

Tiers of Engagement II: Profiling the Characteristics of User Engagement and Motivational Tiers in Business Simulators

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Abstract: This study investigates student engagement and motivation in the use of a business simulation game in the context of a fully online economics course. Building on our prior research, we refined our data collection instrument to include self-reported measures of engagement, intrinsic motivation, perceived learning outcomes and reflections on learning from 388 BA students. Based on this data, we updated and expanded our Tiers of Engagement framework, identifying 15 different engagement tiers. By analyzing 1552 qualitative comments on our respondents' reflections on their learning, we provide characteristics describing these tiers. The tiers show a correlation between higher engagement and intrinsic motivation on perceived learning outcomes and depth of reflection on learning. We also examined the impact of narrative tasks added to the simulator, which were designed to bridge theoretical concepts with practical application. Our findings highlight the simulator's effectiveness in fostering engagement and learning, particularly for highly motivated students, while also identifying areas for improvement in facilitating engagement (and potentially learning) for lower tiers. This research contributes to understanding how game-based learning can enhance educational outcomes in higher education.

Keywords: Game-Based learning, Engagement and motivation, Online education, Business economics education, Business simulators, Self-Determination theory.

1. Introduction

We present an updated and detailed framework for student tiers of engagement in game-based learning activities. Our study aims to further identify and describe specific characteristics of the different tiers of engagement. Through targeted queries, we have expanded our tier framework with a higher granularity, regarding both engagement level (low to high) and intrinsic motivation level (presence of intrinsic motivational factors). This has enabled us to further study the differences both between and within the different tiers.

We also investigate the impact of a supplemental intervention, narrative tasks framed as requests from the business' board of directors. The purpose was to tie the simulator's practical perspectives on business closer to the curriculum's theoretical perspectives, aiming to strengthen student achievement of learning outcomes tied to the link between theory and practice.

We consider whether changes in results from the previous study can be ascribed to changes made in the onboarding and debriefing process of the simulator, as well as improvements in the narrative tasks. These changes were based on the good practice recommendations in our previous article. The main research question for this article is: "What characterizes students on different tiers of engagement in the use of business simulators".

2. Theoretical Background

2.1 Foundation of the Tiers of Engagement

In our previous article (Guttormsen and Weines, 2024) we gave an overview of the theoretical background for our approach to organizing our respondents into different tiers of engagement. To operationalize "engagement" in the context of a business simulator game, we drew on various perspectives from the game-based learning field, and strongly inspired by Schwartz and Plass (2019), settled on considering "engagement to be the active effort, and quality of this effort, students have put into making meaning out of, and making use of the business simulator in their learning processes" as our working definition. Our perspective on motivation was mainly inspired by Deci and Ryan's (2000) self-determination theory (SDT), focusing on extrinsic and intrinsic motivation, and how the business simulator can facilitate students' expression of intrinsic motivation. We furthermore used Miele and Scholer's (2018) concept of metamotivational processes to define our criteria for assessing the level of reflection on learning in the responses and reflection of motivational fit (or quality of effort – that the students are motivated "enough" and/or "in the right way"). By building on literature on engagement,

motivation and self-regulated learning, we aimed for an appropriate and relevant framework for the context of higher education business programs.

Our framework also built on previous studies of the same business simulator we use. Baksaas and Nygård (2019) saw that the simulator could facilitate deep learning. Hovland Honerud et al (2023) found students reporting positive motivation and increased learning in relation to terms and methods, but no cognitive effects on grades and knowledge tests. Skjelbred and Daus (2022) did not find evidence that high satisfaction increased game effectiveness. Our results mirrored the positive results in these studies, and while we did not measure the effectiveness of the simulator, we found that high engagement and intrinsic motivation corresponded with deeper reflections on learning and perceived utility for learning outcomes. In Platz' (2022) systematic review on games in economics education, she highlighted that while motivation is central in the GBL literature (and support for motivation being a factor for learning), the effects of GBL on motivation are unclear. Our data indicated that complexity, challenge and realism could be drivers for engagement, but we did not consider our findings to be strong.

2.2 Further Perspectives on Business Simulators in Higher Education

In revising our framework, we have explored more literature that specifically deals with simulators in higher education business programs. Barker and Warner (2023) provide a thorough overview of how business simulators can provide opportunities for experiential learning tied to difficulties in managing businesses, such as analysis of options for enhancing decision making skills and making strategic decisions in the context of time and resource constraints. From their own evaluations, they point to the importance of practice runs for building students' confidence in using simulators in their learning. Ahuja (2024) also reviews studies on the use of simulators in business education, pointing out that scholars have highlighted several areas where they are useful. These include the practical application of theoretical knowledge, development of critical thinking skills, adaptability, simulated realistic experience, enhanced retention, engagement, as well as enhancing students' confidence in their own abilities. Ahuja notes the opportunities of simulations to not just enhance subject-specific knowledge but also foster development of broader skills. Butler et al (2025) presents a study of factors that impact individual students' performance in business simulators. They found that students with quantitative majors did not, as hypothesized, perform better than students from other majors. Instead, they found that gender had an impact, with women performing worse than men, but suggest further research to clarify this. As expected, they found that grades and time spent in the simulation correlated with better performance.

