report is really helpful and yet enjoyable!

Student perceptions of this theme are coherent with the intended outcomes of our study. A group of students not only enjoyed and positively perceived the value of engaging MI dimensions in learning and assessment, but also performed well. This explains the positive association between MI and student performance as reported by prior studies. In addition, the qualitative analysis strengthens our qualitative findings.

7.3. Experiential learning experience

Reflections in this theme indicate resemblance to real-life experience. Hands-on experience with team members who share common MIs engage the students with the MI-driven assignment.

One of the students (S5192) realizing the value of using the MI questionnaire in grouping and project assignment stated:

> … *it was different from any project we had done before, because it was based on our strengths as a team, which were identified through a Multiple Intelligence Questionnaire, which helped make this project [Project B] much more exciting and enjoyable than Project A.*

Another student (S5901) strong in visual intelligence perceived that the learning experience was enhanced through the MI-driven assessment despite challenges with the innovative method of learning:

> *The project taught us more about the cycles and opened our eyes on new innovative technologies around the world. Moreover, searching for new technologies and finding enough information for the report was a bit difficult, but manageable.*

Student preferences about the two projects varied. Some preferred the more challenging route of preparing a poster or a video compared to a report as it enhanced learning. One of them stated (S1517):

> *Both projects gave me new knowledge about two different technologies that are used in two different cycles. […] Also, I understood the technology in a better way. I think Project B was a good chance for us to have a different project format to do as all the remaining courses require reports like project A.*

Another student (S4048) similarly reported to have had a closer look at the business cycles:

> *The project provided me with a closer look to the content of both cycles which made many concepts clearer.*

This is further elaborated by a student who gained a new method of presentation through creating a video. The student was strong in the interpersonal dimension, and natural fulfillment came through engaging the particular intelligence in working on a video presentation. As stated by the student (S3880):

> *Our project B was to create a* video *regarding our chosen technology related to the expenditure cycle. I really enjoyed doing the project it was different and more fun to do than a report, I learned new skills as that was my first time to do a* video *and it helped me to learn more about the topic and to go deep in research. because I liked the idea of submitting the project in a form of* video *and we had the chance to get creative with the way we display and view our project,*

While appreciating the learning experience, one student suggested another avenue of active experimentation through field trips. The student (S1324) stated:

> *Overall, the experience of projects was amazing. Learned new ideas in Revenue and Expenditure Cycles. But, I think project[s] could be more exciting if students could visit [the] accounting department of a Company and collect real data from a manager instead of online research.*

Another student's (S1397) comment indicates the benefits gained through the shift from abstract conceptualization to active experimentation. In their own words:

> I liked that we searched on how to enhance the business cycle in real life, it helped me understand and visualize it better. […] Overall, it was a positive experience for me as it made me connect what I have studied in the chapter with the business world and made our understanding a whole lot better

Another student also had an overall positive perception despite the challenges faced. The student scored high in the visual dimension and performed better in project B. The student (S2857) stated:

> *Was great experience with new scale that was difficult a little bit firstly but with the project I learned much about every cycle and that helped me with final revision of the cycles that ma[d]e some confused point clear and understandable*

Student reflections in this theme focused on hands-on experience that linked conceptualization and operationalization. Exposure to how technology facilitates two business cycles linked their learning journey to real-life experience.

Overall, student learning varied and included adaptable, enjoyable and hand-on experiences. While the student reflections varied about their learning experiences, their performance consistently improved due to the engagement of the MI dimensions with few exceptions. Our findings correspond to studies that reported a significant relationship between MI and performance. However, it is important to highlight that the qualitative analysis in the present study enhances our understanding of the link between utilization of MI and performance. Moreover, the student comments demonstrate satisfaction in addition to better performance.

