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Do international marketing simulations provide an authentic assessment of learning? A student perspective

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ABSTRACT

This paper seeks to determine whether international marketing simulations provide an authentic assessment of learning. The principles of authentic assessment dictate that assigned learning activities be aligned with the attitudes, skills and knowledge that students will be required to demonstrate in the real world. Research on the application of authentic assessment principles in management education is limited and most of the works that have examined the issue have done so from the perspective of the educator, not the student. A content analysis was undertaken of 122 final reports submitted by teams participating in an online international marketing simulation. The results demonstrate that the simulation provided students with opportunities for reflection and the development of an understanding of the real world of international marketing, with all its complexities and challenges. The simulation also allowed students to receive feedback, correct mistakes and gain an appreciation of the varied activities that contribute to the achievement of an overall objective. Students did not, however, appreciate the transferability of skills acquired in the simulation to other domains of knowledge. Similarly, the final reports did not reflect a significant appreciation of the communication and collaboration benefits that simulations should provide. Further, provision of instructional support was shown to have no impact on students' perceptions of the simulation's authenticity.

1. Introduction

This paper seeks to determine whether computer simulations provide undergraduate business students with an authentic assessment of their capabilities in international marketing. Authentic assessment is generally viewed as the constructive alignment of curriculum and the associated assessments where assigned activities allow students to develop skills viewed as central to the real world (Ashford-Rowe, Herrington, & Brown, 2014; James & Casidy, 2018). Students are required to demonstrate the application of these skills through the successful completion of assignments which mimic tasks they would be required to perform in their careers. The topic of authentic assessment has garnered considerable interest in recent years as educators search for new approaches to close the gap between the expectations of employers and the skills imparted to students (Gault, Leach, & Duey, 2010). In a highly competitive job market employers are more inclined to commit to graduates who are able to immediately contribute to the corporate mission and require minimal orientation to the requirements of the real world.

While authentic assessments focus on higher order thinking skills and the completion of multiple tasks, traditional, i.e. inauthentic assessments, are more concerned with rote memorization of facts and figures and the successful completion of standardized, closed book, multiple choice exams (James & Casidy, 2018). According to the latter authors both authentic and inauthentic assessments have their place in higher education with traditional approaches used to ensure that students have grasped basic concepts.

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Researchers have examined the principles of authentic assessment as they have been applied to a range of disciplines from social work to psychology and law. There are, however, only a limited number of studies which have examined authentic assessment in business disciplines and few that have done so from the perspective of the student. Thurab-Nkhosi, Williams, and Mason-Roberts (2018) as well as James and Casidy (2018) are notable exceptions. In terms of authentic assessment in business simulations again there is a noticeable dearth of research. The few studies (e.g. Neely & Tucker, 2012; Vos, 2015) that have examined the issue have done so from the perspective of instructors and course administrators, not students. This study is the first to examine the authenticity of a business simulation from the perspective of participating students and, therefore, fills an important gap in the literature.

Country Manager is the international marketing simulation employed in this study. This simulation is used to determine whether teams of undergraduate business students perceive it as being an authentic assessment of their learning. In answering this broad question a content analysis of the summative reports of participating teams was undertaken. The analysis of these reports also allowed for an understanding of which specific characteristics of authentic assessment (if any) are reflected in students' experience with the international marketing simulation under study. These characteristics of authentic assessment are well documented in the literature. The role of instructional support and its links to students' perceptions of authenticity is also investigated in the present research. More succinctly, this paper seeks to address the following research objectives:

(a) To determine whether students perceive an international marketing simulation as providing an authentic assessment of their learning.
(b) To determine the specific characteristics of authentic assessment (if any) that are reflected in the summative reports submitted by students participating in an international marketing simulation.
(c) To assess whether students' perceptions of the authenticity of an international marketing simulation are dependent on the provision of instructional support.

The paper is organized into five major sections. Following this brief introduction, a review of the literature on authentic assessment is provided. The theoretical underpinnings of the concept are explored in this section as well as research on its application in the field of management education. The third section is devoted to the study's research method while the fourth presents the principal findings. This is followed in the fifth section by a discussion of the research results. The study's major limitations are highlighted in this final section along with the implications of the findings for instructors and curriculum designers. The fifth section also offers suggestions for future research in this area and provides concluding observations.

2. Literature review

Situated learning and constructivist theories provide the theoretical foundation for authentic assessment. Situated learning theories argue for an understanding of the context in which learning takes place (Lave, 1988 and Brown, Collins, & Duguid, 1989). Situated learning theorists promote the argument that learning new knowledge and skills should occur in contexts that reflect the way they would be used in the real world (Collins, 1989; Lave & Wenger, 1991). Wenger (1998) refers to these contexts as "communities of practice." According to Brown et al. (1989) these communities of practice "are bound by intricate, socially constructed webs of belief, which are essential to understanding what they do" (P. 33). In essence, there is a culture associated with particular domains of knowledge and individuals through enculturation pick up the jargon, behaviors and associated norms of the particular discipline. The activities of any domain of knowledge are, therefore, defined by its culture. Learning, according to Brown et al. (1989), is essentially a process of enculturation with teachers serving as practitioners using the tools of the discipline to solve real world problems. It is participation with the real world that brings about learning hence the term "situated learning" (Stanley, 2013). Newcomers to a community of practice are initially at the periphery of the discipline but as they grow in competence they are trusted to undertake more complex tasks. Lave and Wenger (1991) dubbed this process "legitimate peripheral participation" and it describes the process by which individuals become integrated into a community of practice. Participation is key as is the ability to observe how full-fledged members of the community go about their tasks. According to Lave and Wenger (1991) "rather than learning by replicating the performances of others or by acquiring knowledge transmitted in instruction, we suggest that learning occurs through centripetal participation in the learning curriculum of the ambient community" (P. 100).

The practices of a community constitute authentic activities. When authentic activities are transferred to the classroom, however, the context is changed and there is a loss of meaning and understanding. The activity is no longer situated within the culture from which practitioners can negotiate a true understanding. As suggested by Brown et al. (1989) "Classroom tasks, therefore, can completely fail to provide the contextual features that allow authentic activity" (P.3). Given this assertion one needs to consider whether business simulations function as just another classroom activity, or alternatively, whether they provide instructors with a way to closely mimic communities of practice and allow students to participate in authentic activities. From the perspective of participating students, who are clearly at the periphery of the community, it is important to understand whether business simulations do in fact reflect the real world and allow them to begin the process of integration into the practice of professional managers. To accomplish this a business simulation must provide students with the opportunity to utilize the various tools of the discipline in a manner which reflects how they would be used in the real world.

