Tuijin Jishu/Journal of Propulsion Technology
ISSN: 1001-4055
Vol. 45 No. 2 (2024)

A Study of Student's Perceptions of their Computing Ability and their Augmented Competencies they Achieve in General Foundation Program

Ms. Jitha Challipat Jayathilak, Dr. Sulaiha Beevi,

Senior Lecturer School of Foundation Studies, National University of Science and Technology, Sultanate of Oman,

Senior Lecturer and Asst. Head School of Foundation Studies, National University of Science and Technology, Sultanate of Oman,

Abstract

In this modern world of technology, computer proficiency is essential for individuals across various fields. As such, educational institutions play an important role in equipping students with computing skills and knowledge to confront the challenges presented by the fast-paced and evolving technological landscape. This research aims to look at students' perceptions of their computing abilities and the effectiveness of General Foundation Program (GFP) Computing courses in enhancing their knowledge. Specifically, this study examines the GFP at the National University of Science and Technology in the Sultanate of Oman. The investigation employs survey data and pre-post foundation test scores to explore the research aspects. The findings point to a classic case of Dunning-Kruger effect. Accordingly, students with low ability in computing give overly positive assessments of their ability. However, the research findings establish the remarkable efficacy of the GFP Computing course in strengthening students' computing abilities. Based on these outcomes, it is notable that adjustments can be made to the program by addressing the identified strengths and limitations of the course, aiming to better align it with the goals of Oman Vision 2040.This will ensure that the citizens are adequately equipped with the necessary digital competencies to navigate the evolving technological landscape. Similar studies can be applied by other higher education institutions in Oman to enhance their students' computing abilities.

***Keywords*:** Student's Perception, General Foundation Program, Computing abilities, Oman vision 2040, Computer proficiency

1. Introduction

The importance of computing cannot be exaggerated in this digital era. Its applications span across various domains. It powers the Internet, enabling global connectivity and information exchange. With the advent of Artificial Intelligence and machine learning, computing has transformed industries by automating tasks, making predictions, and driving innovations. Furthermore, the COVID-19 pandemic accentuated the critical role of computing in ensuring connectivity, remote work, and adaptability in times of emergency (Pawlicka, et al., 2022) .Be it education, employment, accessing information or communication it would be difficult to interact with the digital world without computing.

In 2003, Oman embraced the Digital Oman Strategy, initiating efforts to build a knowledge-based economy, promote digital society, and improve e-governance through various national strategies, including human capacity development (How is Oman's digital strategy progressing?, 2015) . The Oman vision 2040 emphasizes the need to equip citizens with digital skills and promote digital literacy at all levels of education (Alhabsi & Alfawair,

2023). By prioritizing computer education and ensuring its integration into the educational system, Oman is empowering its citizens to embrace technology.

The importance of preparing students for effective engagement in higher education was underscored by Oman's National Quality Plan of 2006, particularly through the General Foundation Program (GFP). (Carroll M. , Razvi, Goodliffe, & AL-Habsi, 2009). It is a non-credit program designed to academically prepare a student for their post-secondary studies by providing additional assistance for those who had exposure to the required academic standards but have not yet succeeded in meeting them (OAAAQA-General Foundation Programme Accreditation, 2024).

GFP standards have been developed in four major areas: English, Mathematics, Computing and Study Skills (OAAAQA-General Foundation Programme Accreditation, 2024). These areas were chosen based on the discussions with the education sectors in Oman and review of international literature, such as the Report of the UK's National Committee of Inquiry into Higher Education (Carroll, Razvi, & Goodliffe, Using Foundation Program Academic Standards as a Quality Enhancement Tool, 2009). The primary objective of the Computing course is to acquaint incoming college students with essential computing skills for their higher studies.

As the current generation of students have grown up in the digital era, they have been exposed to various technologies from an early age. This exposure has led the world to believe that they have a good understanding of computing. Also, regular usage of computers and smartphones during the pandemic for remote learning in secondary school has created a false sense of proficiency in basic computing skills (Sari & Yoni, 2021). Even though these students possess a degree of familiarity during their studies, they may not have a comprehensive understanding of the underlying concepts. In today's technologically advanced world, overestimating one's computing abilities can lead to being left behind (Bhaduri & Matusovich, 2017 June). This highlights the relevance of perception- as individuals' judgments about their own computing skills, significantly impacting their ability to succeed in navigating the digital realm. To enhance students' learning experience and to ensure that they are prepared and appropriately challenged, it is very important to understand the students' perception of their computing abilities.