8. Conclusion

Contrary to conventional wisdom of intelligence being limited to verbal (linguistic) and logical (mathematical), Gardner (1983, 2011) advocated for nine dimensions of intelligence in his theory of Multiple Intelligence. The diverse dimensions of intelligences are found in students who may struggle when only verbal and logical intelligences are at play but may shine when intelligences they possess are employed in teaching and learning (Campbell, Campbell & Dickinson, 2003; Gardner, 2011; Pritchard, 2017). Higher education has been slow in accommodating such diversity and the MI theory can go a long way in filling this gap (Barrington, 2004). The engagement of MI in teaching and assessment has been limited in accounting education as we discussed earlier. In the present study, we employ verbal, visual, and interpersonal intelligences of students in two assessments in an accounting course. We find that not only the student performance improves when MI dimensions are engaged but their learning experience is enhanced. Past studies find mathematical intelligence to predict and explain performance of accounting students (Chang, 2006; Pehlivan & Durgut, 2017), which is logical due to the nature of accounting courses. However, in addition to the mathematical dimension, Cabrera and Fernando (2009) find verbal and visual intelligence to predict performance in accounting students. Our findings affirm past findings related to visual intelligence and add interpersonal intelligence as another dimension that potentially explains accounting students' performance in custom-tailored assessments.

We observe the student experience through qualitative analysis of their comments and discover their reactions to group dynamics informed by MI dimensions, their learning experiences, and their

preferences for and against such unconventional learning and assessment processes. One of the purposes of MI theory is to enhance individual students' educational opportunities and options (Gardner, 1983). Designing a curriculum to cater to the individual intelligence of students enhances their understanding of the content along with their performance and kindles intrinsic motivation in them (Pritchard, 2017; Davis et al., 2011; Özdermir et al., 2006; Emig, 1997). Our content analysis of the student comments affirms the benefits of MI discussed in past literature. While some students initially react anxiously to the unconventional assessment design involving MI, they eventually recognize the advantage of such assessment. We also find students' learning experience to be enhanced and experiential in nature due to the involvement of MI dimensions, affirming the premise of MI theory. The phrases from student comments, "…can learn and enjoy at the same time," "Was a great experience…," "… helped us better understand…," "…we had the chance to get creative…," and "…got excited to do…," indicate the positive learning experience of many students.

The present study contributes to the literature in four meaningful ways. First, we add to the very limited number of studies (Cabrera & Fernando, 2009; Chang, 2006; Gómez & Monroy, 2018; Ker & Ee, 2016; Pehlivan & Durgut, 2017) in accounting education that involve MI dimensions. Second, we employ students' individual intelligence to custom-tailor assessments that have the potential to motivate students to engage with the learning process as propounded by past literature (DeMong et al., 1994; Devadoss & Foltz, 1996; Durden & Ellis, 1995; Hand et al., 1996; Krohn and O'Connor, 2005; Perera et al., 2014). Third, we endeavor to understand the learning process from the accounting students' perspective. Research on student perceptions is limited in accounting literature (Babu & Barghathi, 2020; Watty et al., 2010), and our study adds to this scarcity. Fourth, we employ a mixed method that elaborates through qualitative analysis the association between MI and performance from the quantitative analysis. While prior studies find this association (Cabrera & Fernando, 2009; Chang, 2006; Gómez & Monroy, 2018; Ker & Ee, 2016; Pehlivan & Durgut, 2017), our study confirms the association and explains it through student learning experiences extracted from numerous comments.