3. Methodological Design

Like our previous article, our study uses a concurrent triangulation design, where we combine quantitative and qualitative data to explore our research question (Almeida, 2018). Through an online survey framed as a post-simulator reflection assignment we gathered responses from 423 respondents, of which 388 gave consent for their responses to be used for research. We asked the students to report their effort in completing the simulator (i.e. engagement) and to indicate their interest/enjoyment in the simulator (i.e. presence of intrinsic motivation) by choosing the relevant statement on a closed scale.

Students were also asked to report the simulator's impact on their perceived achievement of four learning outcomes on a closed scale. There were four open-ended questions where students were asked to reflect on their experience with the simulator, potential collaboration with other students, the practical relevance of the simulator, and the impact of the narrative tasks (assignment from the board of directors) added by the course instructor. For these open questions, the respondents were given prompts for what they could elaborate on.

As with our previous study, we rely on self-reported data. Relying on established criteria for validity of self-reported data (Gonyea, 2005), we consider our data to be valid in the context of our study. We refer to our discussion of validity in our previous article, and we further discuss potential limitations for our current study later in this article.

Table 1: Open questions in reflection assignment

Category	Query
Reflection on your experience with the simulator	Write what you liked/disliked with the simulator, or any other experiences. Please also answer: Do you think you learned anything from the simulator? If so, what did you learn from the simulator? How did you learn this through the simulator?
Use of the simulator in collaboration with others	Did you discuss the simulator with other students? If so, what use do you think it had for your learning?
Practical relevance	1) How has the simulator impacted your understanding of how theory and practice are connected in business economic analysis? Did you experience the simulator as realistic? 2) How could the simulator be improved in this regard?
How did the assignments from "the board" impact your achieved learning outcomes?	How did you experience the assignments from the board?
Other feedback	If you have other feedback you want to add you can add it here (not mandatory)

We used the same criteria for assessing the depth of reflection on learning as in our previous study, reported in Table 2. However, we note that we prompted the students to reflect on if, what and how they learned through use of the simulator (see Table 1). As the survey was primarily a post-simulator reflection task, we offered the students these questions to strengthen their reflections on their learning.

4. Empirical Findings and Analysis

4.1 Analysis

After collecting the data, some of it had to be coded into more useful parameters for our analysis.

This coding is covered briefly in the tables below before we move on to the data analysis.

Table 2: Criteria for coding reflection on learning

Level of reflection on learning indicators:	How the students describe their experience with the simulator, their perceived learning from it, and insight regarding their learning process. We differentiate between how detailed and deep their thoughts about the simulator and their own learning are as described below.
High (3):	Reflects on what they have learned, but also how they learned, and what could facilitate more learning. Relating their learning to larger contexts.
Medium (2):	Reflects on what they have learned.
Low: (1)	Reflects on what tasks they have done and if they have learned/not learned (e.g. answering "yes" or "no" without further specifications).

Table 3: Criteria for coding level of intrinsic motivation for the simulator.

Level of intrinsic motivation indicators:	How the students describe their experience with the simulator with regards to their feelings of joy and interest towards working with the simulator.
High (H):	Answered "I thought the simulator was very fun and interesting".
Medium (M):	Answered "I thought the simulator was somewhat fun and interesting".
Low: (L)	Answered "I thought the simulator was a neither fun nor interesting", "I thought the simulator was a little boring/not interesting" or "I thought the simulator was very boring/uninteresting"

Table 4: Criteria for coding learning from narrative assignments.

Level of learning from narrative assignments indicators:	How the students describe their perceived learning or usefulness of the narrative assignments put in by the course instructor.
High (3):	Comments indicating great learning value, such as: "Very helpful or very educational", etc.
Medium (2):	Comments indicating some learning value, such as: "OK", "a bit helpful", etc.
Low: (1):	Comments indicating no or negative learning value, such as: "disruptive", "confusing", "bad" etc.

4.2 Analytical Framework

The tiers were constructed based on the data collected on the students' self-reported effort (engagement) on a Likert scale from 1 to 5, and on the students' perceived level of intrinsic motivation towards the simulator from high to medium to low as shown in Table 3 above. The result was a framework consisting of 15 different tiers, presented in Table 5 below. The tiers with few respondents are marked with *.