As noted above constructivism also underpins the concept of authentic assessment. Constructivist theorists emphasize the need to bring the real world into the classroom as a mechanism to promote learning (Mims, 2003). According to Vos (2015) "Constructivists see learning as a process of active engagement through which learners construct meaning and new ideas, taking into account their current and previous knowledge. Learning is not, therefore, seen to be imposed or transmitted by direct instruction" (P.59).

According to constructivists individuals build up their knowledge base by continuously acquiring new and more complex information, confronting old rules with these new insights which may lead to a need to revise old methods of thinking (Fischer & Hänze, 2019). Students, according to constructivists, should be encouraged to challenge their real world constructs, formed from their own individual experiences, with new information. Given this argument it is important to understand whether students do in fact recognize the opportunities that business simulations should provide for reflection and the incorporation of new information into future decisions. Constructivists would consider this to be essential to any task that is considered authentic. If students do recognize the opportunities for reflection and the ability to incorporate new information into future decisions it would suggest that simulations do indeed provide for more active engagement. Constructivists put a great deal of emphasis on students being actively engaged in the learning process and for instructors to be student centric, offering learners the opportunity to tackle complex real world problems. The constructivist paradigm, in essence, redefines the role of teachers as guides, facilitating students' construction of new knowledge.

Constructivist theorists are of the view that active engagement will stimulate higher level cognition in students and improved transferability of knowledge and competences. Traditional approaches, these theorists would argue, lead to passive learning and inert knowledge (Fischer & Hänze, 2019). If one accepts the argument above then it becomes interesting to investigate the extent to which students participating in a business simulation actually do recognize the transferability of the skills to which they have been exposed, to other domains of knowledge. Constructivists would view this as an indication that the activity in which students are involved is indeed authentic. In addition to improved transferability, active student engagement with the subject matter should also improve retention. While there are numerous factors that influence one's ability to retain knowledge in long term memory (see, for example, Ranganath, Cohen, & Brozinsky, 2005 and Wittmann, Dolan, & Düzel, 2011) constructivists, have highlighted the role of active student involvement and relatable real world experiences in improving students' ability to recall the material to which they have been exposed (Allen, 2008).

From the above, the concept of authentic assessment clearly also builds on earlier research on student engagement (Piaget, 1954, 1974). To facilitate engagement, according to the latter author, the emphasis should be on student-environment interaction. Learning becomes a process of discovery with the student defining the problem and identifying specific tasks and approaches to arrive at solutions (Lee & Hannafin, 2016). The role of the teacher is to ask questions which motivate hypotheses that students test on their own. Learning is viewed as a social activity in which students are free to explore what interests them and share their findings with others (Vygotsky, 1978). The latter researcher writes of "zones of proximal development" arguing that learners benefit from engagement with their more capable peers. Peers with greater knowledge, are able to describe concepts in simple terms which facilitates better understanding. Engaged students benefit from this interaction with their peers who challenge and provide feedback. Key here is understanding whether business simulations do in fact stimulate interaction between peers, providing an opportunity for students in their zone of proximal development to collaborate and share information with others who are more capable. If simulations do in fact stimulate increased communication and collaboration then one could argue that students are more likely to be engaged in the assigned tasks.

The literature suggests that engagement is driven by scaffolding, defined as guidance to support one's independent functioning (Lee & Hannafin, 2016; Vygotsky, 1978). With scaffolding individuals with superior knowledge (e.g. teachers or industry experts) provide guidance to the student. As the student's own knowledge and skills improve these supports are gradually removed to allow for more independent functioning. Scaffolding reduces learners' cognitive load by, for example, providing step by step instructions or by directing students to important tasks that need to be performed. Scaffolds may focus on concepts, procedures, strategies or metacognition, i.e. how students should think about the problem. While the literature clearly supports the relationship between scaffolding and student engagement it is silent on the impact of such supports on perceptions of authenticity. This research seeks to shed some light on whether the provision of student support during a simulation impacts perceptions of the authenticity of the exercise. An understanding of this relationship has clear implications for how simulations are administered in undergraduate business education.

2.1. Characteristics of authentic assessment

There is little agreement in the literature on the specific characteristics of authentic assessments (Vos, 2015). Work in this area has been undertaken by Gulikers, Bastiaens, & Kirschner, 2004 and Ashford-Rowe et al., 2014, among others. Gulikers et al. (2004), for example, propose a five dimension model of authentic assessment, viz: the authentic task; the physical context; the social context; the assessment result or form and the assessment criteria. The authors view each of these dimensions as a continuum in that each may vary in terms of its degree of authenticity. In contrast Ashford-Rowe et al. (2014), based on a review of the secondary literature, argue that authentic assessment may be viewed as consisting of eight critical design elements. The authors argue that an authentic assessment should be challenging; the outcome should be in the form of a performance or product; design should ensure transfer of knowledge; metacognition should be a component of the assessment; there should be a requirement to ensure accuracy in assessment performance; the assessment environment and the tools used to deliver the assessment task should be appropriate to the real world; the design should include opportunities to discuss and provide feedback and there should also be built in opportunities for collaboration.

In this research we follow Vos (2015) who indicates that while there is no consensus, a review of the various authentic assessment frameworks does suggest a number of common characteristics. These may be identified as:

2.1.1. Real world applicability

Real world applicability is a key characteristic of authentic assessments. An authentic task refers to an activity that the student would be required to perform in the real world and necessitates that the student integrate knowledge, skills and attitudes. The

number and type of resources available to students to complete the task should reflect what they would have to work with in a professional setting. This includes the time given to the student to complete the task. In other words the physical context of any assessment that claims to be authentic should reflect the way in which knowledge, skills and attitudes would be used in the real world (Gulikers et al., 2004). This perspective is in keeping with the concepts of situated learning and constructivism discussed earlier. To be considered authentic, students should also perceive the task to be relevant, meaningful and representative (Gulikers et al., 2004). Authentic tasks should be essential in nature and enabling in that they guide students to more sophisticated use of their skills and knowledge. This focus on real world applicability is said to lead to higher levels of motivation among students and better outcomes (Sambell, McDowell, & Montgomery, 2013).