Among the limitations of our study, we highlight three. First, it is sometimes challenging to demarcate distinctions between intelligence and other human abilities (Davis et al., 2011; Gardner, 2006). Therefore, there is potential noise in our measurement of performance driven by MI dimensions. Second, since educational interventions are multifaceted it is naïve to attribute student success strictly to MI-driven interventions (Davis et al., 2011). Third, faculty members need time to observe student intelligences (Kezar, 2001) and identification of MI dimensions with an instrument may not yield individual student intelligences with precision. Therefore, the assignment of projects based on the MI dimensions may sometimes be misaligned with true student intelligences. Fourth, the uneven distribution of our data may affect the generalizability of our findings, as the results might be influenced by the specific characteristics of the skewed sample. This limitation underscores the need for caution when extrapolating our results to broader populations. Future research could aim to explore similar projects with more balanced or differently composed samples to compare results. By investigating a more diverse range of samples, subsequent studies can help determine whether our findings hold across different contexts or if they are primarily a function of the unique sample composition in this study. This approach will enhance the robustness and applicability of the conclusions drawn. Fifth, the method of forming groups in our study makes the mapping of individual characteristics to group outcomes noisy. Future research could explore alternative methods of group formation and leadership assignment, such as randomized control trials or the use of algorithms to balance group composition more systematically. This recommendation aims to build on our findings and contribute to the development of best practices in educational group projects.

With only a handful of accounting education studies that attempt at utilizing MI dimensions in learning and assessments, the present study is at the pioneering end and further research is warranted. We suggest five avenues for future research to solidify our understanding of MI dynamics in accounting education. First, other MI dimensions aside from the three we utilized might be engaged in learning and assessment to gauge how they influence performance and learning experience. Second, various accounting courses, including theory and number-oriented ones could adopt the MI theory to test its implications. Third, a variety of creative assessments such as games, simulations, and role-plays might be used to engage the student intelligence to expand the learning tools in accounting education. Fourth, the present study explored the association between MI and performance through simple analyses. Future studies could explore the causality between two constructs with rigorous analysis involving a larger data set utilizing a control group. Fifth, to test the role of self-selection future studies could test the association between MI and choice of majors.

Multiple intelligence is a philosophy, not a single educational approach (Kezar, 2001). Accounting educators might be better equipped to adopt a particular form of pedagogy when they appreciate the importance of identifying individual student abilities (Chang, 2006). The students will likely find personal meaning in their studies if encouraged to engage their MI dimensions in teaching and learning (Barrington, 2004). While one best way of teaching may have been advisable in the past, with plurality of pedagogy, curricula, and assessments of contemporary times (Davis et al. 2011), innovation and diverse methods might be more appropriate. Due to the nature of the accounting field, mathematically intelligent students are attracted to it and the current curriculum caters to the said intelligence. We do not suggest an overhaul of the current curriculum but propose minor modifications when possible to cater to the other intelligences of accounting students. For instance, an audit simulation, such as the one done by Saadullah and Elsayed (2020) could involve multiple MIs. A student with kinesthetic intelligence would find it engaging moving around and working with the audit team members using real source documents and financial statements; a student with visual intelligence would interact well with the flowcharts that detail the client internal control system; and a student with verbal intelligence would utilize their skills in handling the Accounts Receivable confirmation letters and the letters requesting information from third parties such as the bank. Our study steps towards this direction and we invite colleagues to join in this endeavor.

During the preparation of this work the authors used Chat GPT in order to improve language and readability for a minor portion of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Acknowledgements

We would like to thank the participating students for their enthusiasm and effort. We would also like to thank the anonymous reviewers, the associate editor, and the editor Professor Natalie Churyk for their constructive feedback that helped us improve the paper. Open Access funding provided by the Qatar National Library.

Appendix A. Multiple intelligence instrument (McKenzie, 1999)

(The participants answered yes or no for each statement to indicate whether they like the activity)