Table 5: Tiers of Engagement analytical framework

Tiers of Engagement	Distribution of students	Mean reported level of reflection	SD Reflection	Mean reported achievement of learning outcomes	SD Learning Outcomes	Mean usefulness of narrative assignments	Mean age	SD age	% Men (tier)	% Women (tier)	% Men (total)	% Women (total)
H5	19,1%	1,79	0,67	4,40	0,52	2,34	32,33	7,54	42 %	58 %	17 %	21 %
*M5	1,3%	1,40	0,55	4,25	0,56	2,00	29,40	12,24	20,0%	80,0%	0,5%	2,0%
*L5	0,3%	1,00	0,67	4,25	0,51	2,00	28,00	7,87	0,0%	100,0%	0,0%	0,5%
H4	33,9%	1,75	0,72	4,08	0,48	2,31	28,65	6,74	55 %	45 %	39 %	29 %
M4	13,3%	1,63	0,63	3,71	0,57	2,24	28,37	6,94	33,3%	66,7%	9,1%	16,9%
*L4	1,3%	1,80	0,69	3,25	0,58	1,75	28,60	6,86	60,0%	40,0%	1,6%	1,0%
H3	9,9%	1,79	0,62	3,88	0,61	2,30	27,95	6,25	61 %	39 %	12 %	7 %
M3	11,2%	1,62	0,76	3,40	0,52	2,11	28,84	7,04	62,8%	37,2%	14,4%	8,0%
*L3	3,9%	1,20	0,70	2,63	0,70	1,50	30,40	7,04	33,3%	66,7%	2,7%	5,0%
*H2	1,3%	1,40	0,55	3,60	0,38	2,00	25,40	1,52	40 %	60 %	1 %	1 %
*M2	2,3%	1,33	0,71	2,86	0,72	1,63	29,33	5,57	22,2%	77,8%	1,1%	3,5%
*L2	1,3%	1,20	0,58	2,60	0,73	1,75	29,40	6,88	20,0%	80,0%	0,5%	2,0%
*H1	0,0%											
*M1	0,3%	1,00	#DIV/0!	1,00	#DIV/0!	1,00	27,00	#DIV/0!	100,0%	0,0%	0,5%	0,0%
*L1	0,5%	1,00	0,00	2,00	0,58	2,00	25,00	1,15	0,0%	100,0%	0,0%	1,0%

4.3 Quantitative Analysis

The distribution of students in each tier was calculated by taking the total number of students that reported a level of intrinsic motivation given by the letters (H=high, M=medium, L=Low/none), and the reported effort put into the simulator given by the numbers (1-5) that corresponded with the tier. This was divided by the total number of students in the study.

The same criteria used in the distribution were also used when performing the quantitative analysis to group the data into tiers. This allowed us to calculate the mean, standard deviation and percentage measurements for each tier. The objects of these measurements were the students’ tier specific level of reflection, reported achievement of learning outcomes, age, gender distribution, and perceived learning value from the narrative assignments. The characteristics will be covered in the qualitative analysis. The measurements were then analyzed for identifying patterns. They were then visualized in diagrams and compared to corresponding diagrams from our previous study.

4.4 Qualitative Analysis

The focus of the qualitative analysis is on the text comments answered by the students regarding their reflections on the simulator as a learning activity, potential learning through cooperation, practical relevance to real world business, their experience with the narrative assignments from the “board”, and other open-ended comments. In total, 1552 text comments were analyzed, ranging from one word to several paragraphs.

To analyze this rich data, we manually went through all the comments and coded the level of reflection and reported utility from the narrative tasks, using the criteria in the tables above. We also utilized a Large Language Model (LLM) in order to make short descriptions of each tier’s characteristics. Based on our own analysis of the text comments, the summaries fit the “essence” of each tier. Still, it should be interpreted with caution as it is an AI generated summary. The AI that was used was ChatUit 4o. This is an internally hosted and secure AI chatbot/LLM within our university (UiT). The chat history can be provided, if necessary, but it is written in Norwegian language.

5. Findings

The findings from the analysis are visualized in the figures below. The distribution of students into the tier corresponding with their engagement and intrinsic motivational level resulted in the tier specific population shown in Figure 1.

About 19.1% were placed in the highest tier, **H5**. This indicates that a significant number of the participants were highly engaged and intrinsically motivated towards the simulator. We also see that for those who reported the highest level of engagement (5), only 1.6% of the entire population in the study reported medium or low intrinsic motivation. This indicates that high intrinsic motivation towards the simulator might be key for putting in the highest effort and fully engaging with the simulator.