2.1.2. Creation of a product or performance

The constructivist underpinning of authentic assessment suggests that students be required to demonstrate their learning through the creation of a product or performance which reflects the type of knowledge and skills required in the profession. Presentations, student portfolios and take home exams are examples (Vos, 2015). The product or performance should be of comparable quality to what would be expected in a professional setting and should be a demonstration that allows one to make inferences about the student's competence. The performance or product should also be reflective of a full range of tasks, and students should be required to present their work to others and be given an opportunity to defend it (Gulikers et al., 2004). This opportunity for students to present their work to an authentic audience is also believed to increase engagement (Lee & Hannafin, 2016).

2.1.3. Complex and challenging

Authentic assessments should be complex and challenging with the potential for multiple possible solutions (Vos, 2015). Indeed the degree of challenge is a reflection of the authenticity of the assigned tasks (Ashford-Rowe et al., 2014). Authentic tasks should reflect the complexity that the student is likely to encounter in the real world and should be integrative rather than focussed on disaggregated learning outcomes (Wiggins, 1993). Complex tasks require higher order thinking skills and authentic assessments should provide an opportunity for students to develop those skills. Authentic tasks should also depend on the student's own research or use of knowledge and should emphasize depth over breath (Wiggins, 1993).

2.1.4. Transfer of knowledge

Authentic assessments ideally allow students the opportunity to transfer knowledge from one context to another. As noted by Ashford-Rowe et al. (2014) “authentic assessment activity should support the notion that knowledge and skills learnt in one area can be applied within other, often unrelated, areas” (P.208). The latter authors point out that while context is important in authentic assessments transfer of knowledge to another domain may enhance performance. Constructivists have argued, however, that this transfer of knowledge from one domain to another is difficult. As Vos (2015) points out successful knowledge transfer requires scaffolding, reflection and discussion with others. All of these conditions should be present in an authentic assessment.

2.1.5. Collaboration and communication

Situated learning theorists would argue that the social context is also an important element of authentic assessments. In the real world collaboration and team work are the norm, not the exception, and this should be reflected in any authentic assessment. The social process in an authentic assessment should reflect the equivalent situation in reality (Gulikers et al., 2004). Discussion with others allows students to develop a deeper understanding of the issues than would be possible if they worked independently (Vos, 2015). As noted earlier students are in the zone of proximal development and, therefore, benefit from interactions with more capable peers who are able to present concepts in a manner which fosters improved understanding. Collaboration promotes better communication and team building skills and should result in superior outcomes for students, as they share their knowledge and take responsibility for each other's learning (Ashford-Rowe et al., 2014).

2.1.6. Known evaluation criteria

In an authentic assessment students should know the criteria to be used to assess their learning, i.e. they should be assessment literate. This is reasonable given that in the real world employees would generally be made aware of how they are to be evaluated (Vos, 2015).

2.1.7. Feedback and opportunities to develop

The opportunity for development as students work through the assigned tasks is essential to authentic assessments. As Ashford-Rowe et al. (2014) argue the “value of feedback as both guidance and a means of determining areas for improvement is vital to improved performance” (P. 210). Regular feedback is also essential as it allows students to demonstrate higher order thinking skills over time (Vos, 2015). It should be noted that feedback and development does require some reflection on the part of the learner if performance is to be improved (Ashford-Rowe et al., 2014). Reflection is discussed below as a separate characteristic of authentic assessments.

2.1.8. Varied activities

Authentic assessment should also cover all intended learning outcomes. Activities must be sufficient and varied in order to evaluate students’ ability to handle various aspects of a complex problem. Again the concept of scaffolding may be important here as students are exposed to, and required to address, incrementally more challenging aspects of a problem and benefit from the guidance

of instructors and industry professionals. In authentic assessments students are required to bring to bear the full range of their capabilities to address the assigned tasks (Vos, 2015).

2.1.9. Reflection

Vos (2015) argues that in authentic assessments reflection must be encouraged. The process of reflection allows students the opportunity to improve their understanding of the issues, develop new insights into alternative solutions and approaches, as well as identify deficiencies in their own knowledge and skills. In a professional environment self-monitoring and evaluation are central to improving one's performance (Ashford-Rowe et al., 2014). In essence metacognition should allow students to make connections between content areas which should lead to improved understanding and better performance.

2.2. Authentic assessment in management education

Prior research on authentic assessment in management pedagogy is quite limited. Thurab-Nkhosi et al. (2018), for example, apply authentic assessment criteria to evaluate the competences of students in two graduate courses in human resource management. The authors find that the assessments were aligned with the criteria established. While there were areas that required improvement, students believed that they had made progress in a number of competences including problem solving, communication, integrity and evaluative judgement. James and Casidy (2018) investigate the relationship between authentic assessment, student satisfaction and promoting behavior (i.e. speaking positively about the subject to their peers) among undergraduate business students at an Australian university. The authors find a positive relationship, with student satisfaction mediating the relationship between authentic assessment and promoting behavior. They also find that the relationship to authentic assessment was greater in the case of more career oriented students.

Vos (2015) investigates the extent to which educators use authentic assessment principles when teaching with business and marketing simulations. The author finds that most instructors do use authentic assessment principles and that simulations do allow for the development of more higher learning skills and knowledge compared to more traditional assessments. Neely and Tucker (2012) also examine the use of simulations through the lens of authentic assessment. They evaluate a number of business simulations against criteria for authentic assessment proposed by Gulikers et al. (2004). The simulations evaluated covered global strategy, leadership and entrepreneurship. The authors find that business simulations do provide for an authentic assessment of student abilities compared to more traditional approaches. The authors also conclude, however, that the simulations evaluated do not provide a summative assessment of what students have learned. Unlike the work of Vos (2015) and Neely and Tucker (2012) which examine the views of educators, the present study provides a student perspective on the authenticity of simulation-based learning. The author is unaware of any other studies to consider whether students themselves perceive the activities in which they have been engaged as being reflective of the basic characteristics of authentic assessments.

3. Research method

This study examines whether an international marketing simulation provides students with an authentic assessment of what they have learned. Country Manager is the simulation employed. The scenario is one in which a US-based consumer products company is concerned that its primary markets in North America, Australia and Western Europe are maturing. These markets are highly competitive with aging and slow growing populations. The company's strategic response is to establish a presence in the fast growing emerging markets. Instructors may opt to use either the Asian or Latin American scenario and students are required to make a range of strategic decisions to penetrate these markets.

