12-2022

Gamified online industry learning platform for teaching of foundational computing skills

Yi Meng LAU
Singapore Management University, ymlau@smu.edu.sg

Rafael Jose BARROS BARRIOS
Singapore Management University, rafaelbarros@smu.edu.sg

GOTTIPATI Swapna
Singapore Management University, SWAPNAG@smu.edu.sg

Kyong Jin SHIM
Singapore Management University, kjshim@smu.edu.sg

Gamified Online Industry Learning Platform for Teaching of Foundational Computing Skills

Yi Meng Lau
School of Computing and Information Systems
Singapore Management University
Singapore
ymlau@smu.edu.sg

Rafael J. Barros
School of Computing and Information Systems
Singapore Management University
Singapore
rafaelbarros@smu.edu.sg

Swapna Gottipati
School of Computing and Information Systems
Singapore Management University
Singapore
swapnag@smu.edu.sg

Kyong Jin Shim
School of Computing and Information Systems
Singapore Management University
Singapore
kjshim@smu.edu.sg

***Abstract*—Online industry learning platforms are widely used by organizations for employee training and upskilling. Courses or lessons offered by these platforms can be generic or specific to an enterprise application. The increased demand of new hires to learn these platforms or who are already certified in some of these courses has led universities to look at the opportunities for integrating online industry learning platforms into their curricula. Universities hope to use these platforms to aid students in their learning of concepts and theories. At the same time, these platforms can equip students with industry-recognized certifications or digital badges. This paper presents a novel framework - Online Industry Learning Platform Framework (OILP) - designed for learning of foundational computing skills. The framework provides a set of factors in students' learning experience and motivation, and it can be potentially used to evaluate a suitable choice of an online industry learning platform. We applied the framework to an undergraduate course and implemented the integration of an online industry learning platform as part of the course curriculum. The results of the implementation are evaluated and reflected through the students' assessment scores and two surveys.**

***Keywords*—gamified learning, computing skills, industry platforms**

I. Introduction

With the increased need for digital transformations, coupled with the rapid developments in technologies, many organizations are tapping onto online learning platforms for employees' development. Online industry learning platforms available in the market (e.g., Coursera, edX, LinkedIn Learning) offers a wide range of trainings from cutting-edge courses to day-to-day skills building for the digital economy [1]. Through these platforms, employees can engage with a variety of instructors from partnering organizations or universities to acquire new skills. Besides skills trainings, some of them provide professional certifications as well. As organizations accelerates towards a digital economy, the demand for processional certifications will continue to grow.

There is yet another group of online industry learning platforms that are provided by organizations themselves offering their own set of enterprise applications (e.g., Google Analytics Academy, Oracle Academy, Salesforce Trailhead) with certifications [2] [3] [4]. These enterprise applications are usually highly sought after by organizations and are widely used in the industry. Building on top of best practices, these enterprise applications can be complex with configurable business rules and datasets, specific for a particular industry. These platforms are beneficial to organizations who want to train their employees, especially new hires on a specific platform needs.

Traditionally, undergraduate courses at universities are taught using concepts and theories. Gradually, the online industry learning platforms have offered the opportunity for courses to integrate these online industry learning platforms into the curriculum to aid students in their learning of concepts and theories in an industry context. Together with industry recognized certifications, it will boost the credibility of a students' resume, making it attractive to hiring managers [5], thus increases the chances to secure jobs even before graduation [6].

For the learning experience to be more meaningful and beneficial, the choice of online industry learning platforms should have the following characteristics – (a) able to motivate students to experience them independently outside of class hours, (b) has well established support and guidance to students with minimum intervention of the instructors and (c) able to complement the classroom learning with an industry recognized training and certification.

This paper presents a novel framework - Online Industry Learning Platform Framework (OILP) - designed for learning of foundational computing skills in Section III. The framework will enable teaching teams to pick their choice of industry platform and depicts the learning factors to be considered. In Section IV, we present the study methodology to evaluate the framework with three key research questions. This is followed by a case study of applying OILP framework to an undergraduate course in Information Systems program in Section V. It illustrates the alignment of the course, with the online industry learning platform and its gamified features. We evaluated it on a compulsory undergraduate foundation course - Business Process Analysis and Solutions (BPAS) and online learning platform, Salesforce Trailhead. The results and

findings are detailed in Section VI. The evaluation of the implementation and future works are in Section VII. The final section concludes what can be drawn from our work.

II. Related Works

A. Industry Certifications and Digital Badges

Universities are constantly seeking reviews on the content of the Information Systems curriculum, to include what will be most beneficial to students as they embark on their first jobs [7] [8]. Studies have shown that the inclusion of certifications help close the gap between universities' educational outcomes and industry's needs [9] where industry expects graduates to be already competent upon graduation [10]. As such, there is a growing number of institutes of higher learnings to find effective and innovative ways to improve graduates' employment opportunities [11] using certificate programs. Certifications has become a go-to solution to address this challenge and to inform the industry of the skillset that students possess [12] [13]. The need for real-world context is important for students to appreciate the complexity of the industry [14] to equip them with the skills to be able to handle real life projects with ambiguous specifications [10]. Especially in the IT industry where technology is constantly evolving. For graduates to stay within such a challenging industry, they constantly adapt, and self-learn to remain competitive in the job market [15].