The purpose of this research is to analyze GFP students' perceptions and their actual computing abilities by assessing their performance in the placement test prior to taking the General Foundation Program. Additionally, this research evaluates effectiveness of the GFP by comparing their performance in the placement test with the end of semester exam in the Computing course.

2. Literature Review

General Foundation Program (GFP) in Oman is a one-year program designed to bridge the gap between secondary education and college/university level education. The Computing course in the GFP outlines the fundamental knowledge and abilities necessary for every student to become lifelong learners in an environment productive with technology. The course describes the skills in six areas: Computer fundamentals, Basic computer Operations and file management, Spreadsheet, Word Processing, Presentation, and Internet.

Students enrolled in Computing course, however, have their own perception about their computing abilities. Those with a wide range of technical skills may feel that they have already mastered all the learning outcomes of GFP computing course in their school curriculum. Therefore, they might deem further study unnecessary. Moreover, parents express their reservations about the course, believing that their kids are already proficient in computing. Consequently, faculty finds it challenging to convince students and parents about the crucial significance of computing education for further studies, emphasizing that the curriculum extends beyond what might be visible or initially perceived.

Several studies have been conducted about the undergraduate students' perceptions and their actual computing abilities. In one of the studies conducted among undergraduate students enrolled in a public University of North Carolina, it was found that there was a discrepancy between what the students perceive and their actual assessed computing abilities. The student's perception did not match their performance on the assessment for spreadsheet skills and some word processing skills but matched with their PowerPoint skills. (Grant, Malloy, & Murphy, 2009)

A similar study was conducted among the undergraduate students in a public University at the East Coast of Peninsular Malaysia. The findings revealed that out of the six computer application skills tested- word processing, spreadsheet, databases, multimedia, desktop publishing and Internet, there was a substantial deficiency in word processing and spreadsheet skills among the students. (Abdullah, Amin, Mansor, & Maizura, 2011)

Another study that was aimed to assess the computing knowledge of freshman business students revealed that the students did not have necessary skills in computer concepts and spreadsheets. (Wallace & Clariana , 2005)

Despite the paramount significance of computing, there has been a notable absence of recent research concerning students' perception of their computing abilities in the past decade. Moreover, it is noteworthy that no research has been conducted on this topic within the context of Sultanate of Oman. This highlights the need to address the lack of information and to obtain a complete understanding of the challenges and opportunities of computing education for undergraduate students in this country.

Based on these observations, it was decided to fill these gaps and understand exactly how proficient the GFP students are at using computers. This research can shed light on the students actual computing abilities and recommend changes to curriculum if needed to prioritize the specific areas of skill development and help students achieve the required proficiency for their future growth.

3. Hypotheses

Based on the literature review, the following hypotheses were formulated to serve as a pathway for our research.

H1: Majority of the students (>50 %) have higher perception of their computing abilities compared to their actual computing skills in Computer Fundamentals.

H2: Majority of the students (>50 %) have higher perception of their computing abilities compared to their actual computing skills in Basic Computer Operations and File management.

H3: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Microsoft Word.

H4: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Internet.

H5: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in PowerPoint.

H6: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Microsoft Excel.

H7: Majority of the students (>70 %) would show a significant increase in their performance in Computing courses at the end of the General Foundation Program.

4. Research Methodology

To gauge students' perceptions of their computing abilities, we had two options either conducting interviews or administering a survey (Ponto, March-April 2015). We ruled out interviews because students might feel self-conscious and provide inaccurate responses. Additionally, interviewing large cohorts of students would be time-consuming. Therefore, we opted for a survey, where students could remain anonymous and provide responses more efficiently. Similarly, to assess students' actual abilities prior to joining the program, we had to test their computing abilities in all the modules. As the university was already administering a placement test in computing skills for all the students, we opted to utilize the placement test scores to assess students' actual abilities.

To test the hypotheses in this study, a quantitative correlational method was used. Two different instruments were designed to capture the results: a survey to collect students' perception about their computing abilities and an assessment for testing their computing abilities before and after the foundation program.

This study was conducted on the 2022-2023 cohort of students from the General Foundation Program in the National University of Science and Technology. The Computing skills course in the university is taught over the duration of two semesters. The first semester focuses on modules like Computer Fundamentals, Basic Computer Operations and File Management, Internet, and Basic Word whereas the second semester deals with Advanced Word, PowerPoint, and Excel.