Teams are first tasked with the country selection decision. Teams are required to use a range of secondary data on the economic conditions, social characteristics and demographic profiles of the various countries in order to decide which countries are suitable candidates for market entry. Once the country selection decisions have been made students must determine how these markets will be entered. Students make entry mode decisions, i.e. whether to establish a production facility in the target region or rely on exports from the home country plant. Both are available options in the simulation. Exporting from the home country plant will result in faster market entry as there is no construction phase, but will also result in higher transaction costs over the course of the simulation. Teams that opt to establish an overseas plant must plan for a construction phase but will benefit from lower transportation costs and tariffs once the facility is operational. If a plant is to be commissioned in a host country teams must consider depreciation charges and other associated fixed costs, and make the appropriate capacity and plant location decisions.

Playing through multiple rounds of the simulation, students focus on a range of strategic marketing decisions in order to achieve profitability in the selected countries. More specifically, students are required to understand consumer buyer behavior and the factors that motivate purchase decisions. This includes where consumers shop and issues of brand awareness. Given a solid understanding of the consumer, students are encouraged to utilize the traditional segmentation-targeting-positioning (STP) approach covered in more elementary marketing courses, to select appropriate consumer segments and position their company's brand. Further, students have control over the marketing mix variables and make decisions with respect to the firm's product, pricing and distribution strategies. Decisions also have to be made with respect to advertising strategy and salesforce management. Students have access to a range of planning tools and reports to assist in making budget decisions, forecasting sales and profitability and analyzing distribution decisions. Teams also have access to a students' manual and case study. As the simulation progresses students are advised of exogenous shocks to the system, such as the onset of a full scale conventional war between India and Pakistan over Kashmir, or political instability in Venezuela. Teams must assess the potential implications of these events on their operations and undertake any necessary

strategic adjustments. The end goal of the simulation is defined by the instructor and is to maximize cumulative net regional contribution, i.e. long-run profitability in the targeted emerging market countries.

Participating students were enrolled in an undergraduate course in international marketing taught by the author. This course is offered as one component of a Bachelor of Commerce degree program at a Canadian business school and is delivered both online and in the classroom. Participants in the classroom sections would be in the third or fourth year of the four-year degree and would be full-time students. The typical full-time undergraduate student would be in his/her early twenties with limited full-time work experience. The majority of students enrolled in the online sections are also full-time students in the third or fourth year of the program but opt for this delivery mode in order to accommodate heavy part-time work commitments. A small percentage of students ($< 9\%$) enrolled in the online sections are part-time students who are already employed full-time and are attempting to upgrade their educational qualifications. Part-time students enrolled in the course would be older than their full-time peers and would typically have several years of full-time work experience, albeit not in managerial roles.

Working in groups of three to four,[1] students are required to play through successive rounds of the simulation. Students select their own team members at the beginning of the semester and no group changes are permitted after the first round of decisions is complete. Students enrolled in online sections are given the opportunity to play through three practice rounds of the simulation on their own prior to the start of competitive team play. Students enrolled in classroom sections, on the other hand, are not given the opportunity to practice prior to the start of competitive team play. These students, however, have the benefit of attending weekly simulation labs staffed by a trained teaching assistant who is available to provide guidance. Teaching assistants possess at least a Bachelor of Commerce degree and have significant experience with the Country Manager simulation. Students are also required to submit an online peer evaluation and a 10-page group report at the end of the exercise. As part of this report students are required to discuss any lessons learned from their experience with the simulation.

A content analysis of the team reports submitted over the course of seven semesters was undertaken to determine whether students perceived the simulation as an authentic assessment of their learning. Contemporary content analysis is a well-established research technique which has been used in the social sciences and psychology for many years (Krippendorff, 1980). The technique provides researchers with an approach to the analysis of large amounts of text, video, maps, photographic images or other forms of communication to generate inferences that are both valid and replicable. Texts (or other forms of communication) constitute the raw data for content analysis and have usually been generated for purposes other than the current research project. According to Drisko and Maschi (2015) meaningful content is assumed to be fully reflected in the text or other forms of communication to be analyzed. The frequency of occurrence of words or passages is, therefore, indicative of the relative importance of specific content. The technique seeks to code mainly manifest content, i.e. what is literally present in the communication, using deductively or inductively generated code lists. Basic content analysis is usually deductive relying on existing theoretical or empirical work to generate the codes used in the analysis. Software algorithms allow the researcher to classify many words of text into meaningful (and fewer) categories which then allows for the use of descriptive statistics. In this study the focus of the content analysis is on confirming the presence or absence of those characteristics recognized as common to authentic assessments. These common characteristics serve as benchmarks against which the team reports were evaluated.

A profile of the simulations and course delivery options is provided in Table 1. As noted in this table the sample used in this analysis consists of 122 reports submitted by 455 students over seven semesters. Coding of the final reports was undertaken by the principal investigator. As noted in an earlier section while there is little agreement in the literature on the specific characteristics of authentic assessments there are a number that are common to most frameworks. These were identified as: real world applicability; the creation of a product or performance; complex and challenging tasks; the transfer of knowledge to other domains; collaboration and communication; known evaluation criteria; feedback and opportunities to develop; varied activities and reflection. These common characteristics of authentic assessment constitute the codes used in the content analysis. It should be noted, however, that of the nine characteristics of authentic assessment identified above only seven were included in this analysis. The production of an output or performance was regarded as an inherent feature of any simulation and was, therefore, excluded. Similarly, the evaluation criterion by which the teams would be judged was also provided to students in advance and one would, therefore, expect this to be emphasized in the project reports. This characteristic of authenticity was, therefore, also excluded.

The content analysis was conducted using NVivo 12. In order to test the reliability of the results presented below a sample of 10 reports was also coded by a research assistant trained by the principal investigator. This approach to assessing reliability is considered appropriate in content analysis (Krippendorff, 1980). A coding protocol was provided to the research assistant who worked independently of the principal investigator. The key words and phrases used to categorize the various characteristics of authentic assessment are provided in Table 2 below. Inter-rater reliability is measured by the kappa (κ) coefficient which takes on values of -1 to 1, with a value of 1 indicating complete agreement and -1 indicating complete disagreement. $\kappa = 0$ suggests that agreement between the raters is completely random. The average kappa coefficient across all coding nodes was calculated as 0.419 indicating a moderate degree of inter-rater reliability (Landis & Koch, 1977).