To effectively closing the gaps, badges have in the recent years be used as a pedagogical approach [16] to make the learning process more fun and engaging [17]. Badges comes in many forms, from physical badges to stickers and in digitals format which can be published on social medial platforms [18]. Digital badges have gain traction as a show of competency and accomplishment in a particular area [16] [18] [19]. To be award a digital badge, students will have to complete a set of instructional activities at different difficulty levels. The initial ones will be scaffolded with achievable tasks, building a potential pathway towards the next level of competency [16]. Students are able keep track of their learning progress [18]. With good instructional support and feedback system [16], it has made an impact in the students' learning, motivating them to go above and beyond.

B. Gamification

Gamification has become a new social phenomenon as a way to engage individuals, motivate them and promote continuous learning [20]. Building on top of its competitiveness and sense of achievement of an individual through gamification elements – points, badges, leader boards, it has become a pedagogy in which students acquire new knowledge and at the same time develop them [21]. Predominantly at university courses, such as in Software Engineering potentially being able to supports and motivates students and lead to enhance learning processes and outcomes. [22]. To achieve the largest outcome of gamification, it must be integrated with other learning tools rather than in isolation and essentially need to be aligned to instructional process for a more effective performance and fun for the students. [23] [24].

While results are important, the desired learning behavior [24] is a key learning and personality [25] traits which students should adopt as they progress beyond the university. It is evident that when students are able to find enjoyment, being engaged in learning, it not only increases their skills and performance [26] but also in their motivation to continue learning [27].

III. OILP Framework

Online industry learning platforms are designed with their respective unique selling points. An effective choice for the effective learning for foundational computing courses is one which has a progressive path designed for students. It can start off with foundational exercises which students get to learn fundamentals. Moving beyond the basic know-how, it will be beneficial for students to be able to do some small projects which brings them closer to an end-to-end implementation process. The guided experience will build up students' confidence in tackling bigger problems on their own

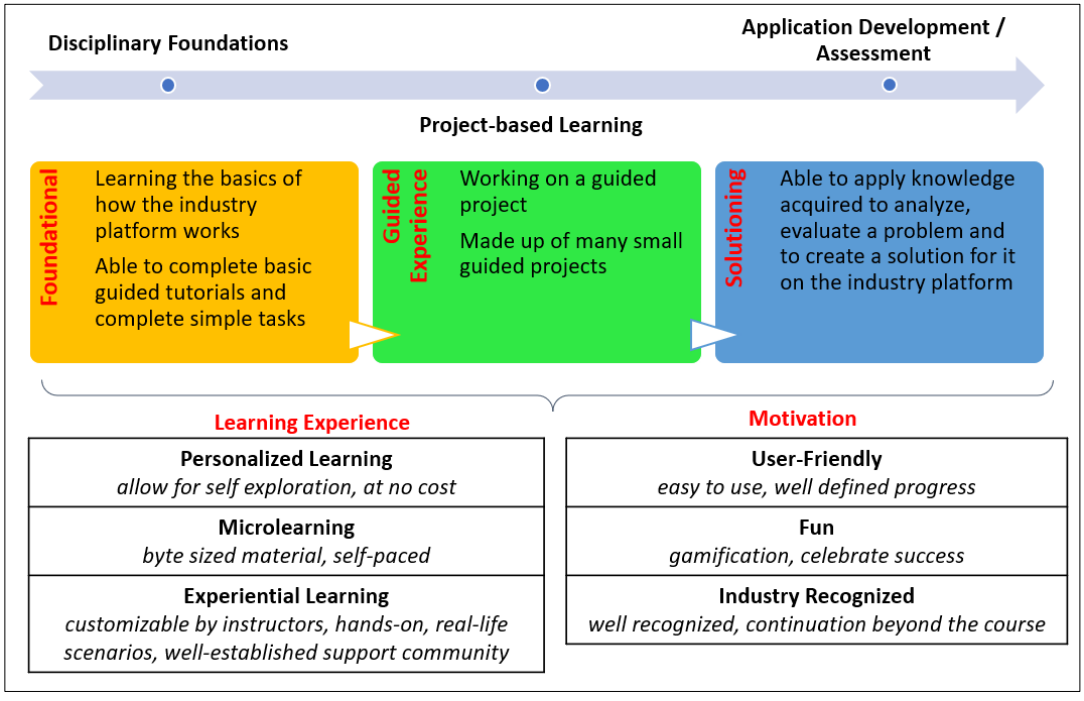

Fig. 1. Online Industry Learning Platform Framework (OILP).

at a later stage. To sum up their learning experience, students can be given a problem statement to solve on their own as part of solutioning. This is aligned with disciplinary courses which provides the foundational concepts before applying to a scope of a project. To sum up students' learning, it is usually a larger scale application development/assessment where students can consolidate their knowledge, often with some assessment points. Fig. 1 depicts the Online Industry Learning Platform Framework (OILP) which combines these key concepts of learning using online environment.