On engagement level 4 we see the highest distribution of students. A total of 48.6% of the respondents were placed here. Of these, 33.9% reported a high level of intrinsic motivation, while 13.3% reported medium intrinsic motivation. The remaining 1.3% reported low levels of intrinsic motivation. This indicates that intrinsic motivation was an important factor for reaching this level of engagement.

On engagement level 3, high or medium levels of intrinsic motivation seem to play a weaker role for becoming engaged, with 9.9% high intrinsic motivation, 11.2% medium intrinsic motivation and 3.9% low intrinsic motivation. But from engagement 3 and down, the role of intrinsic motivation for becoming engaged seems to be less as the distribution of motivational factors evens out. We note that the engagement 2 and 1 tiers in total consists of only 5.7% of the respondents.

This distribution seems to be fairly similar to the corresponding distribution from our earlier work. This indicates that the simulator used in these two studies produces similar engagement and motivation corresponding to our figure for a previous cohort of the same business analysis course.

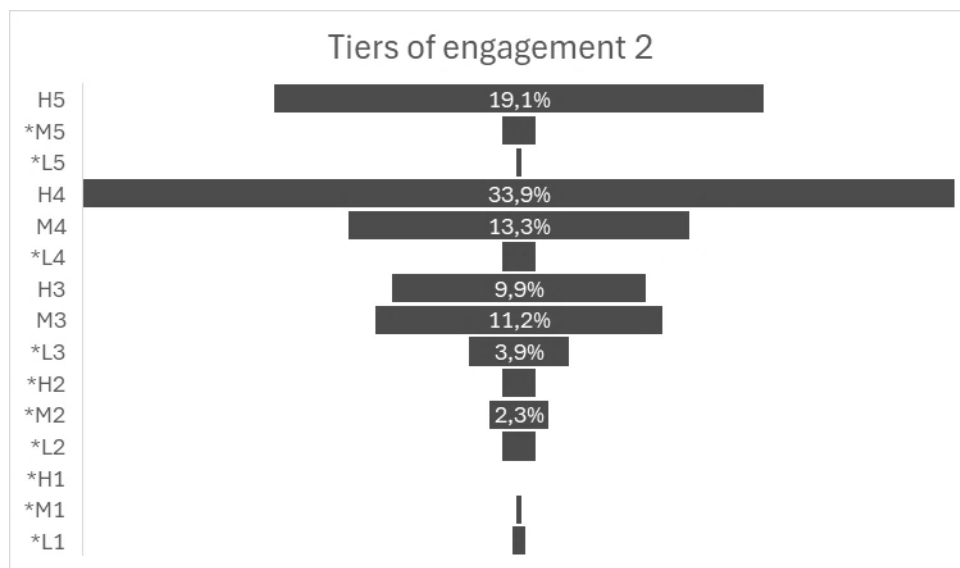


Figure 1: Tiers of engagement distribution of students

With regard to gender differences, and how they are engaged and motivated by the simulator, we analyzed the relative distribution of men and women in each tier. The relative gender distribution for each tier is presented in Figure 2.

We did not find any significant differences between genders with regards to motivation and engagement. Some tiers have more men and some have more women. However there seem to be a slight difference, with two of the three highest significantly populated tiers having a greater distribution of women, while two of the significantly populated lower tiers had a greater distribution of men. This difference is slight, and not significant enough to give any indication with regards to gender differences in the simulator.

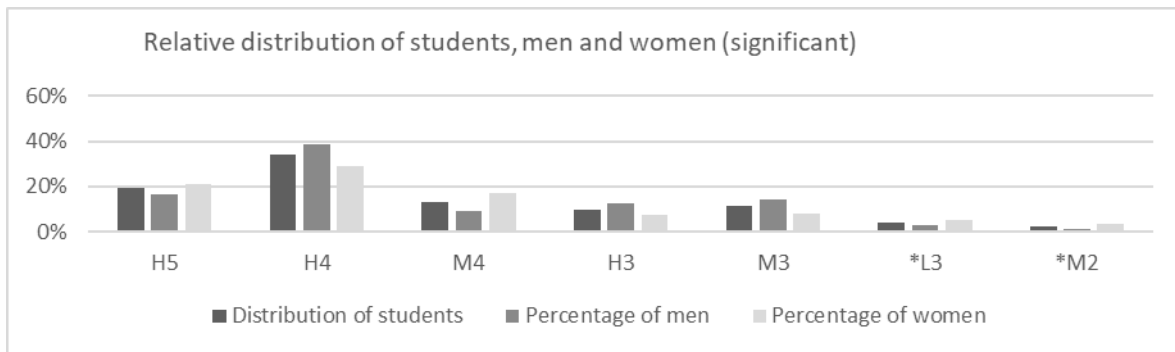


Figure 2: Gender distribution in tiers

So, we can tell that the simulator in our context seems to be an effective method of facilitating high engagement and intrinsic motivation for learning business analytics through simulators. Does this mean that the students that are engaged and motivated report a higher level of learning? And do they offer deeper reflections? To answer this, we turn to our findings on learning effectiveness. Specifically, level of reflection, achievement of learning outcomes, and learning from narrative assignment, as shown in Figure 3. We limit this to the tiers with a significant population. We also comment on the variance (standard deviation) in these tiers.