The sample for this study consisted of students enrolled in majors such as Medicine, Pharmacy, Engineering, and Information Technology Management for Business (ITMB). These students, who completed their secondary education, had backgrounds in both science and arts. The survey and assessment were administered to all students. As the data collection was spread throughout the year, the study was conducted on the whole cohort to ensure consistency of the data.

Instruments and Deployment

The survey, which was conducted at the beginning of the program had two parts. The first part collected their personal data such as their name and student identification number. The second part focused on collecting students' perceptions about their computing abilities in all the six computing modules. The students were asked to take the survey on the google form. They were informed that it was a part of research conducted to improve the course. They had to rate themselves on their perceived computing ability on the five-point Likert scale. A rating of 1 denoted lower proficiency, while a rating of 5 signified very high knowledge.

Two assessments were used for this study. The first assessment focused on students' pre-foundation computing abilities. This was the placement test (pre-foundation test) conducted by the university at the time of their enrollment into the GFP. Their performance in this test was used to determine whether the student had to take the Computing course in GFP or not.

The aim of the second assessment was to evaluate students' performance after they attained knowledge by attending the classes (post foundation test). This test was conducted after teaching each computing module. The students were instructed to take the test seriously as in preparation for the actual exam. Both these assessments tested all the major learning outcomes of the six computing modules. They were administered using the Blackboard learning management system under examination conditions in computer labs.

Data Analysis Techniques:

To extract insights from the data sets, Microsoft Excel and IBM SPSS were used as data analysis software (York, December 2016).

Microsoft Excel was used to organize, clean, and explore the data sets that were recorded from the survey and assessments. The data sets were compiled using various Excel formulas. The pre-foundation and post foundation test data were segregated based on the individual computing skills module. The survey and pre-foundation test score data sets were compared and summarized using Excel. It also helped in generating informative visualizations to enhance insights from the data.

On the other hand, IBM SPSS was used to perform essential statistical analysis including the assessment of normality of the data sets (Berkman & Reise, 2012). Additionally, it assisted in evaluating the significance of difference between post foundation test and pre-foundation test data.

5. Results and Discussion

Six hypotheses were formulated to examine the correlation between students' perceptions of their computing abilities, while an additional hypothesis was developed to assess the efficacy of the GFP in achieving the intended learning objectives. These hypotheses were subsequently assessed based on survey and evaluation findings.

5.1 Comparative Analysis of student's perception and their actual computing competencies

To compare and analyze students' perception and their actual computing abilities, the following two evaluation methods were employed.

Evaluation Method 1 for Hypotheses H1 to H6

Table 1 shows the summary of the survey where the students have rated their computing abilities on the scale of one to five for each computing module.

Table 1 : Student Survey Data

Based on the data in Table 1, 26% of students assessed themselves having very good knowledge in the Internet module. Approximately 23% of students self-assessed their proficiency in the PowerPoint module as very good. On the other hand, around 31% of students rated their proficiency level in Microsoft Excel as very limited.

Student's Actual Computing Abilities Before General Foundation Program

Computing Modules	Very Good (5)	Good (5)	Average (3)	Limited (2)	Very Limited (1)
Computer Fundamentals	0%	3%	16%	38%	43%
Basic Computer Operations and File Management	0%	6%	39%	0%	55%
Microsoft Word	0%	1%	14%	38%	48%
Internet	4%	25%	26%	0%	46%
PowerPoint	1%	5%	19%	35%	41%
Excel	0%	4%	13%	39%	44%

To compare the students' perception data with their actual performance score, the pre-foundation score from their placement test was converted to a scale of five. Table 2 shows the summary of the pre-foundation test results for each computing module on the scale of five.

Table 2 : Pre-foundation Score

Based on the data in Table 2, it can be noted that only 4% of students have a very good knowledge in Internet module and 1 % of students performed well in PowerPoint. The pre-foundation score shows that most students fell in the category of very limited knowledge. More than 50 % of the students in Basic Computer Operations and File Management module and roughly 40% of students in Word and Internet module fall in this category. The

Student's Perception of their Computing Abilities

Computing Modules	Very Good (5)	Good (5)	Average (3)	Limited (2)	Very Limited (1)
Computer Fundamentals	10%	28%	35%	22%	5%
Basic Computer Operations and File Management	13%	34%	34%	17%	3%
Microsoft Word	14%	41%	32%	12%	2%
Internet	26%	37%	24%	11%	2%
PowerPoint	23%	42%	24%	10%	2%
Excel	2%	14%	22%	32%	31%

result shows a significant difference between students' actual computing skills and their perception. This aligns with the Dunning-Kruger effect (Kruger & Dunning, 2000).