For an online industry learning platform to create good learning impact for the students, a set of factors must be considered. These factors can be broadly categorized into: 1) disciplinary course content, 2) learning experience, and 3) motivation.

Disciplinary course content: While many industry learning platforms are highly structured, a platform that will allow instructors to mix-and-match what is required to aligned with course curriculum will be a significant factor affecting the choices made by the instructors. At the same time, the platform content should not only consist of the basic concepts but also activity-based learning where students are engaged, and assessments where students are evaluated. Additionally, a well-established support community gives students a sense of belonging - knowing help is available whenever they need.

Learning experience: The online industry learning platform complements what students learn in the classroom. It can cater to personalized learning which offers a variety of pathways as students learn toward the mastery of the skills [28]. Students can explore on their own for relevant learning materials to support their learning process. Microlearning has gained much traction in recent years such that industries are adopting as a form of training for their employees [29]. It is known that microlearning is highly effectively for hard skills, which has been the approach taken by organizations to train employee [30]. Students are likely to spend time outside of class hours learn on their own, at their own pace. Microlearning materials help students with small achievable milestones which keeps students motivated. Experiential learning has been defined as they key to 21st century learning [31] where students are fully engaged in their own learning. The learning by doing [32] way of learning allows students to remember better as they solve real world problems that are much complex in nature [33]. Through experiential learning, students must be accountable for their own learning needs, and this equips them with future work skills to tackle complex problems in the future [34]. Students remembers better with hands-on activities especially in the study of computing courses and appreciate the complexity of the industry needs and applying real life scenarios.

Motivation: An easy-to-use user-friendly environment on the platform will motivate students to continue their learning journey [35]. The elements of being fun through gamifications [17] [24] will immerse students in their learning. Together with achievable steps that students can accomplish with their newly acquired skills and reaching their goals, [24] it serves as a small celebration of success. The added achievement of digital badges [16] [19] [28] confirm the students' competency level. These are elements of motivation which will increase their desire to continue [21] in the course and taking this beyond into their workplace in the future. Ideally, the platform should incur minimum or no cost for students. In addition, with industry recognized milestones [11] that stays with them beyond the course, motivates the students to continue with the tool usage.

IV. Study Methodology

To better understand the effectiveness of this framework on the learning of a foundational computing course we apply the framework to university computing course and an online learning industry platform. We analyse the suitability of the platform to the course, learning experience and motivation. We present the implementation case in the next section. We finally seek answers to the following research questions.

RQ1: Is the industry platform useful for disciplinary learning?

RQ2: Are students motivated to learn and work on an industry platform on their own?

RQ3: Is the course curriculum aligned with the gamified approach?

V. Case Study

A. Business Process Analysis and Solutions Course

The OILP framework is applied to one of the foundational information systems courses - Business Process Analysis and Solutions (BPAS). BPAS is taken by all Information Systems undergraduates where it presents the concepts and methodologies required for organisations to understand their existing processes, identify gaps and areas of improvements, before translating these into change requirements in which technologies can be adopted to solve them. Foundational concepts - Model, Analyse, Solve and Innovate are covered. Case discussions are used extensively throughout the course as part of the delivery, where students get the opportunities to apply what they have learnt and share with their classmates as part of class participation. Working in teams, students get to work on a predefined project looking into possible changes and innovative solutions for an organization. Finally, students are being assessed through class participation and project, students are also assessed via quizzes and a final examination.

TABLE I. Evaluation of Salesforce Trailhead Using OILP Framework

Category	Factors	Choice: Salesforce Trailhead
Personalized Learning	Allow for self-exploration	There are many tutorials available for learners to self-explore, earn points and badges to represent the skills they acquired.
	At no cost	It is free for learners.
Micro-learning	Byte sized material	The digitally byte sized material is guided good hands-on activities or learners to experience on each function of the Salesforce platform.
	Self-paced	Being online, learners can choose to work on the tutorials anytime. In the byte sized format, learners can complete each activity within shorter timeframes.
Experential Learning	Customizable by instructors	With Salesforce Trailmix, instructors can customize training contents to suit the needs of the learner.
	Hands-on	It comes with hands-on environment for leaners to experience the Salesforce enterprise environment.
	Real-life scenario	Projects and superbadges are designed with real world scenario in mind, mimicking the role of a consultant solving problems for clients.

Category	Factors	Choice: Salesforce Trailhead
	Well established support community	The Trailblazer Community is an online, one-stop shop to learn and connect to others of similar interests. Being an established platform, Salesforce has a huge community of developers and users who are readily available to answer questions from new users via the online forum.
User Friendly	Easy to use	It is easy to get onto Salesforce Trailhead via a google account. While it takes time to navigate around the Salesforce platform interface, materials are easily accessible.
	Well defined progress	The Trailblazer.me profile is a digital resume to show the learner's achievements. This profile can be shared with others easily.
Fun	Gamification	By completing the tutorials, points and badges can be earned. Points are accumulated to match a Trailblazer Rank.
	Celebrate success	Small successes are celebrated from the completion of byte sized tutorials. The prestigious superbadges are awarded when students are able to show that they have acquired the required knowledge to perform tasks to solve a major problem.
Industry Recognized	Well recognized	Salesforce is ranked as a clear leader in Gartner's magic quadrant for CRM applications in 2021. It supports a vast variety of industries [36].
	Continuation beyond the course	There is no time limit for a Salesforce Trailhead account. A simple update of the user's email address will allow learners to continue their Trailhead journey beyond the university.

