Evaluating Onsite and Online Internship Mode Using Consumptive Metrics

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ABSTRACT

The paper aims to assess the effectiveness between onsite and online internship mode by measuring the critical components of learning through the Kirkpatrick's 'consumptive metrics' model. The primary goal of internship is to assist university students in their progression from the academic to a professional work environment. However, the COVID-19 pandemic has disrupted this process where it temporarily moved to online mode. Hence, the authors use Kirkpatrick's 'consumptive metrics' (CM) for evaluating the learning resources consumed using two constructs namely 'reaction' and 'learning'. Using 21 onsite and 20 online intern reports, researchers objectively measured the difference in alignment of theory with practice between onsite and online mode. The research revealed that while the CM components namely 'course satisfaction' and 'training relevance' on the interns are similar for both modes, there is a considerable reduction in the effectiveness of internship in terms of the CM components namely the 'training environment', 'knowledge gained', and 'career advancement' in an online mode.

KEYWORDS

Internship, Learning Alignment, Measurement, Reaction

1. INTRODUCTION

The COVID-19 pandemic has considerably accelerated the digital transformation of the education sector. In this respect, the acquisition of knowledge and skills through learning, experience, or being taught differ in terms of onsite versus online mode of teaching. The term "intern" was first applied to medical students in the 1920s where co-op programs began to be offered on college campuses in the 1960s, and it wasn't until the late 1990s that internships became a norm for the average college student (TaylorResearchGroup, 2014). Internships encompass the integration of professional work experience and related academic, where the student trains within the organization and performs tasks that benefits both the student and the organization (Friesenborg, 2002). In this respect, we need to

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measure the application of learning at the university, applied in the professional environment during the eight weeks' internship program of undergraduate computer science students (referred to as 'interns' in the rest of the paper) of the university in United Arab Emirates (UAE). This can provide academic policy makers with the relative strength and weaknesses of the learning domains.

Internship course is a requirement for the interns to graduate with the Bachelor of Science (in their specializations) as, it helps to bridge the gap between classroom learning and knowledge application in the real world (Toncar & Cudmore, 2000). Hence, the interns studying the Bachelor of Science in Information Technology programs at the university are required to complete the internship program to successfully graduate. The internship program at the university is designed as an eight-week unpaid full-time course for final year undergraduate students. It provides a great opportunity for students to improve their technical and communication skills by gaining hands-on, practical experience under their major-domain and interacting with other IT professionals at workplace. Hence, empirical research into the lack of hands-on practical experience in an online internship mode can provide valuable insights on the effectiveness of the internship program.

Interns are evaluated and graded on a pass-fail based basis where the students are jointly evaluated by faculty and field supervisors. Therefore, the university ensures that undergraduate students participate in the work-related activities required for their academic unit, resulting in student internships in the context of service-learning that integrates practice with specific expertise (Hynie, Jensen, Johnny, Wedlock, & Phipps, 2011). Although internship have multiple benefits it was noted that students need to deal with a variety of challenges, including stress associated with communication with superiors, workloads, tasks beyond current capacity, limited support from the workplace, unfamiliar workplaces and time management (Chu, Ravana, Mok, & Chan, 2019). In this situation when students are placed in an unfamiliar environment away from the comfort zone of the university, measuring learning with consumptive metrics is important for advancing the internship program.

Previous experiences and our assessment recommend that the interns require basic skills for a successful internship. This includes English and Arabic language proficiency, interpersonal and communication skills, problem-solving skills, course related knowledge, technical IT skills in the field, ability to take responsibility, ability to meet deadlines, ability to work with people from different backgrounds, ability to work individually and in teams. Hence the interns seeking degree in Information Technology need to possess both soft skills (communication, interpersonal skills, management skills, teamwork, presentation skills, skills in dealing with difficult personalities, facilitating skills, and leadership skills) and hard skills (knowledge of standard software applications, programming languages, the ability to design user-friendly graphical interfaces, knowledge of database, networking and computer hardware) (Patacsil & Tablatin, 2017). Hence, a balance of hard and soft skills is an integral requirement for a successful internship program for the interns. However, the application of these skills can vary between an online and an onsite internship program.

At the end of internship program, the final evaluation of interns is based on both summative and formative methods. Summative assessment involves assessing students' performance based on the submission of final report and presentation along with weekly reports. As a part of formative assessment, regular meeting with the site supervisor and faculty supervisor ensures performance evaluation and feedback. These two methods provide a Pass / Fail assessment, including satisfaction and performance levels. However, the main problem is the lack of analytical details related to the application of knowledge in the internship program, the additional skills acquired during the internship, and the lack of objective evaluation. Although academic organizations have been following the internship path, the recent Covid-19 outbreak has caused a disruption, forcing afflicted countries to temporarily switch to online mode either voluntarily or as a result of laws (Ricardo-Barreto et al., 2020). Comparing onsite and online internship programs, mandate the assessment of the relative strengths and weaknesses of the two experiential learning categories (response and learning) (Al-Hawamleh, Alazemi, Al-Jamal, Al Shdaifat, & Rezaei Gashti, 2022). Therefore, an objective evaluation between

both onsite and online internships can provide the extent of knowledge acquisition and the application of the knowledge learned in the internship.

The eight-week internship program at the university strives to link academic learning with practice in a realistic context. Hence, the framework given by Donald L. Kirkpatrick continues to be relevant for assessing the success of training and learning (Kirkpatrick, 1979). For analyzing the success of training and learning, the author provides four constructs for evaluation namely reaction, learning, behavior, and results. He has also divided the experiences into two categories namely reaction and learning. These have been referred to as "Consumptive Metrics" (CM) because they measure outcomes in terms of the learning resources consumed during the experience. Hence, the objective of this paper is to assess the effectiveness of internship between an onsite internship mode with an online internship mode by objectively measuring and comparing the critical components of learning through Kirkpatrick's 'consumptive metrics' model. This leads to the three research questions.

(1) Is there a difference between the extent of learning and practice between onsite and online internship?
(2) Which are the constructs of similarity and difference for reaction and learning between onsite and online internship?
(3) What is the extent of similarity and/or difference for reaction and learning between onsite and online internship.

2. RELATED WORKS

The above-mentioned research questions thus assess whether the resources students learned during the three years has been utilized during internship. To answer the research question, we use the questions posed by Kirkpatrick on the two constructs namely reaction and learning) (Table 1). This is further summarized into three induction themes for 'reaction 'and three induction themes for 'learning' (Figure 1).

Kirkpatrick has proposed four constructs for experiential learning namely reaction, learning, behavior, and results. He described 'reaction' and 'learning' as 'Consumptive Metrics' (CM) since they measure results in terms of the learning resources consumed during the internship experience, while behavior and results focus on post internship experience. In this respect, the paper focuses on the evaluation of consumptive metrics through the measurement of reaction via course enjoyment, training enjoyment, training relevance, training context; as well as the measurement of learning via knowledge gained, experience gained, and professional advancement (Figure 1). Reaction assesses the content, delivery, and usefulness of the program for the intern. Learning measures the knowledge, skills, attitudes acquired as a result of internship.