Statement	Dimension	Statement	Dimension
Learning a new language.	Verbal	Studying with a partner.	Interpersonal
Making up nonsense words.		Chatting online.	
Writing stories.		Being on a team.	
Completing a wordfind puzzle.		Talking on the phone.	
Writing in a diary.		Getting along with others.	
Having a debate.		Don't like to be alone.	
Writing letters.		Joining a club.	
Giving a speech.		Being a leader.	
Taking notes.		Working with others.	
Reading books.		Being around other people.	
Keeping things in order.	Logical	Being right is important to me.	Intrapersonal
Following directions.		Having strong feelings about things.	
Solving problems.		Being fair.	
Upset by seeing a mess.		Speaking up when I see something wrong.	
Figuring out Math problems.		Being a good friend.	
Making timelines.		Feeling good about my work.	
Answering riddles.		Helping the poor.	
Knowing before something is about to happen.		Working alone can be good.	
Keeping things neat.		Need to know why I should do something.	
Making lists.		Being treated fairly.	
Picturing things in my mind.	Visual	Sorting things into groups.	Naturalist
Decorating a room.		Protecting nature.	
Making art.		Hiking and camping.	
Drawing maps.		Working on a garden.	
Watching a play.		Visiting National Parks.	
Creating graphs and charts.		Reading charts and tables.	
Putting together a puzzle.		Learning about animals.	
Watching a video.		Recycling waste.	
Using my imagination.		Going to the zoo.	
Planning things in my mind.		Spending time outdoors.	
Studying patterns.	Musical	Thinking about life.	Existentialist
Listening to sounds in nature.		Seeing how everything fits in the big picture.	
Moving to a beat.		Studying religion.	
Playing an instrument.		Studying art.	
Rhyming words.		Studying different countries.	
Listening to music.		Wondering about the universe.	
Remembering rhymes or words to songs.		Observing the stars and planets.	
Having background noise while I work.		Discussing why the world is the way it is.	
All kinds of music.		Summarizing ideas.	
Marching to a beat.		Wondering about life on other planets.	
Listening to a story.			
Working with my hands.	Kinesthetic		
Have a hard time sitting still.			
Playing sports.			
Practicing sign language.			
Exercising.			
Making arts and crafts.			
Dancing.			
Using tools.			
Building things.			
Playing charades.			

Appendix B. Project A

The purpose of this project is to research the cutting-edge technology available in the market place and propose a practical use of it in one or more of the four steps in the Revenue Business Cycle. During our study of the Revenue Cycle, we discussed technologies used in the sales order entry, shipping, billing, and cash collection steps. The assignment of your team is to propose a technology that is not currently utilized in one or more of the four steps in the Revenue Cycle. The technology may be currently in use in a limited capacity or may be a future concept. You are expected to use books, articles, internet, and any other available sources to collect information to do this project. Each source must be properly cited and any plagiarism will be handled according to the university policy.

The students will be divided into groups of four with a designated team leader by the instructor. Each group should prepare a report on their findings addressing the following four aspects:

1) Description of the technology
2) Its use in a particular step in the Revenue Cycle
3) Its benefits
4) Its disadvantages

Each student in the group must address one of the above aspects and write between 250 and 300 words using Times New Roman font. The font size should be 12 and the lines should be double-spaced. A cover page to the report should include the title to the report and the names and ID numbers of the students with the respective parts prepared by each student. The references should be cited following the AAA (American Accounting Association) style.

GRADING

1. Total grade for the project includes 15 points, which will be converted to count 7.5 % of the entire course grade.
2. Each student will be graded individually out of 10 points in the following manner:

a) The content of the write-up of each section will be graded out of 4 points.
b) The wiring style of each section will be graded out of 6 points divided into the following three dimensions. Each dimension will be assigned a grade between 0 (zero) and 2 (two) points based on the instructor's judgment:
   i. Organization: Sentences and paragraphs are organized logically. The ideas conveyed are interconnected and flow smoothly.
   ii. Language: The words and phrases used are appropriate.
   iii. Grammar: The sentences are grammatically correct without any spelling mistakes.

3. The overall project will be graded out of 5 points for originality and presentation.
4. Each member of the group is expected to work cohesively demonstrating team spirit. Any issue related to the lack of teamwork should be reported to the instructor immediately. The instructor will handle each case accordingly.