B. *Salesforce Trailhead*

Salesforce is one of the many industry platforms available. It is widely adopted cloud-based software by a vast number of industries [36]. To train industry developers and users on the Salesforce platform, the Salesforce Trailhead [4] contains hands-on playground and a series of guided, byte sized, online hands-on tutorials of different levels to learn how to use the Salesforce platform. It is also free for learners. As the learning progresses, learners get to earn points at each milestone and badges upon completion of a module. The badges earned are widely recognized by industry practitioners as a recognition of the skills level acquired by an individual. Salesforce Trailhead has Trailmix, which allows organizations to provide customizable learning paths. Using the OILP framework, we evaluate the Salesforce Trailhead platform as shown in TABLE I.

C. *BPAS – Process Automation Specialist Trailmix*

The BPAS - Process Automation Specialist Trailmix (BPAS Trailmix) is created for the BPAS course. It has 6 foundational modules, 1 trail and 1 superbadge. The trail consists of 5 guided projects solving challenges that are accumulated towards building a workable solution on the Salesforce platform. Finally, the superbadge showcases the mastery of business process automation in which students will build an application based on a business case. By completing the BPAS Trailmix, students can look forward to earn a maximum of 13400 points, 6 module badges, 5 project badges and 1 superbadge. Students are required to share their Trailblazer.me profile with their instructors for grading purposes.

D. *BPAS Curriculum and BPAS Trailmix*

Putting all together using OILP framework has facilitated the mapping and alignment of the course curriculum with that of the industry platform. Fig. 2 shows the alignment of BPAS curriculum and BPAS Trailmix. Aligned using the OILP framework, both the curriculum and BPAS Trailmix kicked off with foundational modules and concepts before moving on to a guided experience stage with in-class and hands-on activities, concluding with some assessment or a gamified superbadge.

VI. Results and Findings

The effectiveness of the framework is evaluated through a two pronged approached. The teaching team looks at the students' result from BPAS Trailmix, which contributes to 5% to the students' final grade and two surveys. An initial survey at the beginning of the course and another one the end. The surveys are conducted via the use of a Likert scale of 1 to 10,

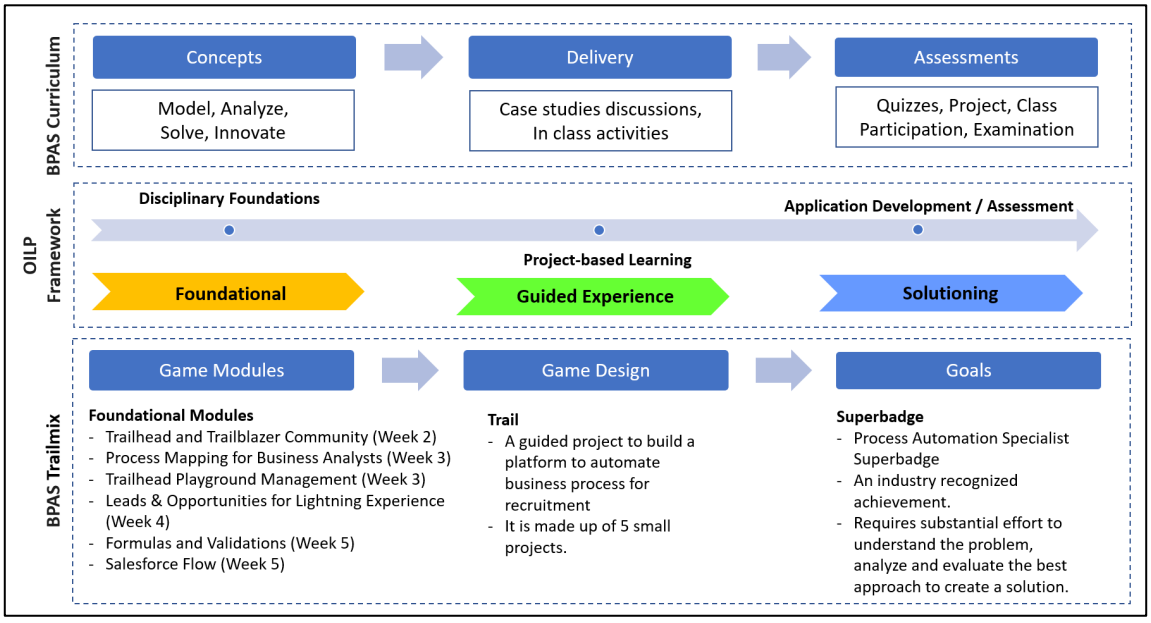

Fig. 2. Applying OLIP to BPAS curriculum and BPAS Trailmix.

with 1 being least favourable to 10 being most favourable and choices selection.