Table 1. Assessment of consumptive metrics namely 'reaction' and 'learning'

Reaction	Learning
Relevance and enjoyment of the training content	Level of knowledge gained
Training enjoyment	Level of experience at the site
Training relevance	Level of advancement or change in the learners
Satisfaction of venue, the style, timing, etc.	Level of experience at the site
Worth the time spend	Level of advancement or change in the learners

Figure 1. Measurement of consumptive and impact metrics (adapted from Kirkpatrick)
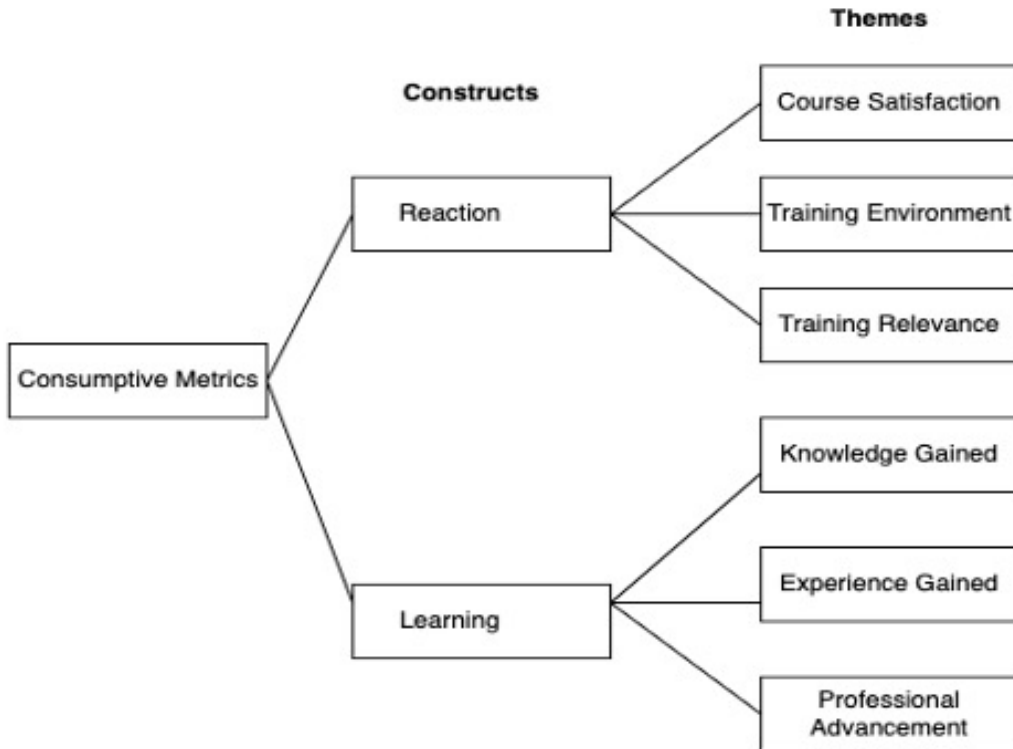
## 2.1 Experiential Learning Perspective of Internship

Experiential learning means learning from experience or learning by doing (Lewis & Williams, 1994) where the framework created by Donald L. Kirkpatrick in 1959 continues to be useful for assessing the effectiveness of training and learning. Educators are increasingly using experiential learning pedagogy to enhance learning (knowledge and skills), with two extremely effective experiential methods being live case study projects and internships (Green & Farazmand, 2012) (Leary & Sherlock, 2020). Practical work placement towards the end of the program is accepted as important part of experiential learning for the interns. Thus, as a form of experiential learning (Bird, Chu, & Oguz, 2015), the internship includes concrete experiential skills, reflective observation skills, conceptualization skills, and active experimentation skills (D. A. Kolb, 2014). From an experiential perspective, learning is a process in which knowledge emerges through the transformation of experience (A. Y. Kolb & Kolb, 2009). In this regard, our research aims to identify the knowledge created for the interns.

2.2 Integrating Learning Into Practice

Students who have completed internship have an advantage in the job market (Knouse & Fontenot, 2008) where internship programs is considered one of the high-impact practices (HIPs) linked to deep learning, self-reported benefits, and successful educational methods. Active learning practices are used in HIPs on Student Engagement, and they share several characteristics such as requiring a significant amount of time and effort, facilitating learning outside of the classroom, requiring meaningful interactions with faculty and students, encouraging collaboration with a variety of others, and providing frequent and substantive feedback (Docherty et al., 2018; Matteo & You, 2020). Thus internship has been described as "an opportunity to have an intensive, work-based exposure to a

broad range of operations within a company" (Crossley, Jamieson, & Brayley, 2012). Furthermore, high-quality internships can lead to an increase in interview requests, job opportunities, and starting salaries (Nicholas, 2016; Nunley, Pugh, Romero, & Seals Jr, 2016). Researchers have recommended internships to be assigned to mentors that provides open communication to give interns with clarity in work assignment, continual feedback, exposure to many aspects of the field, and courteous treatment (Rothman, 2007). In this regard, the degree to which knowledge is integrated into practice can reflect an internship program's overall performance in terms of learning and practice improvement in ten distinct categories (Figure 2). However, not every intern who does an internship acquires all skills related to learning and practice due to challenges they face during the prior learning process (i.e., at the university), and the learning process at onsite, and online internship. While Figure 2 provides generic benefits of internship in terms of learning and practice, how much of the above-mentioned skills are imbied in terms of onsite and online internship is a question.

Figure 2. Benefits of integrating learning into practice
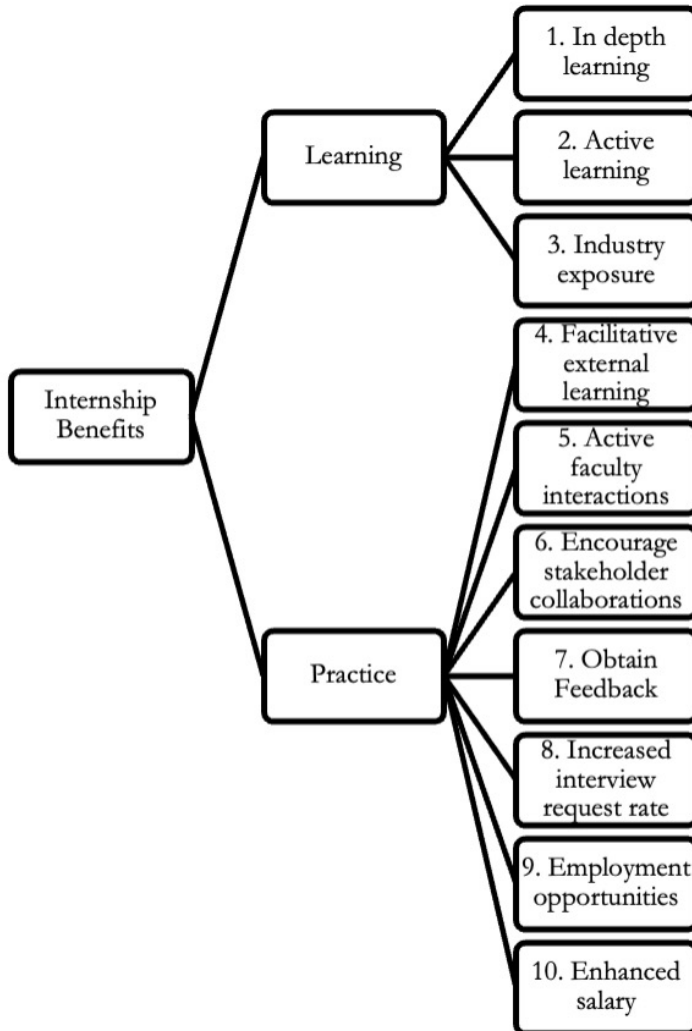
3. METHODOLOGY

The data being qualitative in nature, the research follows the exploratory research path based on research questions. In this respect, qualitative research contributes to an understanding of the human condition in different contexts and perceived situations (Bengtsson, 2016) where the interns experience and perceive professional practice in organizations. The research approach applied in the research is characteristic of qualitative research which involves holistic inquiry into the process of internship using inductive data analysis based on predetermined constructs. This provides descriptive insight into the effectiveness of internship in terms of knowledge and practice in the information systems courses at the university.