4. Findings

The results presented in this section are based on a content analysis of 122 reports submitted by 455 students over seven semesters. In considering the findings it should be noted that the term “authentic assessment” was never used by the instructor at any

[1] In a few exceptional circumstances teams were permitted to complete the simulation with only two members.

Table 1
Simulation profile and course delivery options.

Semester	No. of Teams	No. of Students	Country Manager Scenario	Course Delivery Method
Winter 2019	11	41	Asia	Online
Winter 2019	22	84	Asia	Classroom
Fall 2018	14	52	Latin America	Online
Winter 2018	11	41	Latin America	Online
Winter 2018	27	102	Asia	Classroom
Summer 2018	24	85	Latin America	Online
Fall 2017	13	50	Latin America	Online
Totals	**122**	**455**		

Table 2
Code list – key words/phrases.

Characteristic of Authentic Assessment	Key words/phrases
Real World Applicability	*Real-world; Real life; Real Global Markets; Real Business; Practical, Mimic (a real business); Real Global Marketer; Reality; Practice (for the real world or real business); Realistic; Applied (to a real business).*
Complex and Challenging	*Constant Change; Complicated; Interconnected/Interconnectedness; Hard; Difficult/Difficulties; Complex/Complexity; Challenge/Challenging; Tricky; Convuluted; Overwhelming; Overcome (barriers/obstacles); Struggle; Battle/War; Confusing.*
Transfer of Knowledge	*Apply lessons/skills (to other situations/future careers); Use knowledge (in other academic disciplines); Use knowledge (in everyday life); Prepared team (for future business ventures); Prepared team (to implement better marketing strategies in other geographies); Builds on/complements knowledge (from previous courses); Builds on/complements (past work experience).*
Collaboration and Communication	*Work/working together; Work (as a team);Team/Group; Achieve (Common Goal/Objective); Teamwork; Communication; Collaboration/Collaborative; Meeting; Cooperate; Cohesive/Cohesion.*
Feedback and Opportunities to Develop	*Adjust/Adjustment; Change; Rectify (problem/situation); Alter (strategy/approach); Redo (decision); Checking/Reviewing (past decisions/approaches); Correct (strategy/approach); Respond (to new information/developments); Feedback; Improve (strategy/approach); Develop; Grow.*
Varied Activities	*Multiple tasks/activities; Various/Varied/Varying (business activities);Different (types of decisions to be made, e.g. relating to 4Ps); Range (tasks/activities).*
Reflection	*Mistake, Lessons; Important Lessons; Identify Problems; Thought; Thinking; Failed (to analyze/execute/plan); Better/Improved (understanding/appreciation); lost/missed (opportunity/advantage); Aware/awareness (of mistakes); New knowledge; Re-think; Realize (error/mistake); Overlook (issue/problem); Recognize/pick up on (mistake/opportunity); Review (performance/approach); Reflect/Reflection.*

time in the courses or in the guidelines for completion of the report. Further, the specific characteristics of authentic assessments were never discussed or presented to the teams. The responses in the final report are, therefore, spontaneous and devoid of any guidance from the instructor. The findings are provided in Table 3 for the seven characteristics of authentic assessment considered. As mentioned above the creation of a product or performance and known evaluation criteria were excluded. The table illustrates the number of times each characteristic of authentic assessment was mentioned in the 122 reports that were analyzed along with the associated percentage of the total number of coded references. A number of quotes from the student reports analyzed are also provided in this table to illustrate students' perspective on each of the characteristics.

That the Country Manager simulation did provide students with an opportunity to reflect on their performance is quite clear. This was the highest ranked characteristic of authentic assessment. There were 76 coded references to this particular characteristic. During the course of the simulations teams were able to identify weaknesses in their knowledge and skills and consider how these impacted final outcomes. On reflection students were able to identify areas where resources should have been allocated more efficiently, appreciate the importance of rigorous cost control, and understand the risks of expanding operations too quickly. This finding is indicative of students who are actively engaged in learning, are making use of higher level cognition to solve problems, and are engaged in an activity that is authentic as constructivist theory would suggest. It is also clear from Table 3 that the real world applicability of the Country Manager simulation was not lost on students. Real world applicability was the second highest scoring authentic assessment characteristic with some 33 (16.5%) of the total number of coded references. Students seemed to understand that the simulation would prepare them for making similar decisions in the real world. They saw the simulation as replicating the intense competitive environment likely to be faced by practitioners and recognized that the simulation provided a "safe" environment to hone skills they would eventually need in their careers. This finding suggests that business simulations are not just another classroom activity but are potentially important pedagogic tools in integrating students into a community of practice. The

Table 3
Frequency of coded references to authentic assessment characteristics, associated percentages and illustrative quotes.

Characteristics	Frequency	%	Sample Quotes
Real World Applicability	33	16.5	*"This simulation is a great practice for the real world."* *"The simulation emulated a business trying to enter foreign markets in a competitive business environment. This was a good way to build a foundation of what to do and not to do if tasked with doing this in the real world."*
Complex and Challenging	23	11.5	*"Also, we gained an understanding and experience of the complexity in international markets in terms of how little decisions can affect the [company's] profitability and brand equity."*
Transfer of Knowledge	13	6.5	*"The company learned many different tools and features and feel they can apply these lessons to future jobs, tasks, hobbies or projects."*
Collaboration and Communication	12	6	*"The overall impression our group received from the Country Manager simulation, was that it takes a cohesive group effort to effectively run a company."*
Feedback and Opportunities to Develop	24	12	*"During the simulation, after each round the company was able to look over the previous periods results. This allowed the firm to review which areas performed well, and which did not. By being able to review the previous period results, the company was able to go back and change these specific variables in the future rounds."*
Varied Activities	19	9.5	*"The simulation allowed the company to gain further knowledge on topics varying from pricing issues, benchmarking, contributions and expense allocations, which could be beneficial for future growth".*
Reflection	76	38	*"Based on what we know now Mexico would have been a good opportunity for both production and marketing based on population, sales and low tariff costs."* *"Had we picked up on these little elements during the simulation, we might have been more successful in entering the Latin American market."*
Totals	**200**	**100**	

international marketing simulation employed in this research was, from the perspective of participating students, able to provide the real world context that situated learning theorists argue is a hallmark of an authentic activity.