Appendix C. Project B (Poster)

The purpose of this project is to research the cutting-edge technology available in the market place and propose a practical use of it in one or more of the four steps in the Expenditure Business Cycle. During our study of the Expenditure Cycle, we discussed technologies used in the ordering, receiving, and paying steps. The assignment of your team is to propose a technology that is not currently utilized in one or more of the four steps in the Expenditure Cycle. The technology may be currently in use in a limited capacity or may be a future concept. You are expected to use books, articles, internet, and any other available sources to collect information to do this project. Each source must be properly cited and any plagiarism will be handled according to the university policy.

The students will be divided into groups of four with a designated team leader by the instructor. Each group should prepare a report on their findings addressing the following four aspects:

1. Description of the technology
2. Its use in a particular step in the Expenditure Cycle
3. Its benefits
4. Its disadvantages

Each team should prepare a poster show casing their findings. Each student in the group must address one of the above aspects and prepare part of the poster. Each section of the poster should provide the name and ID of the student who prepared it. The references should be cited following the AAA (American Accounting Association) style.

GRADING

1. Total grade for the project includes 15 points, which will be converted to count 7.5 % of the entire course grade.
2. Each student will be graded individually out of 10 points in the following manner:

c) The content of the poster of each section will be graded out of 4 points.
d) Each section of the poster will be graded out of 6 points divided into the following three dimensions. Each dimension will be assigned a grade between 0 (zero) and 2 (two) points based on the instructor's judgment:
   iv. Presentation: The content is visually appealing. The ideas are easy to follow.
   v. Language: The words and phrases used are appropriate. The sentences are grammatically correct without any spelling mistakes.
   vi. Graphics: The use of graphics are adequate and relevant to the content.

3. The overall project will be graded out of 5 points for originality and presentation.
4. Each member of the group is expected to work cohesively demonstrating team spirit. Any issue related to the lack of teamwork should be reported to the instructor immediately. The instructor will handle each case accordingly.

Appendix D. Project B (video)

The purpose of this project is to research the cutting-edge technology available in the market place and propose a practical use of it in one or more of the four steps in the Expenditure Business Cycle. During our study of the Expenditure Cycle, we discussed technologies used in the ordering, receiving, and paying steps. The assignment of your team is to propose a technology that is not currently utilized in one or more of the four steps in the Expenditure Cycle. The technology may be currently in use in a limited capacity or may be a future concept. You are expected to use books, articles, internet, and any other available sources to collect information to do this project. Each source must be properly cited and any plagiarism will be handled according to the university policy.

The students will be divided into groups of four with a designated team leader by the instructor. Each group should prepare a report on their findings addressing the following four aspects:

1) Description of the technology

2) Its use in a particular step in the Expenditure Cycle
3) Its benefits
4) Its disadvantages

Each team should prepare a ten-minute video show casing their findings. Each student in the group must address one of the above aspects and present part of the video. Each part in the video should visually provide the name and ID of the student who is presenting. The references should be cited at the end of the video following the AAA (American Accounting Association) style.

GRADING

1. Total grade for the project includes 15 points, which will be converted to count 7.5 % of the entire course grade.
2. Each student will be graded individually out of 10 points in the following manner:

e) The content of the video of each section will be graded out of 4 points.
f) Each section of the video will be graded out of 6 points divided into the following three dimensions. Each dimension will be assigned a grade between 0 (zero) and 2 (two) points based on the instructor's judgment:

vii. Oral Presentation: The oral presentation is clear and easy to follow. The presenter speaks smoothly.
viii. Visual Presentation: The video quality is good and the contents presented are relevant to the topic addressed.
ix. Originality: The overall presentation of the video demonstrates originality of thought and delivery of the content.

3. The overall project will be graded out of 5 points for originality and presentation.
4. Each member of the group is expected to work cohesively demonstrating team spirit. Any issue related to the lack of teamwork should be reported to the instructor immediately. The instructor will handle each case accordingly.

References

Armstrong, T. (1994). Multiple intelligences: Seven ways to approach curriculum. *Educational leadership, 52*(3), 26–28.