The participation rate for BPAS Trailmix, defined as students creating an account on the Salesforce Trailhead platform is 83.5% from a cohort of 436 students. For the two surveys, initial survey had 364 responses while the end survey had 167 responses.

A. *RQ1: Is the industry platform useful for disciplinary learning?*

The result from the end survey shows that students are able to apply what they have learnt in the BPAS curriculum onto the BPAS Trailmix. Students can create business rules on the industry platforms (70.6%) and to automate approval or rejection processes (69.4%) as well as improving searching capabilities (67.7%). The detailed results are shown in TABLE II.

TABLE II. BPAS CURRICULUM VS. BPAS TRAILMIX

Survey Questions (167 respondents)	**Avg**	**< 5 (%)**	**5, 6 (%)**	**7, 8 (%)**	**9, 10 (%)**
I am able to apply the concepts (e.g., analysis of As-Is processes) learned in the BPAS Trailmix.	6.47	16.2	26.9	**40.7**	**16.2**
I am able to apply the concepts (e.g. recommendations for To-Be processes) learned in the BPAS Salesforce Trailmix.	6.41	16.8	26.3	**40.7**	**16.2**
I learned to create business rules/formulas to automate validations of a process.	7.25	8.4	21.0	**43.1**	**27.5**
I learned to create business rules to automate notifications of a process.	7.25	8.4	21.6	**42.5**	**27.5**
I learned to create business rules to automate approvals or rejections in a process.	7.18	8.4	22.2	**42.5**	**26.9**
I learned to apply settings and rules to improve the search feature.	7.04	10.2	22.2	**45.5**	**22.2**

Students had indicated that enjoyed the hands-on experience (52.1%) and the guided approach (68.3%) which the BPAS Trailmix provides. 40.1% has indicated that they were able to build something on their own and seeing the results. This was not easily achieved in a classroom setting. Results are presented in TABLE III.

TABLE III. BPAS CURRICULUM VS. BPAS TRAILMIX

Survey Question (167 respondents)	**No. of students making this selection (%)**
What do you like best in BPAS Trailmix? Students can choose more than 1 choice.	
Guided approach for the learner	114 (68.3%)
Hands on experience on an Enterprise Cloud Application	87 (52.1%)
Able to build something on your own and seeing results	67 (40.1%)
Complement your learning of topics in BPAS	47 (28.1%)

The results helped us answer RQ1 where an industry platform is useful to assist students in the learning of a foundational skills. Although there are room for improvements, the result is encouraging to the teaching team for a start.

B. *RQ2: Are students motivated to learn and work on an industry platform on their own?*

The initial survey responses showed that 59.3% of the students them have not heard about Salesforce but 87.9% of them would like to learn more about Salesforce and believe that the badges earned will be helpful to their career as an IT/IS Processional. 78% of them are eager to kick start their learning journey.

Out of the 5% awarded to students who completed the BPAS Trailmix – 0.5% (maximum of 3%) is given for students who complete a foundational module, 1% to students who completed all 5 projects in the trail and 1% to students who achieved the superbadge. The students' average score is 3.7 out of 5.

75.8% of the students completed all the foundational modules and 56.9% completed the trail. A total of 143 students (39.3%) completed the superbadge. It is encouraging also to note that out of the 143 students who completed the superbadge, 133 completed all the foundational modules and trail. 10 of them went straight to the superbadge after completion of some or none of the project. These are likely to be students who already have basic knowledge of using Salesforce platform as shown in some of their Trailblazer.me profiles.

205 students (56.3%) completed all components of BPAS Trailmix except the superbadge. The superbadge, being recognized by the industry is not straight forward and require substantial time and effort. Most students are likely to complete the superbadge towards the end of the course which are typically packed with project submissions from many courses. The detailed breakdown of the students' scores and participation rate in BPAS Trailmix is presented in Fig. 3, Fig. 4 and Fig. 5

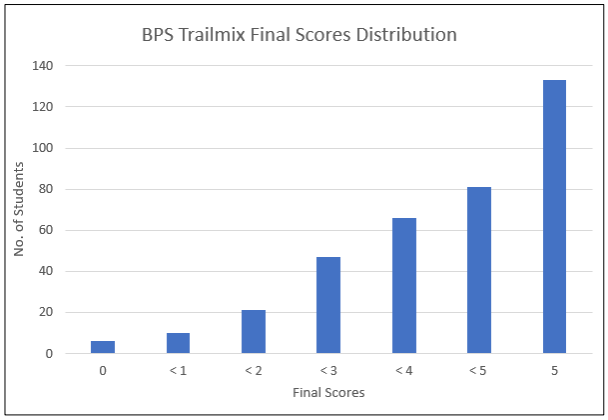

Fig. 3. Distribution of BPAS Trailmix Final Scores.