Students participating in the Country Manager simulation also clearly found it to be challenging and complex. Students seemed to understand that entering foreign markets is a difficult undertaking with a number of inter-connected decisions that determine success or failure. There was an appreciation of the fact that there would be obstacles along the way that would frustrate their strategies and that these needed to be overcome. In their reports teams wrote about their struggles to find a competitive strategy and the need for continuous learning in order to deal with the ongoing challenges. There were 23 coded references (11.5% of the total) to this characteristic of authentic assessment. Constructivists would argue that authentic activities must be complex as they are supposed to provide an approximation to the real world. From the perspective of participating students the simulation clearly fulfilled this requirement. Also, as noted above, authentic assessments should provide students with ongoing feedback and the opportunity to take corrective action. The Country Manager simulation seems to have also been effective in doing this as seen in Table 3, which shows this characteristic with some 24 or 12% of the total number of coded references. When confronted with the results of the previous round of decisions students were able to thoughtfully consider their successes and failures and determine a course of action to improve performance on a go forward basis. These course corrections could involve minor tactical adjustments such as lowering the prices of certain products or more significant strategic changes such as exiting a particular country market. Regardless of the magnitude of the adjustment, however, students needed to incorporate new information, challenge existing decisions and formulate new approaches to problem solving. Again constructivists would view this process as indicative of an authentic activity and one which promotes increased student engagement. Learning is not imposed but constructed from students' own experiences.

Authentic assessment as noted above should involve a wide variety of different activities. Students should be exposed to and challenged to complete a variety of tasks needed to solve a complex problem. Roughly 10% of the coded references addressed this issue (Table 3). Students made reference to the number of different activities that needed to be undertaken in making foreign market entry decisions. Given the characteristics of the different country markets, teams recognized the need to engage in setting prices, evaluating the competitive environment and benchmarking against the best performing teams. Teams also seemed to understand that to be successful in foreign markets it is necessary to implement rigorous budgeting and expense controls.

In terms of teamwork the opportunity for students to communicate and collaborate with each other is, according to the literature on authentic assessment, likely to result in superior outcomes. As mentioned, the Country Manager simulation, with very few exceptions, is played in groups of three to four students. Given the challenges and opportunities inherent in working in teams (see Hansen, 2006) it is rather surprising that inter-personal communication and collaboration did not feature more significantly in the final project reports. Only 6% of the total number of coded references addressed this issue making it the lowest ranked characteristic of authentic assessment (Table 3). A comment such as that referenced in Table 3 suggests some students recognized and appreciated the need for team cohesion in order to achieve success in the simulation. Other groups noted that while team cohesion was central to decision making achieving this was difficult if members were not able to meet face to face. Other groups pointed to the need for

Table 4
Number of Team Reports Referencing each Characteristic of Authentic Assessment and Associated Percentages.

Characteristic	Number of Reports Referencing Characteristic	Percentage of Total Number of Reports Submitted (%)
Real World Applicability	24	19.7
Complex and Challenging	21	17.2
Transfer of Knowledge	10	8.2
Collaboration and Communication	10	8.2
Feedback and Opportunities to Develop	19	15.6
Varied Activities	18	14.8
Reflection	63	51.6

effective communication in order to ensure that all managers had the same information and understood the overall strategy. As noted above students in the zone of proximal development may appeal to their more able peers for guidance. With such a low recognition of the importance of communication and collaboration as a characteristic of authenticity it would appear that such guidance was not a significant factor in students' knowledge acquisition and engagement.

Knowledge transfer was another area that students did not mention frequently in their reports. Only 6.5% of coded references related to this characteristic of authentic assessment. It is clear from the results that most teams did not connect the insights gained from the simulation to other domains of knowledge. Constructivists cite this as an important feature of an authentic task. There were very few references to the simulation building on previous course content or the future applicability of the skills acquired in the simulation to other areas. Lappalainen and Rosqvist (2015) refer to these as backward-reaching and forward-reaching types of knowledge transfer, respectively. Neither was much in evidence in the over 120 reports subjected to content analysis.

It is important to recognize that the authentic assessment characteristics discussed above were well distributed across the 122 team reports evaluated. Table 4 illustrates the number of reports that mentioned each of the seven characteristics included in the analysis. Slightly more than 50% of the reports submitted mentioned reflection. This was the most frequently mentioned characteristic of authentic assessment. Also as shown in Table 4 transfer of knowledge and collaboration and communication were the least frequently mentioned with only 8% of reports making reference to these characteristics. In essence Table 4 illustrates that none of the characteristics was mentioned in fewer than 8% of the reports and most characteristics were mentioned in at least 15% of the reports evaluated.

As noted above the demographic profile of students enrolled in the online sections is similar to that of students enrolled in the classroom sections. Both groups are largely made up of full-time undergraduate students in the 3rd or 4th year of a Bachelor of Commerce degree and are roughly the same age. Those enrolled online typically have a heavier commitment to part-time employment. A small number of online students are registered as part-time. These students would be engaged in full-time employment and would typically be older than their full-time student counterparts. While demographically similar the online and classroom sections did differ in terms of the type of support to which they had access. As mentioned above students enrolled online did not benefit from ongoing in-person instructional support but instead were allowed the opportunity to practice on their own prior to the commencement of team play. Classroom sections on the other hand were able to access trained teaching assistants for guidance over the course of the simulation. Teaching assistants possess at least a Bachelor of Commerce degree and have substantial experience with the Country Manager simulation. It should be noted that teaching assistants were instructed to not make decisions on behalf of the teams but rather to ask probing questions that encourage students to think more deeply about the problems being addressed, in order for them to identify possible solutions on their own. Students were similarly advised that they were solely responsible for the quality of the decisions made and the resultant outcomes.

As noted above scaffolding is expected to decrease students' cognitive load and increase engagement. This research suggests, however, that scaffolding has little impact on students' perceptions of the authenticity of the international marketing simulation in which they participated (Table 5). Irrespective of course delivery option, and access to in-person support, team reports contained references to all seven of the authentic assessment characteristics proposed by Vos (2015). Further, reflection and real world applicability continue to be the top ranked authentic assessment characteristics in terms of the frequency with which they were mentioned in the student reports. Similarly, collaboration and communication and knowledge transfer continue to be the lowest ranked characteristics when measured by the number of times each was mentioned in the reports analyzed. Overall, the results suggest that students' ranking of the characteristics of authentic assessment is largely invariant to course delivery mode and access to in-person instructional. These preliminary results suggests that, from the perspective of participating students, the provision of instructional support is unlikely to impact perceptions of authenticity.