The objective of the research is to evaluate the relative strength and weakness of the two constructs of experiential leaning (reaction and learning) between onsite and online internship programs. In this respect, our project follows the inductive reasoning method which aims at collating data to pre-defined constructs. Inductive reasoning aims at moving from specific observations to broad generalizations based on the collected data. Subsequently, the researchers did content analysis of the final internship report of 21 students who did internship on site during 2020 Spring term 1 and 20 students who did internship in an online mode during 2020 Spring term - 2. Data involves the qualitative analysis of 41 internship reports using content analysis. Content analysis involves replicable and valid methods for making inferences from observed communications to their content (Krippendorff, 1980). Furthermore, content analysis enables researchers to sift through large volumes of data with relative ease in a systematic fashion, examining trends and patterns in documents, thus providing an empirical basis for monitoring shifts in public opinion (Stemler, 2000). From a methodological perspective, the researchers follow the rationale which states that data appropriate for content analysis are texts (including written documents) to which meanings can be attributed (Krippendorff, 2018).

4. ANALYSIS OF DATA

Analysis of data was done using the qualitative research software NVIVO 12. We did a comparative study of two internship programs covering two terms where one internship was conducted onsite in one semester, while another internship was conducted online in the subsequent term (same semester) due to Covid-19 restrictions. Both the 21 onsite and 20 online internship final reports were uploaded to the NVIVO software for qualitative analysis. The report provides a detailed summary of their learning, training, and experience during the eight weeks' program. We used the inductive nodes (two constructs) and the associated six themes to identify and assign declarative statements made by the interns in the internship report. The assignment of selected text is arbitrary and follows the guidelines of Miles and Huberman (1994) who stated that the researcher can use innovation in the analysis of qualitative data, as well as use word count and frequency. In this respect, we used work count and frequency as a measure to evaluate the strength of the nodes.

Statements in the internship report that are attributed to each of the six themes under the two constructs are highlighted and then allocated to the respective themes where it aggregates into the respective constructs (Figure 1). NVIVO assigns a percentage to the selected node from a single report. For example, in Table 2, Column, 1, row 1, in 'Report_1' 1.4% of the report has been attributed to the positive reaction in terms of the sub node (themes) 'course satisfaction'. Aggregating the percentage of 21 reports gives a sub total coverage of 51.8%. However, adding the sub total for the three themes give a total coverage of 201.85% for 'reaction' due to the overlap of statements where more than two themes has been characterized which is subsequently reduced to 100% in the last row. Table 2 provide the outline of this section.

Each sub section presents the measurement and analysis from four perspectives. First, the table provides an overview of the positive feedback from all intern's reports in terms of coverage

Table 2. Sub sections measuring/analyzing reaction and learning

Topic Under Analysis	Analysis Type	Location	Sub Section
Measuring 'reaction' and 'learning'	Coverage	Onsite	A
Measuring 'reaction' and 'learning'	Coverage	Online	B
Measuring 'reaction' and 'learning'	Frequency	Onsite	C
Measuring 'reaction' and 'learning'	Frequency	Online	D

or frequency of citation of the same. Second, the two pie charts illustrate the percentage of students that provided low, medium, and high feedback (coverage or frequency). Third, a single pie chart illustrates the two constructs namely reaction and learning. Fourth, a table provides a quantitative overview of the percentage of students (low-medium-high) who provided positive feedback on both reaction and learning.

4.1 Measuring 'Reaction' and 'Learning': Coverage and Onsite

Table 3 illustrates the extend of coverage of the themes under the constructs namely 'reaction' and 'learning'. Out of the three themes under the 'reaction' construct, the theme 'course satisfaction' scored low in terms of content (25.66%) while the themes 'training relevance' and 'training environment' scored very high with content of 37.09% and 37.35% respectively. This shows that the students enjoy the practical aspect of being in a professional setting where the experience counts more than course content. From a 'learning' perspective, out of the three themes, 'knowledge gained' scored very high with 46.25% coverage, followed by 'experienced gain' with a coverage of 37.77% while 'advancement' scored the least with a coverage of only 15.98%. In this respect, students' incremental addition of knowledge at the internship program is a positive indicator while the theme 'career advancement' needs to be focused on for further action from the university policy makers. One of the reasons cited by students for the low value for 'career advancement' is the short duration of eight weeks for internship.

Figure 3 and 4 illustrates the percentage of students who scored high, medium, and low between the two constructs ('reaction' and 'learning'). To evaluate the relative strengths of each construct and the associated themes, we used the range of 'reaction' (lowest value of 0.42 [Report_21] to a high value of 49.61 [Report_11]) and categorized these into low (0.42 – 16.50), medium (16.51 – 35.00) and high (35.01 – 49.61) by separating these into three equal value ranges. In the 'reaction' construct, we found that 10% of students scored high, while 9% scored medium and 81% scored low (Figure 3).

This is an area of concern where the graph is skewed to the left. Hence, further research is required to identify and evaluate the rationale for this skewness.

In a similar manner, we separated 'learning' into three value ranges (lowest value of 4.62 [Report_15] to a high value of 44.59 [Report_11]). Furthermore, we categorized these into low (4.62 – 17.62), medium (17.63 – 30.00), and high (30.01 – 44.59) by separating these into three equal value ranges. From a 'learning' perspective, we found that the 5% of students scored high, 5% scored medium and 90% scored low (Figure 4). This match with the 'reaction' construct and is an area where we need to focus on to evaluate the reasons for the low value.

Figure 5 illustrates the overall comparison of 'reaction' to 'learning', from a coverage perspective. It was found that students scored relatively high on 'learning' (57%) than 'reaction' (43%). This showed that while they enjoyed the training, the application of academic content to practice as well as the learning of the course content during the internship period is low. Table 4 illustrates the comparison between 'reaction' and 'learning' between low, medium, and high groups of interns.

Table 3. Coverage of reaction and learning in consumptive metrics onsite

| | Reaction | | | | | Learning | | |
	A: 1.1 Course Satisfaction	B: 1.2 Training Relevance	C: 1.3 Training Environment	Reaction	D: 2.1 Knowledge Gained	E: 2.2 Experience Gained	F: 2.3 Advancement	Learning
1: Report_01	1.4%	0.87%	1.00%	3.27%	2.20%	4.02%	0.89%	7.11%
2: Report_02	0.51%	1.20%	1.60%	3.31%	3.05%	5.32%	1.88%	10.25%
3: Report_03	0	3.51%	1.52%	5.03%	3.38%	4.29%	0	7.67%
4: Report_04	1.70%	5.07%	1.11%	7.88%	2.97%	6.99%	0.40%	10.36%
5: Report_05	2.50%	1.89%	1.44%	5.83%	11.35%	1.03%	0.93%	13.31%
6: Report_06	2.63%	0.54%	3.23%	6.4%	2.41%	2.44%	0	4.85%
7: Report_07	0.57%	3.15%	1.51%	5.23%	1.17%	10.26%	3.28%	14.71%
8: Report_08	0	4.93%	9.59%	14.52%	9.20%	1.20%	5.10%	15.50%
9: Report_09	1.10%	3.33%	0	4.43%	4.01%	6.30%	2.50%	12.81%
10: Report_10	6.30%	4.86%	2.50%	13.66%	3.22%	9.17%	0	12.39%
11: Report_11	8.28%	8.30%	33.03%	49.61%	32.71%	3.58%	8.30%	44.59%
12: Report_12	14.09%	21.67%	0	35.76%	8.26%	8.18%	7.59%	24.03%
13: Report_13	0	1.37%	4.69%	6.06%	1.95%	2.93%	0	4.88%
14: Report_14	1.12%	2.70%	1.47%	5.29%	0.98%	10.73%	3.63%	15.34%
15: Report_15	2.79%	0	0.90%	3.69%	0	4.62%	0	4.62%
16: Report_16	2.06%	1.54%	0.93%	4.53%	2.37%	4.97%	0	7.34%
17: Report_17	3.36%	0.54%	2.15%	6.05%	1.98%	0.69%	3.36%	6.03%
18: Report_18	2.29%	3.48%	4.22%	9.99%	0.75%	3.94%	0	4.69%
19: Report_19	1.14%	1.63%	0	2.77%	3.18%	8.62%	1.14%	12.94%
20: Report_20	0	4.29%	3.83%	8.12%	11.73%	0	3.01%	14.74%
21: Report_21	0	0	0.42%	0.42%	14.67%	0	0	14.67%
Total	51.80%	74.87%	75.14%	201.85%	121.54%	99.28%	42.01%	262.83%
Total (out of 100)	25.66%	37.09%	37.35%	100.0%	46.25%	37.77%	15.98%	100.00%