Ashford-Rowe, K., Herrington, J., & Brown, C. (2014). Establishing the critical elements that determine authentic assessment. *Assessment & Evaluation in Higher Education, 39*(2), 205–222.

Babu, A., & Barghathi, Y. (2020). Self-assessment and peer assessment in accounting education: Students and lecturers perceptions. *Corporate Ownership and Control, 17*.

Baker, R., & Wick, S. (2020). Undergraduate accounting students' perception of a course in accounting research and theory. *Accounting Research Journal*.

Barrington, E. (2004). Teaching to student diversity in higher education: How multiple intelligence theory can help. *Teaching in higher education, 9*(4), 421–434.

Behjat, F. (2012). Interpersonal and intrapersonal intelligences: Do they really work in foreign-language learning? *Procedia-Social and Behavioral Sciences, 32*, 351–355.

Bonk, C. J., & Smith, G. S. (1998). Alternative instructional strategies for creative and critical thinking in the accounting curriculum. *Journal of accounting education, 16*(2), 261–293.

Bradley, E. H., Curry, L. A., & Devers, K. J. (2007). Qualitative data analysis for health services research: Developing taxonomy, themes, and theory. *Health services research, 42*(4), 1758–1772.

Briggs, K. C. (1976). *Myers-Briggs type indicator*. Palo Alto, CA: Consulting Psychologists Press.

Campbell, L., Campbell, B., & Dickinson, D. (2003). *Teaching and learning through multiple intelligences* (3rd ed). New York: Plume.

Cabrera, J. & Fernando, G., (2009). Multiple Intelligences as Predictor of Academic Performance in Accounting: Evidence from a Private University in the Philippines. *Available at SSRN 2158151*.

Chang, C. F. (2006). Teaching accounting to learners with diverse intelligence. *Taylor's College, Malaysia. Paper presented at Asia Pacific Educational Research Association International Conference*. Hong Kong Institute of Education.

Chen, J. Q., Moran, S., & Gardner, H. (2009). *Multiple intelligences around the world*. John Wiley & Sons.

Clikeman, P. (2012). J & K Fitness Supply Company: Auditing inventory. *Accounting Education, 21*(2), 161–170.

Conrad, D., & Openo, J. (2018). *Assessment Strategies for Online Learning: Engagement and Authenticity*. Athabasca, Canada: Athabasca University Press.

Cross, K. P., & Angelo, T. A. (1988). Classroom Assessment Techniques. A Handbook for Faculty.

Davis, K., Christodoulou, J. A., Seider, S., & Gardner, H. (2011). The Theory of Multiple Intelligences.

DeMong, R. F., Lindgren, J. H., Jr, & Perry, S. E. (1994). Designing an assessment program for accounting. *Issues in Accounting Education, 9*(1), 11.

Devadoss, S., & Foltz, J. (1996). Evaluation of factors influencing student class attendance and performance. *American Journal of Agricultural Economics, 78*(3), 499–507.

Durden, G. C., & Ellis, L. V. (1995). The effects of attendance on student learning in principles of economics. *The American Economic Review, 85*(2), 343–346.

Emig, V. B. (1997). *A Multiple Intelligences Inventory. Educational leadership, 55*(1), 47–50.

Entwistle, N. J., & Entwistle, A. (1991). Contrasting forms of understanding for degree examinations: The student experience and its implications. *Higher education, 22*(3), 205–227.

Fleming, N., & Baume, D. (2006). Learning Styles Again: VARKing up the right tree! *Educational developments, 7*(4), 4.

Garcés, G. A. G. (2013). Initiatives for critical thinking in accounting education. *International Journal of Critical Accounting, 5*(4), 346–358.

Gardner, H. (2006). *Replies to my critics* (pp. 277–344). Howard Gardner under fire: The rebel psychologist faces his critics.

Gardner, H. E. (2011). *Frames of mind: The theory of multiple intelligences*. Hachette UK.

Gardner, H. (1993). *Frames of mind: The theory in practice*. New York: Basic.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: NY, Basic Books.