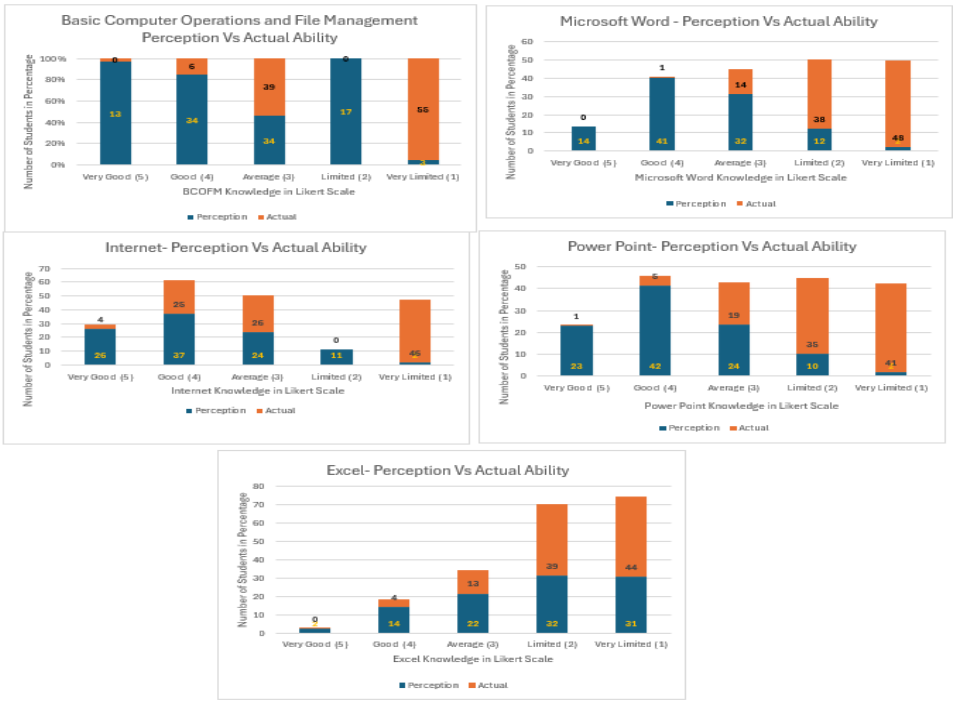


Figure 1 :Computer Fundamentals-Perception Vs Actual Ability

According to this psychological principle, individuals with limited knowledge or experience in a specific area are prone to overestimating their competence. In the context of computing education, students who have a basic understanding of computing may mistakenly believe that they possess advanced skills simply because they lack the awareness to accurately assess their proficiency.

To evaluate hypothesis 1, students perception data from Table 1 was compared with the actual ability data in Table 2 for Computer Fundamental module. Figure 1 clearly depicts that students have very high perception about their Computer Fundamental module.

Perception Vs Actual Ability
Computer Fundamentals Module

Knowledge of Computer Fundamentals	Student's Perception (in %)	Actual Ability of Students (in %)
Very Good (5)	10	0
Good (4)	28	3
Average (3)	35	16
Limited (2)	22	38
Very Limited (1)	5	43

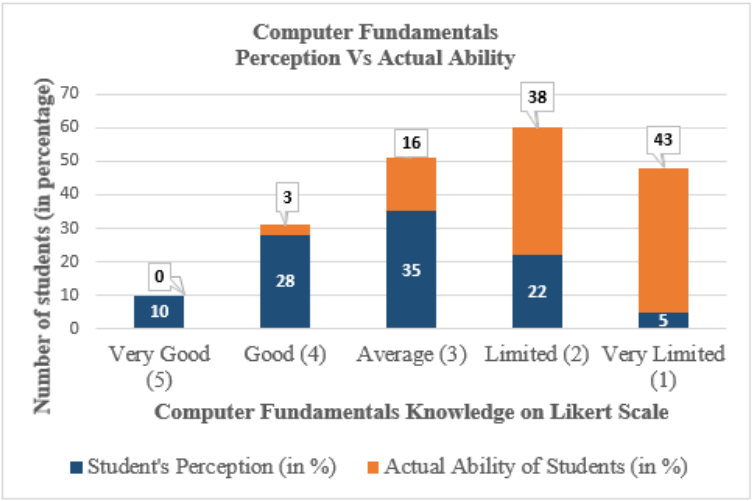


Figure 2 : Module wise Comparison of Students Perception and Actual Ability

A similar comparison was made for all the other computing modules and is summarized as shown in Figure 2. It shows that the students have very high perception about all their computing modules.