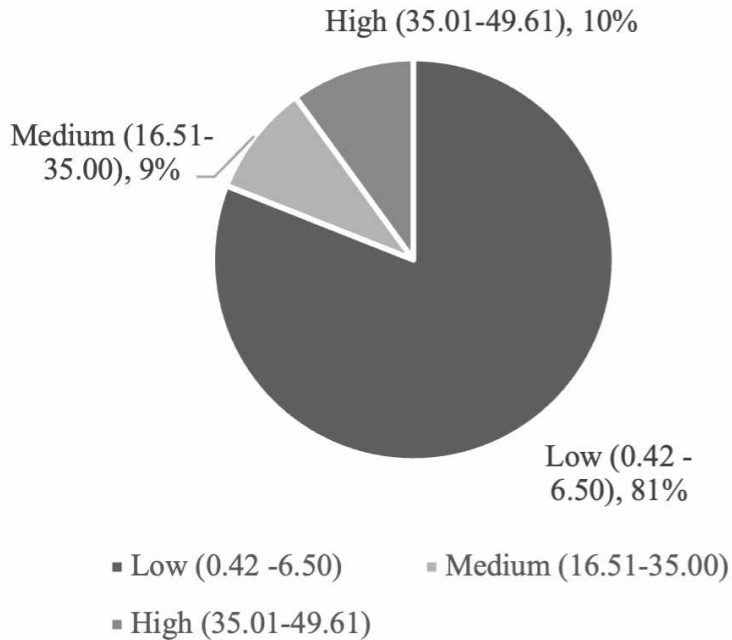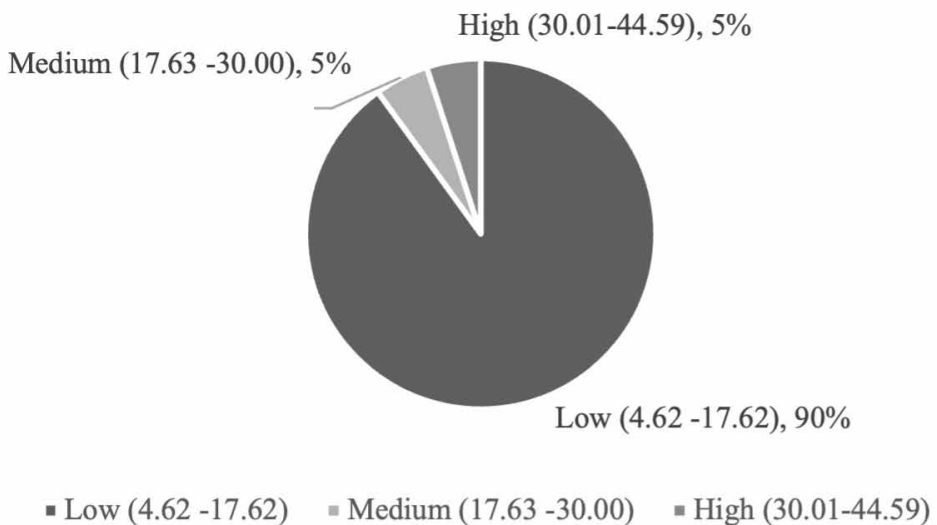**Figure 3. Pie chart for categorizing reaction in coverage-onsite**

Figure 4. Pie chart for categorizing learning in coverage-onsite

4.2 Measuring 'Reaction' and 'Learning': Coverage and Online

This section presents and analyze the positive evaluation of students between reaction and learning from the intern's experience of doing the internship online. In this respect, table 5 illustrates the extend of coverage of the themes under the constructs namely 'reaction' and 'learning'. Out of the three themes in 'reaction', (summative value [Total] in the last row) 'course satisfaction' scored a coverage

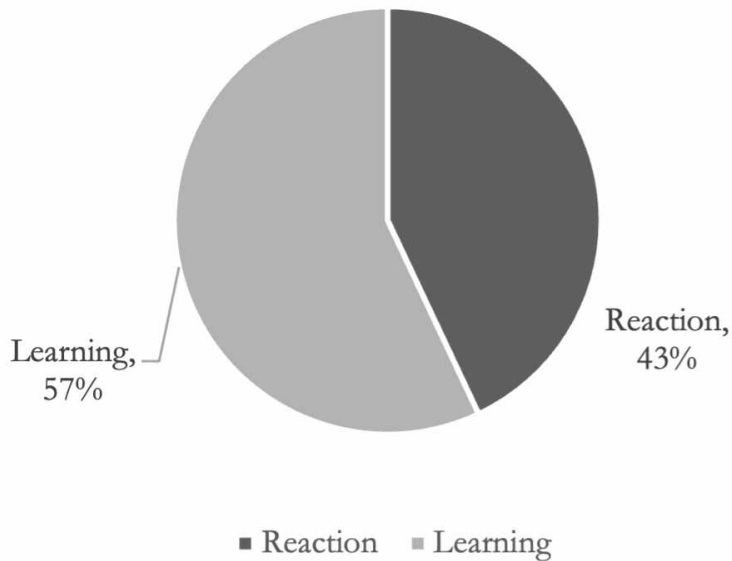**Figure 5. Pie chart illustrating comparison of reaction to learning from a coverage perspective onsite**

Table 4. Percentage of students in the low, medium, and high feedback group between reaction and learning

Constructs	Low	Medium	High
Reaction	81%	9%	10%
Learning	90%	5%	5%

of 59.7 (34.07%), 'training relevance' scored very high with a coverage of 75.03 (42.82%), followed by 'training environment 'with a coverage of 40.53 (23.13%). This demonstrates the importance of having an onsite internship rather than an online internship program. From a 'learning' perspective, out of the three themes, knowledge gained' scored a coverage of 68.51 (40.06%), 'experience gained' scored very high with a value of 77.92 (45.57%) coverage, followed by 'advancement' with the least coverage of only 24.55 (14.35%). In this respect, while students are content with the experience, the low indicator for career advancement is a very concerning factor since one of the main objectives of any internship program is to provide avenues for career advancement.

This sub section displays and analyze the percentage of students who scored high, medium, and low on the three themes under reaction. In this respect, we used the low to high range of 'reaction' (2.23 [Report 8] to 19.96 [Report 6]) and categorized these into (2.23 – 8.14) as low, (8.15 – 14.05) as medium and (14.06 – 19.96) as high by separating these into three equal value range. In the 'reaction' construct, we found that 65% of students scored low, 15% scored medium and 20% scored high (Figure 6). This is an area of concern due to the absence of a bell-shaped curve.