Gardner, H., & Moran, S. (2006). The science of multiple intelligences theory: A response to Lynn Waterhouse. *Educational psychologist, 41*(4), 227–232.

Gómez, J. L., & Monroy, L. D. (2018). Gamification in accounting distance education. *Journal of International Scientific Publications, 12*(8).

Gunawan, Supriatna, & Fauzi, D. A. N. (2021). Analogical reasoning on two dimensional geometry. In *Journal of Physics: Conference Series* (Vol. 1778, No. 1, p. 012007). IOP Publishing.

Gulikers, J. T., Bastiaens, T. J., & Kirschner, P. A. (2004). A five-dimensional framework for authentic assessment. *Educational technology research and development, 52*(3), 67–86.

Hand, L., Sanderson, P., & O'Neil, M. (1996). Fostering deep and active learning through assessment. *Accounting Education, 5*(2), 103–119.

Hajebi, M., Taheri, S., & Noshadi, M. (2018). The relationship between interpersonal intelligence, reading activity and vocabulary learning among Iranian EFL learners. *International Journal of English Language & Translation Studies, 6*(1), 48–56.

Handayani, S. (2016). Interpersonal intelligence in enhancing oral presentation proficiency for the indonesian students: Multiple intelligence approach in education field. *Journal of Psychological and Educational Research (JPER), 24*(1), 149–158.

Healy, M., McCutcheon, M., & Doran, J. (2014). Student Views on Assessment Activities: Perspectives from their Experience on an Undergraduate Programme. *Accounting Education, 23*(5), 467–482.

Herrington, J., Reeves, T. C., & Oliver, R. (2006). Authentic tasks online: A synergy among learner, task, and technology. *Distance Education, 27*(2), 233–247.

Herrnstein, R. J., & Murray, C. (2010). *The bell curve: Intelligence and class structure in American life*. Simon and Schuster.

Honey, P., & Mumford, A. (1982). *Manual of learning styles London: P*. RR: Schmeck.

Jensen, A. R. (1980). *Bias in mental testing*. New York, NY: Free Press.

Jensen, A. R. (1998). *The g factor: The science of mental ability*. CT, US: Westport.

Ker, S. C., & Ee, C. S. (2016). Effects of Learning Strategies in Accounting: A Case Study of a Malaysian Pre-University Student. *International Conference on Language, Education, Humanities and Innovation*, 18–33.

Kezar, A. (2001). Theory of multiple intelligences: Implications for higher education. *Innovative Higher Education, 26*(2), 141–154.

Kimmel, P. (1995). A framework for incorporating critical thinking into accounting education. *Journal of accounting education, 13*(3), 299–318.

Kolb, D. A. (2014). *Experiential Learning: Experience as the Source of Learning and Development*. Upper Saddle River, NJ: Pearson Education.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall.

Kornhaber, M. (2004). Multiple Intelligences: From the Ivory Tower to the Dusty Classroom-But Why? *Teachers college record, 106*(1), 67–76.

Krohn, G. A., & O'Connor, C. M. (2005). Student effort and performance over the semester. *The Journal of Economic Education, 36*(1), 3–28.

Kruger, S. J. (2020). Accountancy students' and lecturers' perceptions of the effect of open-book assessments on writing examinations. *South African Journal of Higher Education, 34*(1), 158–175.

Larkin, Teresa. "The student conference: A model of authentic assessment." (2014): 36-46.

Mahama, H., & Khalifa, R. (2017). Field interviews: Process and analysis. In *The Routledge companion to qualitative accounting research methods* (pp. 321–338). Routledge.

McKenzie, W. (1999). Multiple Intelligences Inventory, Copyright @ 1999 Walter McKenzie, The One and Only Surfaquarium. Retrieved on August 11, 2020, from http://surfaquarium.com/MI/inventory.htm.