Evaluation Method 2 for Hypothesis H1 to H6

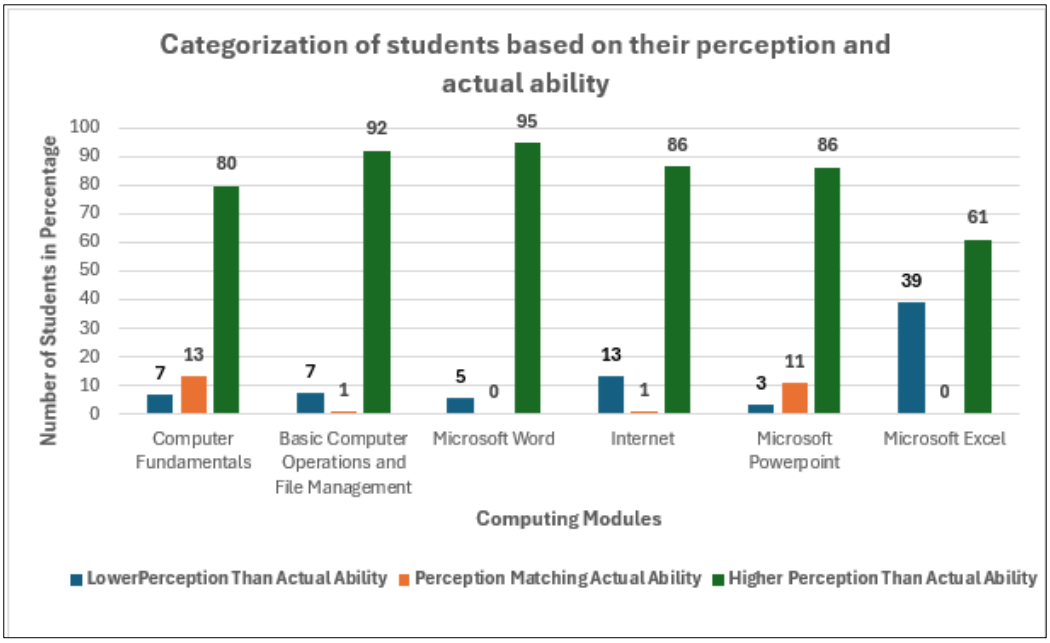
For closer observation, pre-foundation test score and students' perception score were later compiled as per the student identification number. Difference was calculated by subtracting the student's actual performance score (pre-foundation score) from the student's perception score (survey score) for each student.

Based on the difference the students were categorized into three different groups: Higher perception, Lower perception and Congruent perception. A positive difference was an indication that the students have higher perception about their computing abilities, whereas a negative difference meant students have lower perception about their computing abilities. If the difference was zero, then it meant that students' perception matched with their computing abilities (congruent perception). A sample of the above calculation is shown in Table 3 for Basic Computer Operations and File Management module.

Table 3 : Comparing Individual Students Perception and Actual Ability for Basic Computer Operation and File Management

Student ID	Perception Score (Survey) P	Actual Ability (Placement Test Score) A	Difference(P -A)
2201XX	1	2	-1
2204XX	3	0	3
2200XX	4	0	4
2201XX	4	0	4
2203XX	4	2	2
2203XX	4	2	2
2204XX	4	0	4
2204XX	4	0	4
2204XX	4	0	4
2204XX	4	0	4
2205XX	4	4	0

Figure 3 shows the categorization of students in three groups: Students with higher perception, students with lower perception and students with congruent perception.



Based on the above graphical representation, it can be noted that most of the students fall into the higher perception category in all the computer modules. More than 90% of the students have a very high perception about their Microsoft Word and Basic Computer Operations and File Management skills. Interestingly for Microsoft Excel module, 39% of the students fall in the group of lower perception. The reason for this perception can be that most of the students mostly rely on the Internet, PowerPoint and Microsoft Word for their activities compared to Microsoft Excel.