Figure 7 displays the percentage of interns who scored low to high on the 'learning' construct. We used the low to high range of 'learning' (1.98 [Report_11] to 22.63 [Report_18]) and categorized these into low (0 – 17.62), medium (17.63 – 30) and high (30.1 – 44.59) by separating these into three equal value ranges. Thus, from the 'learning' perspective, we found that the 65% of students scored low, 15% scored medium and 20% scored high (Figure 7). The percentage distribution perfectly matches with the 'reaction' construct and the substantial percentage of students (65%)

Table 5. Coverage of reaction and learning in consumptive metrics for students who did their internship online

	Reaction				Learning			
	A: 1.1 Course Satisfaction	B: 1.2 Training Relevance	C: 1.3 Training Environment	Reaction	D: 2.1 Knowledge Gained	E: 2.2 Experience Gained	F: 2.3 Advancement	Learning
1: Report_01	3.1%	0.0%	0.00%	3.09%	12.23%	0.0%	4.45%	16.68%
2: Report_02	3.48%	4.06%	7.90%	15.44%	3.78%	0.0%	0.0%	3.78%
3: Report_03	1.54%	2.29%	0.0%	3.83%	4.84%	6.2%	2.54%	13.58%
4: Report_04	0.00%	3.85%	0.0%	3.85%	0.0%	2.49%	0.88%	3.37%
5: Report_05	2.13%	1.26%	3.65%	7.04%	0.0%	1.95%	1.63%	3.58%
6: Report_06	0.0%	9.15%	10.81%	19.96%	0.0%	8.86%	0.00%	8.86%
7: Report_07	3.33%	2.26%	0.0%	5.59%	3.73%	0.0%	0.0%	3.73%
8: Report_08	2.23%	0.0%	0.0%	2.23%	2.92%	0.00%	0.00%	2.92%
9: Report_09	0.00%	6.57%	6.72	13.29%	4.78%	0.00%	0.00%	4.78%
10: Report_10	2.90%	1.54%	0.00%	4.44%	1.17%	1.23%	0.00%	2.40%
11: Report_11	3.07%	1.61%	1.34%	6.02%	0.0%	1.98%	0.00%	1.98%
12: Report_12	0.0%	11.19%	0.00%	11.19%	17.16%	3.9%	0.0%	21.06%
13: Report_13	14.09%	0.0%	2.47%	16.56%	0.0%	8.44%	0.00%	8.44%
14: Report_14	0.0%	6.25%	0.0%	6.25%	5.75%	9.88%	0.0%	15.63%
15: Report_15	6.58%	3.29%	0.00%	9.87%	1.21%	4.06%	0.00%	5.27%
16: Report_16	5.3%	2.33%	0.0%	7.63%	1.06%	1.81%	0.00%	2.87%
17: Report_17	0.0%	8.09%	0.0%	8.09%	0.0%	3.14%	0.0%	3.14%
18: Report_18	1.63%	4.27%	2.3%	8.2%	4.31%	11.56%	6.76%	22.63%
19: Report_19	6.24%	5.09%	5.34%	16.67%	4.17%	5.54%	0.0%	971.0%
20: Report_20	4.04	1.93%	0.0%	5.97%	1.4%	6.88%	8.29%	16.57%
Total	59.70%	75.03%	40.53%	175.21%	68.51%	77.92%	24.55%	170.98%
Total (out of 100)	34.07%	42.82%	23.13%	100.0%	40.06%	45.57%	14.35%	100.00%

Figure 6. Pie chart for categorizing reaction and in coverage-online
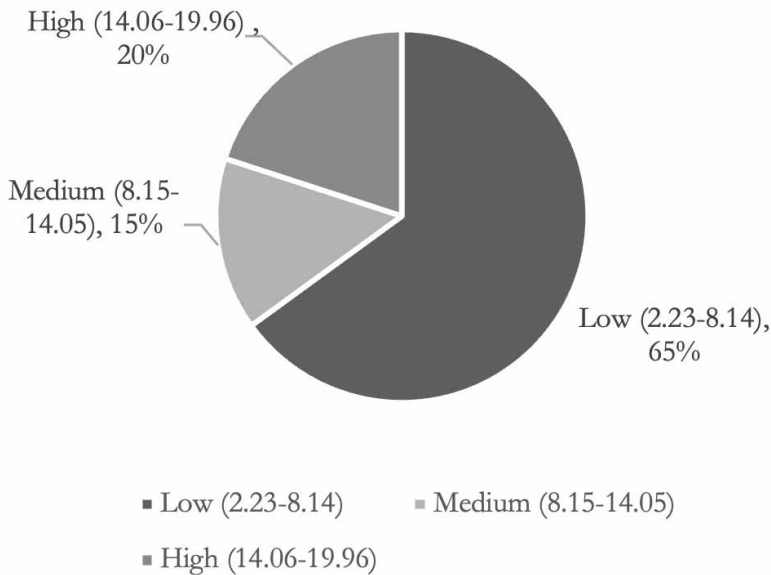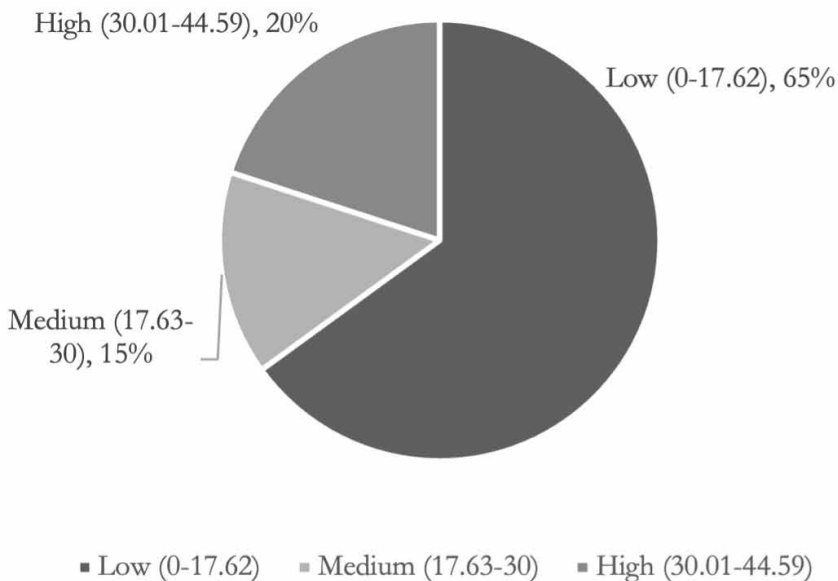

Figure 7. Pie chart for categorizing learning in coverage-online

who have very few positive feedback on this aspect demonstrates the low effectiveness of online mode of internship.

Figure 8 illustrates the overall comparison of 'reaction' to 'learning', from a coverage perspective where both constructs scored similar positive feedback in terms of reaction (50.6%) and learning (49.4%). While the positive feedback is similar, it should be noted that the coverage of positive feedback, in the internship report is very low for online internship when compared with onsite internship.

Figure 8. Pie chart illustrating comparison of reaction to learning from a coverage perspective-online
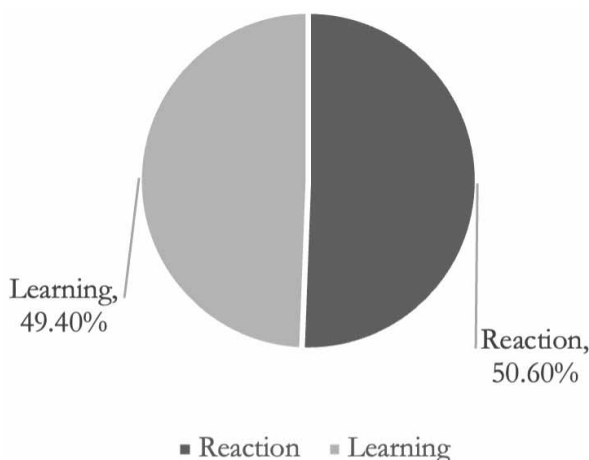
4.3 Measuring 'Reaction' and 'Learning' Based on Frequency of Positive Feedback for Onsite Internship

Table 6 illustrates the extend of frequency (the number of times positive feedback is repeated in the internship report) of the themes under the constructs namely 'reaction' and 'learning'. Out of the three themes in 'reaction' (see total field), 'course satisfaction' scored a frequency of 33 (33.33%), 'training relevance' scored very high with a value of 37 (37.37%) frequency, followed 'training environment' with a frequency of only 29 (29.3%). In terms of the frequency of positive feedbacks in the internship report for 'learning' construct, the theme 'knowledge gained' scored a frequency of 54 (35.52%), 'experience gained' scored high with a frequency of 76 (50%) followed by 'career 'advancement' with a frequency of only 22 (14.47%). While this is a positive sign on the value of internship, we observed that, it is not assisting students in their career advancement. This finding thus correlates with the measurement analysis done under coverage. To evaluate how many students scored low, medium, and high on frequency for reaction and learning, we used the overall range of 'reaction' (1[Report_21] – 10 [Report_1/Report_4) and categorized these into low (1 - 3), medium (4 - 6) and high (7 - 10) by separating these into three equal value range (Figure 9). Analyzing 'reaction' construct, from a frequency perspective, we found that the 45% of interns scored low, 35% of interns scored medium while only 20% of interns scored high in terms of the number of times, they have written positive feedback in relation to the construct 'reaction'.