Looking at the figure and the data, we can see that higher engagement corresponds with a higher mean of reported learning outcomes. We also see an impact from motivation type. **H3** has a slightly higher reported learning outcome than **M4**. This forms a declining wave pattern through the tiers, showing how both engagement and intrinsic motivation impacts reported perceived learning and reflection on learning.

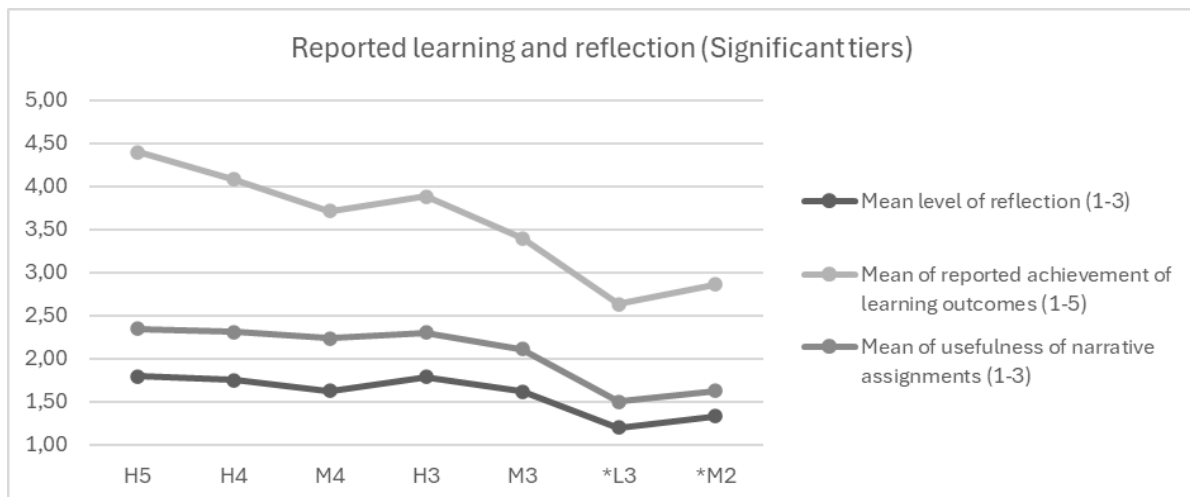


Figure 3: Means of learning and reflection from this study

With regards to the mean level of reflection and mean learning value from the narrative assignments we can see the same type of wave pattern, although not as pronounced as in mean of reported perceived learning outcomes.

This does not mean that every individual student in a tier experiences the same results on reflection and achievement of learning outcomes. Looking at the standard deviations presented in Figure 5, we see that every tier has a variance in answers that can be considered medium-to-high. This is especially prevalent for reflection, where the standard deviation on average is 0.69 on a 1-3 scale. This means that within each tier, the individual variance between the students' reflection scores is moderate-to-high and can vary greatly from the mean.

The standard deviations for achievement of learning outcomes are on average 0.57. With a scale that goes from 1-5, this standard deviation can be considered low. This means that for achievement of learning outcomes, the individual students in each tier report scores that are relatively close to the mean. Therefore, the mean level of reflection can only describe the tiers as a whole, and not the individual students. There is still some variance in the mean level of achieved perceived learning outcomes as well, but this can to a certain degree also be used to describe the individuals.