Mobashshernia, D., & Mashadi Aghazadeh, S. (2018). The relationship between the interpersonal intelligence and reading comprehension achievement of Iranian bilingual and multilingual EFL learners. *International Journal of Research in English Education, 3*(3), 13–20.

Mulyaningsih, T., Rais, A. D., & Sulistyawati, H. (2013). A Correlation Study between Grammatical Competence, Verbal Linguistic Intelligence, and Writing Ability. *English Education, 2*(1).

Nkhoma, C., Nkhoma, M., & Tu, L. K. (2018). Authentic assessment design in accounting courses: A literature review. *Issues in Informing Science and Information Technology, 15*(1), 157–190.

Özdermir, P. I., Güneysu, S., & Tekkaya, C. (2006). Enhancing learning through multiple intelligences. *Journal of Biological Education, 40*(2), 74–78.

Pehlivan, A., & Durgut, M. (2017). The effect of logical-mathematical intelligence on financial accounting achievement according to multiple intelligence theory. *Journal of Education & Social Policy, 4*(3), 132–139.

Perera, L., Nguyen, H. O. A., & Watty, K. I. M. (2014). Formative feedback through summative tutorial-based assessments: The relationship to student performance. *Accounting Education, 23*(5), 424–442.

Pritchard, A. (2017). *Ways of learning: Learning theories for the classroom*. Routledge.

Ramsden, P. (1997). The context of learning in academic departments. *The experience of learning, 2*, 198–216.

Rebele, J. E., & Pierre, E. K. S. (2015). Stagnation in accounting education research. *Journal of Accounting Education, 33*(2), 128–137.

Rico Clavellino, G. M. (2020). Multiple Intelligences and ICT Tools (Video Games/2D-3D Softwares) for teaching CLIL technical drawing. *Master's Dissertation*. Downloaded January 1, 2022.

Saadullah, S., & Elsayed, N. (2020). An audit simulation of the substantive procedures in the revenue process–A teaching case incorporating Bloom's taxonomy. *Journal of Accounting Education, 52*, Article 100678.

Šafranj, J., & Zivlak, J. (2018). Spatial-Visual Intelligence in Teaching Students of Engineering. *Research in Pedagogy, 8*(1), 71–83.

Scapens, R. W. (2004). Doing case study research. In *The real life guide to accounting research* (pp. 257–279). Elsevier.

Shearer, B. (2004). Multiple intelligences theory after 20 years. *Teachers college record, 106*(1), 2–16.

Solehah, S. (2017). *The correlation between verbal linguistic intelligence and writing ability of the fifth semester students of English education study propram of uin raden fatah palembang* (Doctoral dissertation, UIN Raden Fatah Palembang). Downloaded January 2, 2022.

Springer, C. W., & Borthick, A. F. (2004). Business simulation to stage critical thinking in introductory accounting: Rationale, design, and implementation. *Issues in accounting education, 19*(3), 277–303.

Sridharan, B., & Mustard, J. (2015). *Authentic assessment methods: A practical handbook for teaching staff*. Victoria: Business and Law Learning innovations.

Struyven, K., Dochy, F., & Janssens, S. (2005). Students' perceptions about evaluation and assessment in higher education: A review. *Assessment & Evaluation in Higher Education, 30*(4), 325–341.

Suharni, S. (2016). *The effects of verbal intelligence and vocabulary mastery towards students' writing skill (A Survey Study at Senior High School in Plumbon Subdistrict-Cirebon Regency)* (Doctoral dissertation, Universitas Widya Dharma). Downloaded January 2, 2022.

Teele, S. (1996). Redesigning the educational system to enable all students to succeed. *NASSP bulletin, 80*(583), 65–75.

Thompson, F., & Washington, H. L. (2015). Critical thinking skills and teaching accounting: A comparative study. *Journal of Finance and Accountancy, 19*, 1.

Watty, K., Jackson, M., & Yu, X. (2010). Students' approaches to assessment in accounting education: The unique student perspective. *Accounting Education: An international journal, 19*(3), 219–234.