With respect to the construct 'learning' where the frequency of positive feedback ranges from 1 – 20, we categorized these into low (1 - 7), medium (8 - 13) and high (14 - 20) by separating these into three value ranges. By analyzing the percentage of interns who scored low, medium, and high, we found that 67% scored low, 14% scored medium and 19% of students scored high (Figure 10). Since 'learning' signifies the knowledge and experienced gained including career advancement, the high percentage of students (67%) who has given less positive feedback is a domain that need to be explored further for the rationale.

Figure 11 illustrates comparison of 'reaction' to 'learning', from a frequency perspective. Contrary to coverage, where reaction has a slight edge over learning, it was found that students scored high on 'learning' (61%) than 'reaction (39%) when we counted the number of times the interns cited the respective constructs in the report.

From a coverage and frequency perspective (Table 7), while learning still scores low with respect to the low percentage of students who provided positive feedback, the percentage of students who scored low in both reaction and learning is a domain that needs to be explored further.

Table 6. Frequency of reaction and learning in consumptive metrics-onsite

| | Reaction | | | | Learning | | | |
	A: 1.1 Course Satisfaction	B: 1.2 Training Relevance	C: 1.3 Training Environment	Reaction	D: 2.1 Knowledge Gained	E: 2.2 Experience Gained	F: 2.3 Advancement	Learning
1: Report_01	6	2	2	10	4	14	2	20
2: Report_02	2	4	3	9	6	8	5	19
3: Report_03	0	4	4	8	7	7	0	14
4: Report_04	3	5	2	10	5	9	1	15
5: Report_05	3	2	1	6	8	1	1	10
6: Report_06	3	1	2	6	3	3	0	6
7: Report_07	1	1	1	3	1	3	1	5
8: Report_08	0	2	1	3	1	1	2	4
9: Report_09	1	2	0	3	1	4	2	7
10: Report_10	2	1	2	5	1	3	0	4
11: Report_11	1	1	2	4	1	1	1	3
12: Report_12	1	2	0	3	1	1	1	3
13: Report_13	0	1	1	2	1	1	0	2
14: Report_14	1	2	1	4	1	7	2	10
15: Report_15	2	0	1	3	0	1	0	1
16: Report_16	2	2	1	5	3	3	0	6
17: Report_17	2	1	1	4	2	1	2	5
18: Report_18	2	2	2	6	1	3	0	4
19: Report_19	1	1	0	2	3	5	1	9
20: Report_20	0	1	1	2	1	0	1	2
21: Report_21	0	0	1	1	3	0	0	3
Total	33	37	29	99	54	76	22	152
Total (out of 100)	33.33	37.37	29.3	100	35.52	50	14.47	100

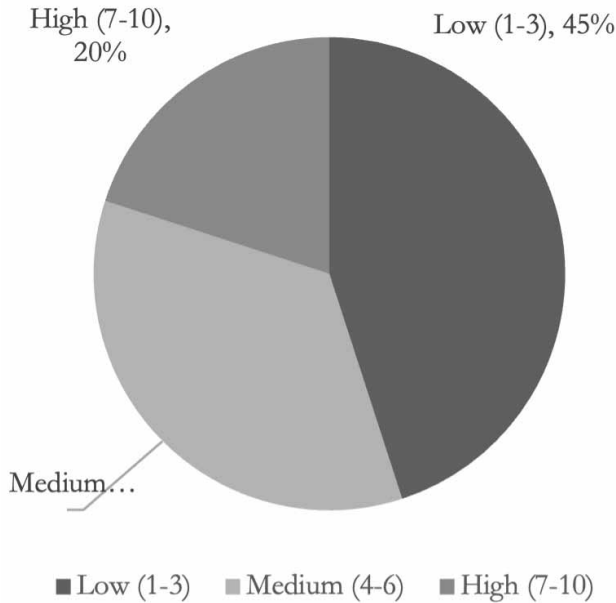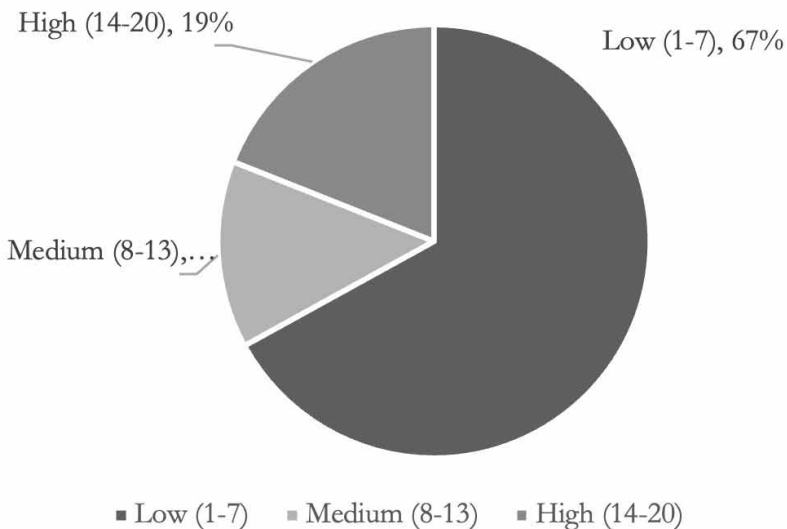**Figure 9. Pie chart for categorizing reaction in frequency-onsite**

Figure 10. Pie chart for categorizing learning in frequency-onsite

4.4 Measuring 'Reaction' and 'Learning' Based on Frequency-Online

Table 8 illustrates the extend of frequency of the themes under the constructs namely 'reaction' and 'learning'. The zero and very low scores in terms of the number of times positive feedback was given by interns in the report clearly demonstrates the strength of onsite mode. Out of the three themes in 'reaction', (last row [Total] field) 'course satisfaction' scored a frequency of 23 (37.7%), 'training relevance' scored high with a value of 24 (39.34%) frequency, followed by 'training environment' was

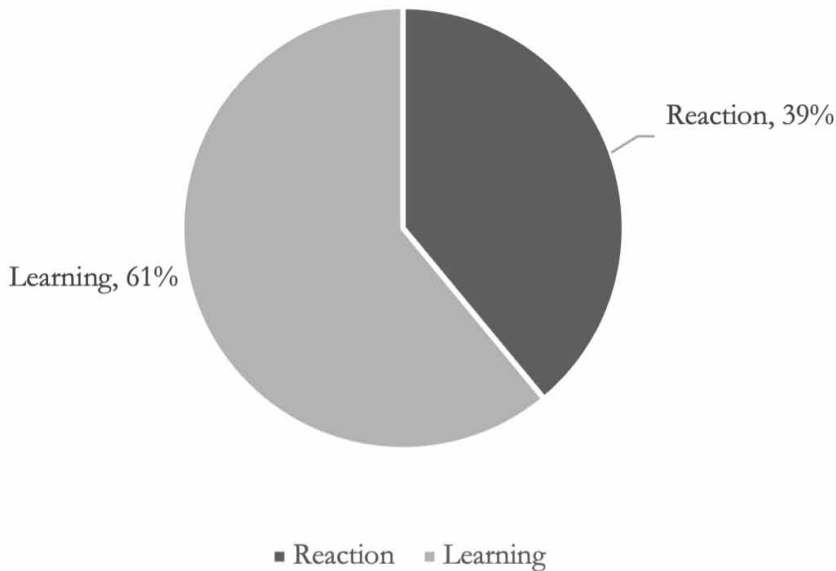Figure 11. Pie chart illustrating comparison of reaction to learning from a frequency perspective-onsite

Table 7. Comparison of coverage (C) with frequency (F) for the two constructs-onsite

	High		Medium		Low	
	C	**F**	**C**	**F**	**C**	**F**
Reaction	10%	19%	9%	24%	81%	57%
Learning	5%	19%	5%	14%	90%	67%

least covered with a frequency of only 14 (22.95%) (see Figure 12). From a 'learning' perspective, 'knowledge gain' scored a frequency of 27 (37.5%), 'experience gained' scored high with a value of 37 (51.39%) frequency, and 'advancement' was least covered with a frequency of only 8 (11.11%). While this is a positive sign on the value of internship, we observed that, it is not assisting students in their career advancement. This finding correlates with the measurement under coverage.