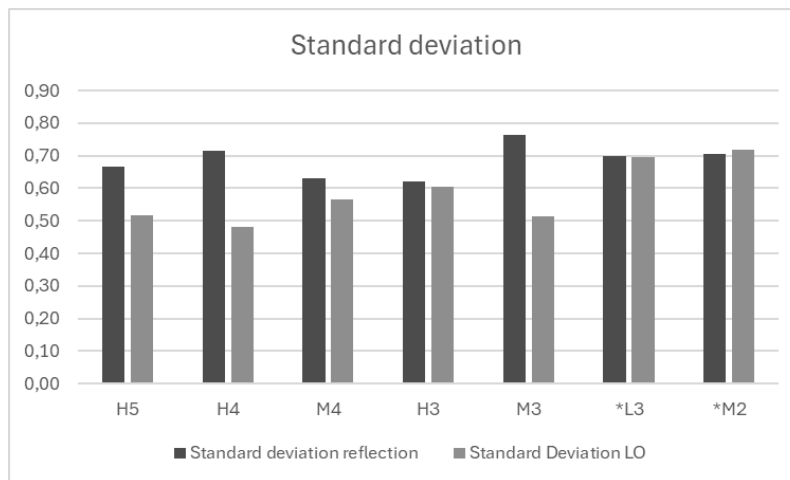


Figure 4: Standard deviations on learning and reflection

The final quantitative findings are the age distribution among the tiers, presented in Table 5. We see that the tier with the highest mean age is **H5**, with a mean age of 32.33 years. This indicates that **H5** is on average populated by students of a higher age than the other tiers. For the middle tiers, the mean ages are relatively alike with a mean age of around 28.5 years. The mean age for the lower tiers increases slightly to about 29.5 years. The standard deviation of age is on average about 6.87 across all tiers, the only outliers are **M5**, **H2**, **H1**, **M1**, and **L1** which are insignificant because of their low population.

This indicates that the simulator either motivates and engages, or does not engage and motivate, older students. Younger students tend to spread evenly among the tiers. We cannot say for sure why this is, but leaning on insight from the qualitative data, it could be that older students have more practical business or life experience and could either see the simulator as very relevant and realistic, increasing motivation and engagement, or not relevant and realistic, decreasing motivation and engagement.

The characteristics of each tier, based on AI-assisted analysis of the qualitative data is reported in Table 6 below.

Table 6: Characteristics of the Tiers of Engagement

Tier of Engagement	Characteristics
H5 (19,1%)	Highly Engaged and motivated students. Immersed in the simulator. Reflects on strategic choices. Prefer learning through practical assignments.
*M5	Highly Engaged and result-oriented students. Find the simulator helpful but wants more interactivity.
*L5	Highly Engaged and diligent students. Not motivated. Finds the simulator boring / irrelevant. Not enthusiastic
H4 (33,9%)	Engaged and motivated students that put in fair effort.
M4 (13,3%)	Engaged students. Moderately motivated. Finds the simulator helpful, but not too exciting.
*L4	Engaged but not motivated students that do the work to pass. Not enthusiastic. Finds the simulator to be repetitive and sometimes irrelevant.
H3 (9,9%)	Moderately engaged and motivated. Finds the simulator fun.
M3 (11,2%)	Moderately engaged. Does the work to pass.
*L3	Moderately engaged, not motivated, finds the simulator to be repetitive, irrelevant and boring. Does the work to pass.
*H2	Low engagement and motivation. Finds the simulator fun.
*M2	Low engagement, moderately motivated
*L2	Low engagement. Not motivated. Does the work to pass. Finds the simulator boring and irrelevant.
*H1	
*M1	Not engaged. Moderately motivated.
*L1	Not engaged and not motivated. Does the work to pass. Finds the simulator boring and irrelevant.

6. Limitations and discussion

6.1 Limitations

Our study is based on self-reported data from students who have consented to their reflection assignment being used for research. While we consider our data to satisfy Gonyea's (2005) suggested criteria for validity, we acknowledge that the data could be skewed due to being self-reported. Rating of engagement and motivation

is not based on analysis of qualitative data but on direct queries of the respondents' experience on a closed scale.

As the survey was a mandatory part of completing the simulator coursework, this may have impacted the effort spent on answering it. The respondents were asked to consent in order for their surveys to be used in our study, and informed that their data would be anonymous and not traceable. The survey was primarily a reflection assignment intended to provide an individual post-simulator debriefing that actively prompted for reflections on learning, and secondarily a data collection for research. We therefore point out potential bias in the questions reported in Table 1. However, despite the prompting, the mean level of reflection does not indicate any large positive bias towards deeper reflection.

As the student population we have studied is heterogeneous, with a high mean age and many who are studying in combination with full-time employment, the respondents could potentially be highly motivated and more prone to putting effort into their studies. We see fewer negative responses regarding the time and effort required for the simulator compared to the last study. This could be because of the increased timespan the simulator was open, and the increased emphasis on the trial runs.

6.2 Differences From Previous Study

Due to the changes in the survey and expansion of the tier framework, direct comparison with the previous study is difficult. By asking the respondents to directly report their effort in completing the simulator and their experience of interest and enjoyment, the tiers are not based on our own application of the criteria to assess engagement and motivation. This also means that the engagement and motivation levels are not derived from analysis of the same set of qualitative data. In addition, the use of a five-point scale increases the granularity of the framework. The integration and facilitation of the simulator by the course instructor was also modified based on our recommendation in the previous study. This can also have implications for how the respondents have answered the survey. Our focus is therefore not on comparison between the current and previous study, but to analyze the differences between the different tiers in the most recent dataset.