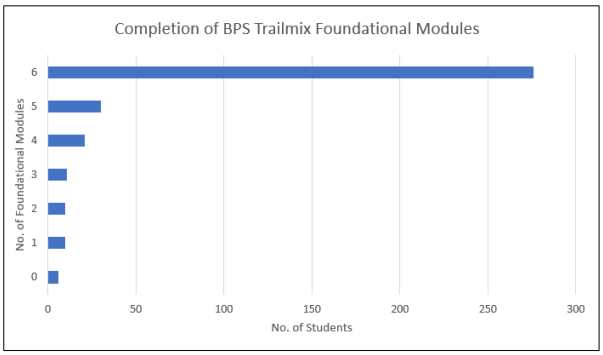

Fig. 4. Distribution of Students who completed BPAS Trailmix Foundational Modules

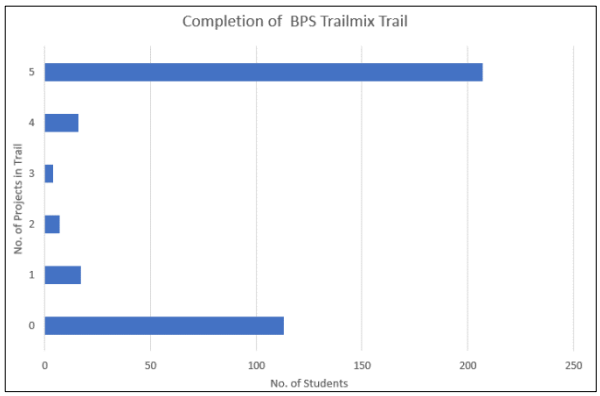

Fig. 5. Distribution of Students who completed BPAS Trailmix Foundational Modules

Besides the students' final scores, the survey results show that students are able complete the exercises on their own (68.2%) without needing help from their instructors or teaching assistants. 66.5% of the respondents can complete the superbadge through the self-learning or from community forums. The gamified way of scoring is one of the motivating factors (62.2%).

However, half of the respondents did not find that the platform has helped them better understand the concepts taught in the BPAS curriculum course. They also do not think that the badges they have earned will helped them secure a role as an IS professional (50.3%). Less than half will want to continue with other Salesforce Trailhead badges. The data are presented in TABLE IV.

TABLE IV. BPAS CURRICULUM VS. BPAS TRAILMIX

Survey Questions (167 respondents)	**Avg**	**< 5 (%)**	**5, 6 (%)**	**7, 8 (%)**	**9, 10 (%)**
I am able to complete the exercises in the BPAS Trailmix without instructor's or teaching assistant's help.	7.28	12	19.8	**31.7**	**36.5**
I am able to develop the solution for BPAS Trailmix superbadge task by self-learning and discovery of the Salesforce platform.	6.86	15.6	18	**41.8**	**24.6**
The game-based learning (scoring model) is useful in motivating my learning journey.	6.65	17.4	20.4	**37.1**	**25.1**
The hands-on experience in the BPAS Trailmix helped me understand the BPAS As-Is and To-Be concepts better.	6.32	18	28.1	**37.7**	**16.2**
I think the Salesforce Trailhead badges will help me secure a career as an IS Professional (e.g., as a business analyst).	6.08	21.6	28.1	**35.9**	**14.4**
I am eager to accomplish other badges in Salesforce related to my career path.	6.13	19.8	32.3	**32.9**	**15**

While majority of the students are motivated to learn on their own and complete BPAS Trailmix to various extend, there is lesser motivation for them do complete more badges beyond the course of BPAS may be something that the teaching team has to look at.

C. *RQ3: Is the course curriculum aligned with the gamified approach?*

As shown in TABLE V, students appreciate the BPAS Trailmix. The concepts learned in BPAS curriculum must be aligned with the game modules in BPAS Trailmix.

From the students who responded, 70.7% can apply concepts on **Modelling** and 65.4% in **Analyzing** techniques taught in class confidently in the BPAS Trailmix, showing good alignment.

However, there is more to be done in the areas of **Solve** (50.9%) and **Innovate** (32.9%). These are the last two topics covered – meaning that students have lesser time to assimilate. The application of concepts in **Solve** is more significant in BPAS Trailmix superbadge which only 40% of the students completed. There are limited opportunities for students to **Innovate** in BPAS Trailmix this round. While the superbadge allows students to design their solution, it is still very much on the within Salesforce Trailhead platform and students are not allowed to make use of other technologies e.g., IoTs.

TABLE V. BPAS CURRICULUM VS. BPAS TRAILMIX

Survey Question (167 respondents)	**No. of students making this selection (%)**
Which of the following areas in BPAS have you applied in the BPAS Trailmix? Students can choose more than 1.	
Modelling	118 (70.7%)
Analyzing	109 (65.4%)
Solve	85 (50.9%)
Innovate	55 (32.9%)
Others	5 (3%)

VII. LIMITATIONS AND FUTURE WORKS

This is the first run of Salesforce Trailhead in the BPAS curriculum which from the results, and there are areas for improvement. Other than evaluating the integration of the Salesforce platform standalone, a comparison with other similar industry online learning platforms can reveal useful insights about each platform's unique selling points. Our framework can be tested out in other foundational computing courses to further enhance it.