To evaluate the relative strengths of each construct and the associated themes, we used the overall range of 'reaction' (1 - 10) and categorized these into low (1 - 4), medium (4.1 - 7) and high (7.1 - 10) by separating these into three equal value ranges. Analyzing 'reaction' construct, from a frequency perspective, we found that the 0% of students scored high while 15% scored average and 85% scored low (Figure 12). To evaluate the relative strengths of each construct and the associated themes, we used the overall range of 'learning' (1 - 20) and categorized these into low (1 - 7), medium (7.1 - 13) and high (13.1 - 20) by separating these into three equal value ranges. Considering 'learning' construct, we found that 0% of students scored high, while 10% scored medium and 90% scored low (Figure 13). This again reveals a lack of alignment of academics with practice. Most students receive low ratings for "reaction" and "learning," which again correlate to the findings from coverage. The lack of positive feedback in an online setting clearly demonstrates the low score for online internship.

Figure 14 illustrates comparison of 'reaction' to 'learning', from a frequency perspective, it was found that students scored slightly high on 'reaction' (54%) than 'learning' (46%). Since reaction refers to the practical aspect of internship, this finding provides the relevance of hands-on approach

Table 8. Frequency of reaction and learning in consumptive metrics-online

	Reaction				Learning			
	A: 1.1 Course Satisfaction	B: 1.2 Training Relevance	C: 1.3 Training Environment	Reaction	D: 2.1 Knowledge Gained	E: 2.2 Experience Gained	F: 2.3 Advancement	Learning
1: Report_01	1	0	0	1	5	0	1	6
2: Report_02	1	1	1	3	1	0	0	1
3: Report_03	1	1	0	2	3	4	1	8
4: Report_04	0	2	0	2	0	3	1	4
5: Report_05	3	1	3	7	0	2	1	3
6: Report_06	0	2	4	6	0	4	0	4
7: Report_07	2	1	0	3	3	0	0	3
8: Report_08	1	0	0	1	1	0	0	1
9: Report_09	0	1	2	3	1	0	0	1
10: Report_10	2	1	0	3	1	1	0	2
11: Report_11	1	2	1	4	0	1	0	1
12: Report_12	0	1	0	1	3	1	0	4
13: Report_13	3	0	1	4	0	2	0	2
14: Report_14	0	2	0	2	3	5	0	8
15: Report_15	2	1	0	3	1	5	0	6
16: Report_16	3	1	0	4	1	2	0	3
17: Report_17	0	2	0	2	0	1	0	1
18: Report_18	1	3	1	5	2	2	2	6
19: Report_19	1	1	1	3	1	2	0	3
20: Report_20	1	1	0	2	1	2	2	5
Total	23	24	14	61	27	37	8	72
Total (out of 100)	37.7	39.34	22.95	100	37.5	51.39	11.11	100

Figure 12. Pie chart for categorizing reaction in frequency-online
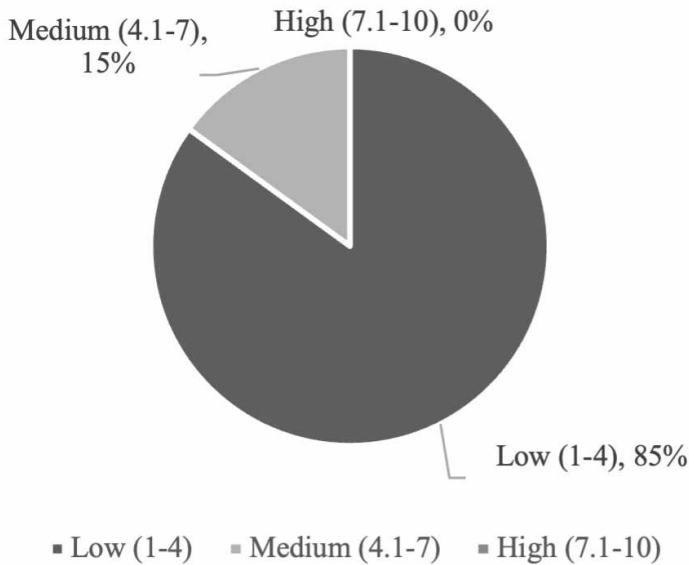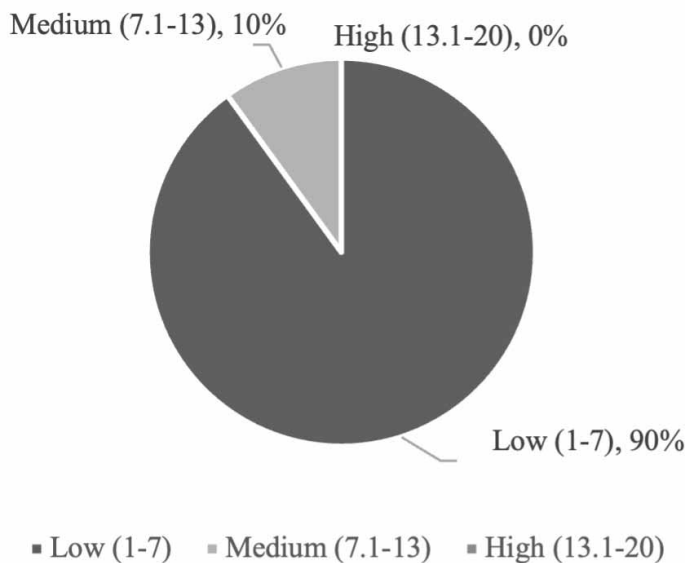

Figure 13. Pie chart for categorizing learning in frequency-online

to interns. This finding also gives rise to the question of why learning is more effective in online mode while reaction is effective in an onsite mode.

Viewing the overall coverage and frequency from an online internship mode (Table 9), the mode, the 'zero' scores, attributed to both reaction and learning and the high percentage of interns who have hardly any positive feedback provide a stark contrast to the figures given in the onsite internship mode.

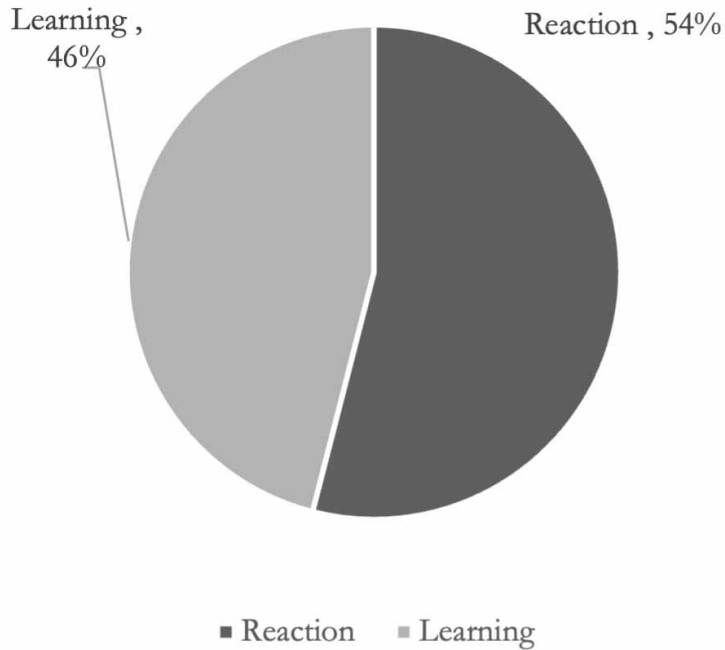**Figure 14. Pie chart illustrating comparison of reaction to learning from a frequency perspective-online**

Table 9. Comparison of coverage (C) with frequency (F) for the two constructs-online

	High		Medium		Low	
	C	**F**	**C**	**F**	**C**	**F**
Reaction	0%	0%	15%	15%	85%	85%
Learning	0%	0%	10%	10%	90%	90%

5. DISCUSSION

This section provides the answers for the research questions we proposed in 'introduction' section.