Based on the above findings all the six hypotheses were analyzed as follows.

Hypothesis 1

H1-Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Computer Fundamentals.

Based on evaluation method 1, Figure 1 clearly indicates that 73% of students believed that they have a very good to average understanding of Computer Fundamentals, yet in truth, 81% have limited or very limited knowledge. Similarly Figure 3 from evaluation method 2 depicts that 80% of the students have a higher perception about their Computer Fundamental skills. Based on these two evaluation methods it is noted that there is sufficient evidence to support hypothesis 1. So, Hypothesis 1 is confirmed.

Hypothesis 2

H2: Majority of the students (>50 %) have higher perception of their computing abilities compared to their actual computing skills in Basic Computer Operations and File management.

Based on evaluation method 1, Table 1 clearly indicates that 81% of students assumed that they have a very good to average understanding of Basic computer operations and file management module. But based on data from Table 2, it can be noted that approximately 55% of students have very limited knowledge. Figure 3 from evaluation method 2 depicts that 92% of the students have a higher perception about their Basic computer operations and file management module. Based on these two evaluation methods there is ample evidence supporting this hypothesis, leading to the validation of Hypothesis 2.

Hypothesis 3

H3: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Microsoft Word.

Based on evaluation method 1, Table 1 shows that 87% of students believed that they have a very good to average understanding of Microsoft Word, but in actual, based on data from Table 2, around 86% of students have limited to very limited knowledge. Figure 3 from evaluation method 2 illustrates that 95% of the students have a higher perception about their Microsoft Word module. It has been observed that there is substantial evidence to validate this hypothesis. Therefore Hypothesis 3 is established.

Hypothesis 4

H4: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Internet, WWW & Email.

Based on evaluation method 1, Table 1 clearly demonstrates that only 13% of the students believed that they have limited to very limited understanding of Internet module, but in fact Table 2, shows that there are around 46% of students who fall into this category. Similarly Figure 3 from evaluation method 2 shows that 86% of the students have a higher perception about the Internet module. Notably there is substantial evidence in favor of this hypothesis, resulting in the confirmation of Hypothesis 4.

Hypothesis 5

H5: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in PowerPoint.

Based on evaluation method 1, Table 1 clearly indicates that 89% of students believed that they have a very good to average understanding of PowerPoint module whereas Table 2 shows that only 25% of students have very good to average knowledge. Similarly Figure 3 from evaluation method 2 indicates that 86% of the students have a higher perception about PowerPoint module. Remarkably there is ample supporting evidence for this hypothesis, culminating in the affirmation of Hypothesis 5.

Hypothesis 6

H6: Majority of the students (>50 %) have a higher perception of their computing abilities compared to their actual computing skills in Microsoft Excel.

Based on evaluation method 1, Table 1 data shows that very few students have rated themselves in the group of very good to average knowledge of Excel. Approximately 38% of students fall into this group. Table 2 data demonstrates that only 17% of students have a very good to average understanding of Excel module. Even though there is a difference in perception and actual ability in Excel, it is comparatively less. Figure 3 from evaluation method 2 depicts some interesting facts. 61% of the students fell into a group of higher perception whereas almost 39% of students fell into a group of lower perception. Based on the above facts it is noted that there is considerable evidence to support this hypothesis. Thus, hypothesis 6 is corroborated.

5.2 Testing the effectiveness of General Foundation Program

Hypothesis 7

To assess the efficacy of the General Foundation Program pretest and post test scores of students were collected and analyzed. Based on the student identification number, the post foundation score data (Post Test) and the pre foundation score data (Pre-Test) for each computing module were compiled into one as shown in Table 4