Industry platforms such as Salesforce are complex applications which students may not be able to appreciate fully given the lack of industry experiences. For universities to include them as part of their learning, it will require much

effort. The attractiveness of Salesforce Trailhead comes along with its gamified features which makes the learning enjoyable [27] which enhances their learning process [22]. We have seen that while it is useful to incorporate it as part of the course, the motivation from students to continue working and acquiring new knowledge is important [20] [21] [23]. The gamified approach, with points and badges collections, are motivations for students, but they may not be able to appreciate the impact of the recognition of superbadges by industry at this point of time. Instructors may want to reach out to graduates who are working on Salesforce platform to share their experience with students. Another alternative is to provide a recap of activities at various milestones in BPAS Trailmix in class with its alignment to the course curriculum.

Secondly, the steep learning curve requires students to invest substantial amount of time and effort to work through the exercises. Although these are guided tutorials, the navigation through the different functions, understanding industry terms and relating back to what is covered in a classroom setting will require time and effort. Instructors can assist students by providing some coverage of these in the classroom.

Thirdly, there are students that are more used to a classroom approach as opposed to learning-by-yourself approach. They will prefer instructors to demonstrate the use industry platform in class before they try it out on their own.

Fourthly, the 5% of the final grade may not seem enticing enough to students. If they were to put in effort in other components of the course, they are still likely to attain a good grade in the course.

Finally, it might be good to introduce more examples of Salesforce applications and platforms beyond BPAS Trailmix at the end of the semester to encourage students to continue their journey on Salesforce Trailhead acquiring more points and badges.

VIII. Conclusion

This paper shares our approach to source for a suitable industry platform for an undergraduate Information Systems course. The Online Industry Learning Platform (OILP) framework provides the list of factors that may determine a suitable online industry learning platform, looking at areas of learning experience and motivation. The key motivation is a gamified approach, with students earning badges and points which are fully recognized by industry. The design of a structured approach of the tutorials or exercises on the platform will be beneficial to students, as they progress in their learning. This has to be aligned against the traditional approach of a university course.

The OILP framework is applied to a business process course in an undergraduate Information Systems program . We used the scores achieved by the students and two surveys to evaluate the effectiveness of the framework. There is good indication of the industry platform's usefulness. While majority of the students are motivated to complete the requirements, more can be done to provide motivation for students to learn beyond the course. There are also gaps in the topics covered, particularly the last two which are covered at the end of the semester. The learning experience acquired by students have provided them with a deeper understanding of an application that is used in organizations. The digital badges earned will be helpful to students in their future career. The paper shares a framework to identify a suitable online industry learning platform for learning of foundational computing skills.

References

[1] Emerson Dameron, "9 Online Learning Platforms for Quality Professional Development," accessed: June 2022. [Online]. Available: https://zapier.com/blog/online-professional-development/

[2] "Google Analytics Academy", Google.com, accessed: June 2022. [Online]. Available: https://analytics.google.com/analytics/academy/

[3] "Oracle Academy", accessed: June 2022. [Online]. Available: https://academy.oracle.com/en/oa-web-overview.html

[4] "Salesforce Trailhead", Salesforce.com, accessed: June 2022. [Online]. Available: https://trailhead.salesforce.com/en

[5] S. K. White, "10 best entry-level IT certifications to launch your career," accessed: June 2022. [Online]. Available: https://www.cio.com/article/3309576/10-best-entry-level-it-certifications-to-launch-your-career.html

[6] K. J. Shim, S. Gottipati, and Y. M. Lau, "Integration of Professional Certifications with Information Systems Business Analytics Track Curriculum," 2021 IEEE Global Engineering Education Conference (EDUCON), pp. 1337–1344, 2021.

[7] L. N. K. Leonard, K. Jones, and G. Lang, "Information System Curriculum versus Employer Needs: A Gap Analysis," Information Systems Education Journal, vol. 17, pp. 32–38, 2019.

[8] K. J. Knapp, C. Maurer, and M. Plachkinova, "Maintaining a Cybersecurity Curriculum: Professional Certifications as Valuable Guidance," J. Inf. Syst. Educ., vol. 28, pp. 101–114, 2017.

[9] K. K. S. Pittenger, R. A. Jacobs, and J. Moss, "Integration of Professional Certifications in Business Curricula," 2020.

[10] D. Oguz and K. Oğuz, "Perspectives on the Gap Between the Software Industry and the Software Engineering Education," IEEE Access, vol. 7, pp. 117527–117543, 2019

[11] N. Bakir, K. Dana, and A. Abdullat, "Certifying Business Students in Microsoft Office Specialist Certification Excel Core Exam: Lessons Learned," Information Systems Education Journal, vol. 17, pp. 4–11, 2019.