5. Discussion and conclusions

This research sought to address three key objectives. The first was to determine whether an international marketing simulation

Table 5
Frequency of coded references to authentic assessment characteristics, associated percentages and ranks, by access to student support.

Characteristic	Access to In-person Student Support					
	Yes (Trained Teaching Assistants)			No (Individual Practice Only)		
	Frequency	%	Rank	Frequency	%	Rank
Real World Applicability	9	16.67	2	24	16.44	2
Complex and Challenging	4	7.41	4	19	13.01	3
Transfer of Knowledge	2	3.70	6	11	7.53	6
Collaboration and Communication	2	3.70	6	10	6.85	7
Feedback and Opportunities to Develop	7	12.96	3	17	11.64	4
Varied Activities	3	5.56	5	16	10.96	5
Reflection	27	50.00	1	49	33.56	1
Total	**54**	**100**		**146**	**100**	

provided students with an authentic assessment of their learning. In terms of this first objective the results of a content analysis of 122 summative team reports suggested that, from the perspective of participating students, the international marketing simulation used in this research did provide an authentic assessment of learning. As noted above the content analysis utilized the authentic assessment framework proposed by Vos (2015) and focussed specifically on the following characteristics: real world applicability; the creation of a product or performance; complex and challenging tasks; the transfer of knowledge to other domains; collaboration and communication; known evaluation criteria; feedback and opportunities to develop; varied activities and reflection. All of the characteristics of authentic assessment proposed by this framework were recognized in the team reports analyzed.

This study's second objective was to determine which specific characteristics of authentic assessment (if any) are reflected in the summative reports submitted by students participating in the international marketing simulation under study. Reflection and real world applicability were the two most frequently cited characteristics of authentic assessment. Playing through successive rounds of the simulation over several weeks, for example, did provide students with an opportunity to reflect on past errors and what could have been done differently. Further, the essential nature of authentic tasks is that they have real world applicability. This seems to be borne out by comments from the students participating in this simulation. Students were of the view that the simulation provided them with insights into the type of decisions they would be required to make as professional international marketers and that the exercise mimicked the real world. The third most frequently cited characteristic of authentic assessment was feedback and opportunity for development. The results of the content analysis suggest that the feedback from the simulation after each round, in terms of performance metrics and competitor details, provided teams with multiple opportunities to make necessary adjustments. This is a key requirement of any task considered to be authentic. Students made reference to fairly minor tactical adjustments such as price changes on specific products as well as more strategic decisions such as exiting an underperforming country market. The simulation provided students with an opportunity to observe first-hand how these decisions and course corrections impacted performance and pointed to additional changes that would be needed in successive rounds.

The fourth most cited characteristic of authentic assessment related to the complex and challenging nature of the exercise. Here again students were clear that they were challenged by the simulation and that the issues to be decided were not trivial. This is an important characteristic of any task that claims to be authentic. Also, and as noted previously, the Country Manager simulation requires that students undertake a number of decisions each week. Results from previous periods need to be reviewed, competitor data considered and various analyzes undertaken to support the next period's decisions. In response teams needed to set prices, adjust advertising budgets and reallocate salespeople to the most profitable distribution channels. From the perspective of participating students these activities were deemed to be sufficient and varied. The fact that teams were competing in multiple countries at the same time seemed to drive home this facet of authentic assessments. Varied activities was the fifth most cited characteristic of authenticity referenced in the team reports.

Issues of collaboration and communication were also raised in the final reports, although the number of coded references to this characteristic of authentic assessment was, perhaps, less than would have been expected given the problems that normally surround working in teams (Hansen, 2006). This was one of the least cited characteristic of authentic assessment in the team reports. One possible explanation for this is provided by Lohmann et al (2019). These authors note the tendency for students working in teams to merely divide up the tasks among themselves and to work largely independently. This compartmentalization may be the reason why the number of coded references for this characteristic was relatively low. It simply was not a point of emphasis for the teams.

To increase authenticity this analysis points to the need to better facilitate communication and collaboration on group projects. Team work is expected to result in improved communication skills along with greater student motivation, critical thinking abilities and inter-personal and social skills (Hansen, 2006). While communication and collaboration are essential in the world of business this

study suggests that simply forming students into groups does not guarantee that they will imbibe these skills or recognize their importance. This finding is in line with the work of Barker and Franzak (1997). Educators need to adopt innovative strategies to actively encourage the development of these skills within the context of group projects. Team building exercises, for example, may promote group cohesion and increase communication and collaboration (Barker & Franzak, 1997). Students also need to be formally taught the stages of group formation and the importance of trust and communication. It may also be useful to have industry professionals come into the classroom to stress the importance of working in teams and the impact of poor communication and collaboration on corporate objectives (Hansen, 2006). In essence, students need to be prepared to take on group assignments and this research suggests that this preparation needs to extend to the upper years of the business curriculum. It is erroneous to assume that these team building skills have been mastered in the earlier years of the standard business curriculum, or that they do not need to be reinforced.

Knowledge transfer is an important aspect of authentic assessments. Theory suggests that knowledge acquired from the performance of authentic tasks should be transferrable to other domains. This was one of the characteristics of authentic assessments that students focussed on the least in their reports. Very few teams recognized that the knowledge they had acquired from the simulation could actually be useful in other contexts or that the simulation built on material covered in more introductory courses. Students, it would appear, saw this as strictly an international marketing exercise and gave little consideration to the more fundamental skills to which they were being exposed. This type of silo thinking may well reflect the manner in which many undergraduate business school curricular are structured.

It should be recognized that knowledge transfer is a difficult and contentious issue with some authors e.g. Detterman (1993) claiming that it is not possible to teach this skill to students, but with other researchers e.g. Alexander and Murphy (1999), arguing that such development and adaptive learning is possible. Several reasons have been advanced to explain why knowledge transfer is problematic. For example, it may be difficult for an individual to appreciate how information obtained from different sources at various points in time is relevant to solving the problem at hand. It is also possible that the individual may not believe that he or she actually possesses information and insights that are relevant to solving the problem under consideration and, therefore, little effort is made to apply existing knowledge (Sillito Walker & Bonner, 2018). The latter authors also point out that leveraging previously acquired knowledge to solve new problems is cognitively taxing and as a result effective transfer tends to fail. Hinsz, Tindale, and Vollrath (1997) have argued, however, that groups have the potential to harness the members' joint information processing power to solve problems. Teams, therefore, have access to greater combined cognitive resources that can be deployed to solve problems compared to individuals acting alone (Sillito Walker & Bonner, 2018). The implication is that teams are in a better position to facilitate knowledge transfer. This, of course, assumes effective communication and collaboration between team members.