6.3 Discussion

The analytical framework and resulting findings show that engagement is a clear driver for perceived achievement of learning outcomes, and that high levels of intrinsic motivation towards the simulator can improve existing engagement and compensate for lower engagement. We mainly discuss the findings from the tiers with a significant population. Deci and Ryan's (2000) self-determination continuum show motivational types from non-self-determined to self-determined on a spectrum from amotivation, via external motivations and internalized motivations, to intrinsic motivation. Depending on motivation type, different regulatory styles and practices are employed. Our tiers do not correspond directly with the continuum, and it is possible to have several motivational types at the same time, but we find it useful in explaining the differences between our tiers.

In characterizing the **H5** tier (19.1%), we found that they in general report a deeper immersion in the simulator. They are also on average older than in the other tiers, and think deeply about strategic choices. The immersion and strategic thinking might come from their experience, which allows them to visualize the simulators' context more clearly and therefore tie the curriculum to the practical context. They enjoy working with practical assignments which bolster their motivation and engagement. This kind of simulator might be an ideal fit for these students (i.e. they are both motivated "enough" and "in the right way", ref. Miele and Scholer, 2018). They are able to reflect on a deeper level about the simulator and its content, as well as bolstering their theoretical knowledge through immersion and application in the practical context.

For the **H4** tier (33.9%) these students are also intrinsically motivated and engaged in the simulator, but they lack the immersion seen in **H5**, perhaps because they are on average younger and have less experience. This leads them to reflect and think about their choices on a surface level rather than on a deeper level. Still, they find the simulator fun and see it as a useful learning tool.

For **M4** (13.3%) we found that they have lower intrinsic motivation but put in a lot of effort into the simulator. They do not find it as fun as the higher tiers, but view it as a helpful tool for their learning. For students in this tier, it could be helpful to make the simulator more fun and intrinsically motivating in order to lift them to a higher tier. A potential way to achieve this could be to enhance the narrative tasks by making them feel more realistic and relevant, with enhanced feedback in order to drive the students' sense of autonomy and mastery.

In addition to the level of intrinsic motivation, the higher tiers of our framework (**H5**, **H4**, **M4**) exhibit a varying degree of characteristics that are similar to the 'somewhat internal' to 'internally' motivated sections of the SDT-

continuum. They see the value and relevance of the learning activity beyond being a requirement to pass the course, some even expressing interest, joy and satisfaction from their engagement with the simulator.

H3 (9.9%) finds the simulator fun but only puts in moderate effort. **M3** (11.2%) put in a moderate amount of effort but mainly express that they complete the simulator in order to pass the course. These tiers might compare to the 'external' to 'somewhat external' sections of the SDT-continuum. They comply with the course requirement, and some might experience an internal reward for completing it, but do not see the value for learning. There could be potential in further refining the facilitation to make the usefulness and value of the simulator as a learning tool more visible.

Even though the lower tiers represent a small part of the total population, their comments might shed some light on what could be done to assist them in climbing to higher tiers. Looking at the lower tiers of the framework (***M2**, ***M1**, ***L3**, ***L2**, ***L1**), we see that they find the simulator repetitive, boring or irrelevant, wanting more interactivity and excitement. A common characteristic shared by these tiers is that students state that they completed the simulator in order to pass the course. Similar comments are also found in the ***L4** tier. These tiers make out 9.7% of the total population. The comments and characteristics of the lower tiers are similar to the 'non-self-determined' and 'externally motivated' sections of the SDT-continuum. They do not see the value of the learning activity, they comply and complete it in order to pass the course (i.e. avoid the punishment of not being able to take the exam), and do not seem to see any internal reward in their own performance in the simulator.

As discussed above, direct comparison with the previous study is difficult. The lowest tiers then represented 15% of the population. The instructor made changes to how the simulator was integrated and introduced in the course, aiming to reduce the frustration reported by some students and facilitate understanding of how the simulator could be useful for learning. It is not possible to conclude if the reduction of the lowest tiers by a third is due to the changes in facilitation, or the changes in data collection. However, there might still be potential in refining how the simulator is facilitated, making the relevance clearer in order to help externally motivated students see the potential benefits of engaging with the simulator.