(1) RQ1: Is there a difference between the extent of learning and practice between onsite and online internship?
(2) RQ2: Which are the constructs of similarity and difference for reaction and learning between onsite and online internship?
(3) RQ3: What is the extent of similarity and/or difference for reaction and learning between onsite and online internship.

In this respect, first we look at the extent of learning resources consumed (consumption metrics) during onsite and online internship.

5.1 Comparison of Consumptive Metrics: Onsite vs. Online (RQ1, RQ2 and RQ3)

In terms of the extend of coverage, we found that the interns learn more when they are involved physically in a practical environment. Second, the extend of low positive feedback including multiple

zero feedback in all the six themes in the online internship mode, clearly demonstrates the extend of dissatisfaction in the consumptive metrics for the online mode. Table 10 demonstrates the low CM value where reaction reduced by 26.64% and learning reduced further by 53.72% in an online internship mode. Hence, when there is lack of onsite experience learning suffers as is evident from the coverage presented in the table. These figures clearly provide relevance to onsite internship mode over online internship mode.

Exploring this further into three themes of reaction, it is found that while course satisfaction provided more positive feedback in an online mode with an increase of 13.38% (51.8 to 59.7), training environment suffered a substantial decrease of 85.39% (75.14 to 40.53), while the relevance of training increased marginally (74.87 to 75.03) by 0.21% (see Figure 15). While the data on training environment is realistic due to online mode, it is significant to note that interns provided marginally higher score on course satisfaction and training relevance. This can provide valuable information to academic decision makers who can provide interventions in this respect to make online internships relevant and satisfying in case a policy or regulatory need arise.

While only one theme of reaction showed a substantial decline in terms of reaction, when it comes to learning (Figure 16), it was observed that all three themes namely knowledge gained, experience gained, and career advancement suffered low satisfaction rate with knowledge suffering a drop of 77.36% (from 121.54 to 68.51) while the drop for experience gained and career advancement are 27.41% (99.28 to 77.92) and 71.12% (42.01 to 24.55). This clearly reveals the difficulty in getting jobs for interns due to lack of 'experience gained' in an online mode.

In terms of the number of times the interns stated their positive feedback on the CM, we found that onsite mode has clear advantage over online mode. In terms of reaction, there was a 62% (99 to 61) of reduction in terms of positive feedback and a reduction of a 111.11% (152 to 72) in terms of

Table 10. Comparison of consumptive metrics in terms of overall coverage: onsite vs online

	Onsite	Online	Difference
Reaction	201.85	175.21	-26.64%
Learning	262.83	170.98	-53.72%

Figure 15. Comparison between online and onsite coverage (overall) in terms of reaction

Figure 16. Comparison between online and onsite coverage (overall) in terms of learning

learning (Table 11). This again clearly substantiate the figures from 'coverage' highlighting the lack of learning in an online mode of internship.

While 'coverage' of positive feedback proves the overarching relevance of online mode, this needs to substantiate with frequency for validation. In this respect, exploring this further into three themes of reaction (Figure 17) in terms of frequency namely course satisfaction, training relevance and training environment. In the reaction construct, all three themes showed a considerable decrease (of positive evaluation) by 43.47% (33 to 23 for course satisfaction), 54.16% (37 to 24 for training relevance) and 71.12% (29 to 14 for training environment). While the correlation between coverage and frequency is not same, from an overall perspective, it however, clearly indicates the lack of positive feedback for online mode of internship.

Considering the number of times, interns have written positive feedback on the three themes under 'learning' (Figure 18), a comparison of these themes between onsite and online mode reveals a considerable drop with online mode. In this respect, 'knowledge gained' recorded a drop of 100% (54 to 27), 'experience gained' a drop of 105.4% (76 to 37), and 'career advancement' a substantial drop of 175% (22 to 8). This clearly indicates the low effectiveness of the online mode in terms of learning. This also substantiates the percentage drop for learning in the 'coverage'.

The figures and tables given in this section along with discussion, clearly answer the three research questions where it was observed that in both reaction and learning the online mode of internship is less effective than onsite mode of internship. However, in terms of extend of effectiveness for 'reaction' and 'learning', it was clear that the decrease was more for 'learning' than 'reaction'. Considering the six themes under 'learning' and reaction', while two themes under 'reaction' namely 'course satisfaction' and 'training relevance' showed similarity between onsite and online mode, the considerable decrease of effectiveness in 'training environment', 'knowledge gained', experience gained', and 'career advancement' is a cause of concern for online mode.

Table 11. Comparison of consumptive metrics in terms of frequency: onsite vs. online

	Onsite	Online	Difference
Reaction	99	61	-62.3%
Learning	152	72	-111.11%

Figure 17. Comparison between online and onsite frequency (overall) in terms of reaction

Figure 18. Comparison between online and onsite frequency (overall) in terms of learning

6. CONCLUSION

In this paper, we used the theoretical lens of Kirkpatrick's consumptive metrics to measure and evaluate the two constructs namely 'reaction' and 'learning for the onsite (21 students) and online mode (20 students) of internship of the undergraduate students of information systems and technology. In this respect, we found that while 'course satisfaction' and 'training relevance' have similar effectiveness for the onsite as well as online mode, the effectiveness for online mode was considerably reduced in terms of 'training environment', 'knowledge gained', and 'career advancement'. In terms of 'career advancement', the reduction was severe for online mode highlighting the lack of job opportunities. However, considering both the onsite and online mode, the extend of learning resources consumed during the internship program is less for interns. This led to low alignment of theory with practice.

Critical questions have emerged during the findings in the research. First, the overall qualitative and quantitative observation, showed the online mode to be less effective, the similarity of effectiveness in terms of 'course satisfaction', and 'training relevance' need to be explored for the rationale. Second, the online mode was done by the interns during March/April 2020 when the pandemic scare was at the maximum. Will the results be the same during the current situation where interns are more used to the pandemic environment? Third, the research did not explore the reasons behind the similarity or decrease in internship effectiveness for the six themes. Research on this domain can uncover critical areas for intervention.

Fourth, overall, the extend of learning resources consumed during the internship program is less for interns. Reasons for this can provide academic decision makers to frame positive intervention policies. Fifth, the data was taken from the internship reports where the students tend to provide positive feedback when they submit for grades (where they may assume that any negative feedback may result in a failure). An anonymous qualitative interview of interns in the CM perspective can provide us meaningful insights. In sub section D, (under the section Analysis of data) the finding gives rise to the question of why learning is more effective in online mode while reaction is effective in an onsite mode which is a critical question for further research.

The research is not without its limitations. The main limitation of this research is the smaller sample taken in a single semester (January to May 2020) where one internship was done onsite, and the subsequent one done online (due to covid restrictions). Second, the research did not uncover the rationale behind the feedback. Third, a triangulation of results was not done using multiple modes of data as we solely depended on final internship reports. However, our study that sheds light on the multiple variables that are affected by both onsite and online internship, can provide valuable insights for academic decision makers for framing policies and initiating positive interventions.

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