Knowledge transfer can be improved. The literature suggests that if a particular topic is well understood by students the prospects of knowledge transfer to different contexts are improved, as opposed to situations where learning occurred via rote memorization (Lappalainen & Rosqvist, 2015). Further, Billing (2007) suggests that transfer is more likely to occur when learning takes place in a social context in which the generation of principles and explanations is encouraged, and when there is feedback on student performance with training examples. The latter author also suggests that instructors have a responsibility to show learners how problems are related to each other if they are expected to eventually make these connections themselves. It behooves instructors to explain the underlying goal structures of problems that students are confronted with, provide varied examples and emphasize rules and principles for their solution. The learning of principles facilitates transfer between domains of knowledge as it promotes more flexible mental representations.

The present research has demonstrated that a business simulation on its own will not achieve instructors' knowledge transfer objectives but would need to be integrated with other pedagogic approaches. Educators need to more actively encourage students to think outside the narrow confines of the particular functional discipline. The results of this research suggests that even with assignments that are well connected to real world requirements students do not always recognize the transferability of the skills to which they are being exposed. Instructors using simulations should seek out ways to encourage students to make these connections to other domains of knowledge. Specifically with respect to simulations Mayer, Dale, Fraccastoro, and Moss (2011) argue that perceived knowledge transfer is greater when participants learn the simulation by reading the student manual and interacting with peers rather than from instructors or hands-on experience. According to these authors: "It may serve the learner better to rely less on instruction and more on his or her own mental efforts to make sense and distill the knowledge into a form helpful for future use" (P. 79). These authors suggest that instructors may encourage study of the simulation manual by administering open-book, timed quizzes on the material that students must complete either individually or a team. Alternatively, instructors may utilize assignments that require students to demonstrate an understanding of the simulation. Mayer et al. (2011) also argue in favor of students working with peers as part of a team to allow opportunities to discuss the material and exchange ideas. This should result in a deeper level of learning and improved transfer. Interestingly, and as noted earlier, participants in Country Manager did not seem to recognize the communication and collaboration opportunities this simulation provided indicating that more needed to be done to foster interaction between team members.

Mayer et al. (2011) also argue that time spent on strategic and financial decisions in the simulation was related to perceptions of knowledge transfer whereas time spent on more functional areas such as marketing was not. This may partially explain the low frequency recorded for this characteristic of authentic assessment in this study. These authors also examined the issue of grade expectations. It was found that grade expectation was related to perceptions of transfer, i.e. the higher the overall course grade students expected the greater was perceived transfer of learning. Winning the simulation was not, however, related to perceived knowledge transfer. Given this result the researchers suggest that instructors place less emphasis on winning the simulation and place more grading emphasis on simulation-related assignments that reinforce the overall learning objectives of the course. The authors

argue that this should result in improved knowledge transfer. Again for the simulation under study most of the grade emphasis was placed on the competitive aspect of the game, as opposed to the summative report, which may also have contributed to the low ranking for this characteristic of authentic assessment.

The study's third objective was to assess whether students' perceptions of the authenticity of an international marketing simulation are dependent on the provision of instructional support. It was found that students' appreciation of the authenticity of the international marketing simulation used is invariant to whether they received in-person support or were given the opportunity to practice on their own prior to the commencement of live competition. All the characteristics of authenticity in the Vos (2015) framework were in evidence in both groups and the ranking of these characteristics was very similar. While this result is preliminary, scaffolding does not appear to have any impact on students' perceptions of authenticity. As noted previously constructivists do argue for a positive relationship between scaffolding and student engagement. The literature also suggests a positive relationship between authentic activities and student engagement. This research suggests that the relationship between scaffolding and perceptions of authenticity is a bit more tenuous. This is an interesting finding which deserves more rigorous investigation.

This study suffers from several limitations. These limitations, however, provide opportunities for future researchers in this area. Only one international marketing simulation was used in this analysis and the results, therefore, may not be generalizable. It would be instructive to replicate this study using simulations in other business disciplines in order to validate these preliminary findings. It should also be noted that this study is based on student perceptions of authenticity and while they provide some information cannot be considered objective measures. Further, the computed inter-rater reliability ($\kappa = 0.419$), while acceptable, is not high. The results presented above should, therefore, be viewed as preliminary. Also in terms of method this study is focussed on understanding whether the characteristics of authentic assessment described in the extant literature are recognized by students who participated in this particular international marketing simulation. While the codes used in this analysis were based on the secondary literature a more inductive approach may have pointed to other characteristics not considered in the theoretical literature on authentic assessment. This is another potentially fruitful avenue for future researchers.

It would also be useful for future researchers to investigate more thoroughly, from the perspective of students participating in business simulations, the relationship between scaffolding and authenticity. Preliminary results from this research suggest that there is no relationship between scaffolding and perceptions of authenticity but this needs to be assessed using more formal approaches. The issue of knowledge transfer also needs to be examined more closely. A better understanding of how students transfer knowledge from simulations to other domains would be helpful to educators who employ this pedagogic tool. For example, the relationship between knowledge transfer and team collaboration and communication is one area deserving of attention. In this study knowledge transfer and communication and collaboration were shown to be the least referenced characteristics of authentic assessment. This may not be a coincidence given that teams working cohesively are better positioned to transfer previously acquired knowledge (Hinsz et al., 1997). This suggests that a better understanding of the relationship between these two constructs in the context of business simulations is warranted.

In conclusion this paper is the first to examine the issue of authentic assessment of simulation-based pedagogy from the perspective of participating students. The findings were generated by a content analysis of 122 team reports submitted by some 455 students over seven semesters. The analysis suggests that the international marketing simulation evaluated does provide an authentic assessment of learning but not all characteristics of authentic assessment were equally weighted in the final team reports. While students appreciated the value of the simulation in giving them an appreciation of the real world and an opportunity to reflect on decisions made, for example, knowledge transfer and communication and collaboration did not figure significantly in the team submissions. Possible explanations for these findings as well as strategies to improve knowledge transfer and communication and collaboration were explored.

Declaration of competing interest

I wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. I also confirm that I have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing I confirm that I have followed the regulations of my institution concerning intellectual property.

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