Our data shows that higher engagement corresponds with a higher mean of reported learning outcomes, with motivation type also having an impact. With a mean of 4.40, **H5** has the highest reported perceived achievement of learning outcomes, with a drop to 4.08 for **H4**. **M4** reports a mean of 3.71, with **H3** having a small increase to 3.88. **M3** reports a mean of 3.40. We see a declining wave pattern down through the tiers, which illustrates the impact of engagement and intrinsic motivation. We see similar patterns for reflection on learning and the usefulness of the narrative tasks.

In the qualitative data, we find several instances of students finding the simulator to be useful for improving practical skills (such as reading budget reports, making budgets, etc.) and strategic thinking (seeing the effect of their choices, trial and error, planning ahead, making use of the information in the market reports). These reported outcomes match the potential learning benefits of business simulators as reported by Ahuja (2024). Recurring comments include better understanding of price elasticity, perceived realism, and the opportunity to apply the curriculum in a practical context. Drawing on these reflections on learning from students, it might be possible to better prime the students in how they can use the simulator as a tool for learning, potentially boosting the benefit for students across the tiers. However, we see that while the higher tiers (**H5** and **H4**) express experiencing benefit from the added narrative tasks for application of theoretical concepts in a practical setting, the lower tiers often express the tasks as disruptive or disconnected from the simulator. This should be kept in mind so that opportunities for increased learning for the higher tiers do not come at the expense of the lower tiers.

We used the same criteria as in the last study to code the depth of reflection on learning, but as described above we also prompted for reflections on *if*, *what* and *how* they learned. We were therefore unsure if we would see an increase in the level of reflection. We found, however, that compared with our previous study, the highest tier (**H5**) sees a drop in the level of reflection on learning, from 2.5 to 1.79. In tiers **H4** and **M4**, the level of reflection is similar to the equivalent tiers in the previous study (1.63-1.79 vs 1.68-1.75). Because of the high standard deviation on reflection, it is hard to say anything about individual reflections.

One of the changes in facilitation was a higher emphasis on the trial run of the simulator. Barker and Warner (2023) highlight the importance of such trial runs for enabling students to get the most out of simulators in their learning. In the qualitative comments, several students made positive comments about the trial runs. As we

have analyzed the data, we have considered if the trial runs also contribute to the high levels of effort students report. As a large share of the students in the course are working full-time, both the trial- and full runs of the simulator were open for a longer period of time in order to not cause stress.

In the **H5** tier, the majority are women (58%). In the **M4** tier, there are slightly more men (55%). These are the tiers that also report the highest perceived impact on learning outcomes (means 4.40 and 4.08). Due to time constraints, we have not run separate analyses on gender. 11.5% of the total women in the study are found in the ***M2**, ***L3**, ***L2** and ***L1** tiers, and they make out a clear majority in each of these tiers. However, these tiers do not have a significant population. Butler et al (2025) found that women performed worse in business simulators, but that high performance correlated with time spent. Our data might indicate that the level of effort and intrinsic motivation outweighs the effect of gender, but we do not consider our data to strongly support this.

7. Conclusion and Future Work

The main research question for this article is: “What characterizes students on different tiers of engagement in the use of business simulators”. Through refining our data collection, our tiers of engagement framework has a higher granularity, enabling us to look closer at different segments. While it relies on self-reported data, we think that this rich data offers opportunities to closely examine how students experience business simulators.

Our study shows that the higher tiers of engagement express a higher perceived learning outcome, higher level of reflection on learning, and higher utility from the added narrative tasks. They exhibit a clear view of how the simulator provides opportunities to connect theoretical curriculum with practice. They also find the simulator to be interesting and enjoyable. One can say that the simulator as a learning activity is a good fit for their motivation.

The middle tiers expend effort to complete the simulator, but while some find it interesting, they do not necessarily see the value of the simulator as a learning experience. The lower tiers make out a small share of the total population and are characterized by finding the simulator to be boring, repetitive or irrelevant.

While our study shows that in our context, the use of the simulator is to a large extent seen as a meaningful and useful learning activity, we have identified some potential venues to further improve the facilitation and integration of the simulator in our course. These include improving the introduction of the simulator by making the potential for learning and value as a learning tool more visible and making the added narrative tasks feel more realistic and relevant, improving feedback in order to drive the students’ sense of autonomy and mastery. However, the reflections from the lower tiers indicate that they experience the added tasks as confusing or disrupting, which makes it important to make sure that further development is made in ways that facilitate engagement not only for the students who are already moderately or highly motivated.

A potential for further development is to more precisely examine different motivational types, further refining the characteristics of the tiers in order to more clearly differentiate between external and internal factors, as well as the self-regulating processes employed by students when engaging in this type of learning activity.

Ethics Declaration: The data was collected with informed consent and anonymously.

AI Declaration: We made use of a LLM in the analysis of the data, as described in the analysis section.

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