[12] D. Laverie, W. F. Humphrey, K. T. Manis, and K. Freberg, "THE DIGITAL ERA HAS CHANGED MARKETING: A GUIDE TO USING INDUSTRY CERTIFICATIONS AND EXPLORATION OF STUDENT PERCEPTIONS OF EFFECTIVENESS," Marketing Education Review, vol. 30, pp. 57–80, 2020

[13] E. Tüzün, H. Erdogmus, and I. G. Özbilgin, "Are Computer Science and Engineering Graduates Ready for the Software Industry? Experiences from an Industrial Student Training Program," 2018 IEEE/ACM 40th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET), pp. 68–77, 2018.

[14] V. Shankararaman and S. Gottipati, "Mapping information systems student skills to industry skills framework," 2016 IEEE Global Engineering Education Conference (EDUCON), pp. 248–253, 2016.

[15] T. J. Bell III, "Integrating third party-certification with traditional MBA curriculum, defining value and encouraging innovative Programs--a theoretical study," International Journal of Higher Education Management, vol. 4, no. 1, 2017.

[16] T. J. Newby and Z. Cheng, "Instructional digital badges: effective learning tools', Educational Technology Research and Development," vol. 68, pp. 1053–1067, 2019.

[17] M. K. Saxton, "Adding Badging to a Marketing Simulation to Increase Motivation to Learn," Marketing Education Review, vol. 25, pp. 53–57, 2015.

[18] Z. Cheng, J. C. Richardson, and T. J. Newby, "Using digital badges as goal-setting facilitators: a multiple case study," Journal of Computing in Higher Education, vol. 32, pp. 406–428, 2020.

[19] A. Ziegler, "Framework + digital badges = online instruction for today," Journal of Library & Information Services in Distance Learning, vol. 13, pp. 235–241, 2018.

[20] R. S. Alsawaier, "The effect of gamification on motivation and engagement," 2018.

[21] J. K. Acosta-Medina, M. L. Torres-Barreto, and M. Alvarez-Melgarejo, "Literature mapping about gamification in the teaching and learning processes," 2020.

[22] M. M. Alhammad and A. M. Moreno, “Gamification in software engineering education: A systematic mapping,” J. Syst. Softw., vol. 141, pp. 131–150, 2018.

[23] F. S. Cechella, G. da Silva Abbad, and R. Wagner, “Leveraging learning with gamification: An experimental case study with bank managers,” Computers in Human Behavior Reports, 2021.

[24] M.-B. Ibáñez-Espiga, A. D. Serio, and C. D. Kloos, “Gamification for Engaging Computer Science Students in Learning Activities: A Case Study,” IEEE Transactions on Learning Technologies, vol. 7, pp. 291–301, 2014

[25] R. Smiderle, S. J. Rigo, L. B. Marques, J. A. P. de Miranda Coelho, and P. A. Jaques, “The impact of gamification on students’ learning, engagement and behavior based on their personality traits,” Smart Learning Environments, vol. 7, pp. 1–11, 2020.

[26] S. Subhash and E. A. Cudney, “Gamified learning in higher education: A systematic review of the literature,” Comput. Hum. Behav., vol. 87, pp. 192–206, 2018.

[27] Z. Sabri, Y. Fakhri, και A. Moumen, “The Effects of Gamification on E-learning Education: Systematic Literature Review and Conceptual Model,” Statistics, Optimization & Information Computing, 2022.

[28] H. A. Alamri, S. Watson, and W. Watson, “Learning technology models that support personalization within blended learning environments in higher education,” TechTrends, vol. 65, no. 1, pp. 62–78, 2021.

[29] A. Taylor and W. Hung, “The Effects of Microlearning: A Scoping Review,” Educational technology research and development, 2022.

[30] M. J. Dolasinski and J. M. Reynolds, “Microlearning: A New Learning Model,” Journal of Hospitality & Tourism Research, vol. 44, pp. 551–561, 2020.

[31] E. Marin, “Experiential Learning: Empowering Students to Take Control of Their Learning by Engaging Them in an Interactive Course Simulation Environment,” Procedia - Social and Behavioral Sciences, vol. 180, pp. 854–859, 2015.

[32] S.-C. Cheng, G. Hwang, and C.-H. Chen, “From reflective observation to active learning: A mobile experiential learning approach for environmental science education,” Br. J. Educ. Technol., vol. 50, pp. 2251–2270, 2019.

[33] Y. M. Lau, K. J. Shim, and S. Gottipati, “Design and Supervision Model of Group Projects for Active Learning,” 2021 IEEE Frontiers in Education Conference (FIE), pp. 1–9, 2021.

[34] S. Gottipati and V. Shankararaman, “Designing a data warehousing and business analytics course using experiential learning pedagogy,” 2016.

[35] S. Ostrowski, R. Rolczynski, J. Pniewska, και I. Garnik, “User-friendly E-learning Platform: a Case Study of a Design Thinking Approach Use,” MIDI ’15, 2015.

[36] “Salesforce positioned as a leader in 2021 Gartner Magic Quadrant for Multichannel Marketing Hubs,” Salesforce News, 01-Jun-2021, ,” accessed: June 2022. [Online]. Available: https://www.salesforce.com/news/press-releases/2021/06/01/salesforce-positioned-as-a-leader-in-2021-gartner-magic-quadrant-for-multichannel-marketing-hubs/.