Table 4 : Post and Pre-Foundation Score

	Computer Fundamentals		Basic Computer Operations and File Management		Internet		Microsoft Word		PowerPoint		Microsoft Excel	
Student ID	**Post Test (5)**	**Pre-Test (5)**	**Post Test (4)**	**Pre-Test (4)**	**Post Test (4)**	**Pre-Test (4)**	**Post Test (11)**	**Pre-Test (11)**	**Post Test (5)**	**Pre-Test (5)**	**Post Test (11)**	**Pre-Test (11)**
220XXX	5	1	4	2	4	0	8	0	5	5	7	5
220XXX	2	1	3	1	4	3	9	0	4	4	7	3
220XXX	5	2	3	0	4	1	10	0	5	4	6	2
220XXX	5	2	4	2	4	3	1	1	5	4	4	2
220XXX	5	0	2	0	4	1	2	1	5	4	10	3
220XXX	5	1	4	0	4	1	3	1	4	4	5	3
220XXX	5	1	4	1	4	1	3	1	5	4	7	1
220XXX	3	0	4	1	3	1	4	1	4	4	9	3
220XXX	2	2	3	0	4	2	4	1	5	4	8	6
220XXX	5	0	4	2	4	2	4	1	5	4	9	3

Due to non-normality of the dataset (Kim, August 2014), Wilcoxon signed-rank test (Durango & Refugio, 2018) was carried out for each computing module. The Wilcoxon signed-rank test is a statistical method used to compare two related groups to assess if there is a significant difference between them.

Table 5 and Table 6 show the output of Wilcoxon signed-rank test for computer fundamentals module.

Table 5 : Descriptive Statistics for Computer Fundamentals Module

Descriptive Statistics

	N	Percentiles		
		25th	50th (Median)	75th
CF_POSTTEST	177	2.0000	3.0000	5.0000

CF_PRETEST	177	1.0000	1.0000	2.0000

Table 6 : Wilcoxon signed-rank test for Computer Fundamental Module

Ranks

		N	Mean Rank	Sum of Ranks
CF_PRETEST – CF_POSTTEST	Negative Ranks	137[a]	81.82	11210.00
	Positive Ranks	16[b]	35.69	571.00
	Ties	24[c]		
	Total	177		

a. CFPRETEST < CFPOSTTest

b. CFPRETEST > CFPOSTTest

c. CFPRETEST = CFPOSTTest

Test Statistics[a]

	CF_PRETEST – CF_POSTTEST
Z	-9.757[b]
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Table 6 shows that there is a significant difference (z=-9.757, p<.001) between scores of tests conducted before teaching computer fundamentals module and after teaching the module. The mean of the negative ranking (81.82) is larger than the mean of the positive ranking (35.69) suggesting post test scores are larger than pretest scores. Table 5 shows that the students had a median score of 1 before they took the computer fundamentals course. After they took the course, the same students had a median score of 3. This indicates that their confidence in their computing skills in computer fundamentals module increased after they completed the course. Therefore, the result seems to indicate the effectiveness of GFP after taking up the computer fundamental module.

Following are the summarized observations of Wilcoxon signed-rank test for all the computing modules.

Hypothesis 7

Table 7 : Wilcoxon signed-rank test data for all Computing Modules

Computing Modules	Subjects	Pretest Median	Post test Median	Pretest-Post test Mean Ranks		Z Value	p-Value
				Positive Ranks	Negative Ranks		
Computer Fundamentals	177	1	3	35.69	81.82	-9.757	<.001
Basic Computer Operations and File Management	177	1	3	26.58	82.19	-10.55	<.001
Microsoft Word	257	3	8	43.85	128.40	-13.32	<.001
Internet	175	1	3	34.58	83.18	-9.76	<.001
Power Point	483	1	5	47.75	233	-18.70	<.001
Excel	352	3	8	18	171.86	-15.98	<.001

H7: Majority of the students (>70 %) would show a significant increase in their performance in Computing courses at the end of the General Foundation Program.

Based on the summarized Table 7, it can be noted that there is a significant difference (z=-9.757 to -18.70, p<.001) between scores of tests conducted before teaching a module (Pretest) and after teaching the module (Post-test). The mean of the negative ranking is larger than the mean of the positive ranking for all the modules suggesting post test scores are larger than pretest scores. The students had a lower median score before they took the GFP course in computing. After they took the course, the same students had a higher median score. This indicates that

their confidence in their computing skills ability increased after they completed the course. Therefore, the result seems to indicate the effectiveness of GFP after taking up the course. Essentially there is considerable evidence supporting this hypothesis, ultimately confirming Hypothesis 7.

6 Limitations and Future Scope

The limitation of this research lies in the scope of the pre-foundation test, which evaluated only the essential learning outcomes addressed within the six computing modules. This restriction was required due to the time constraints of the placement test (pre-foundation test) administered by the University. To enhance the accuracy of the results, a broader pre-foundation test covering a more comprehensive range of learning outcomes would be advantageous.

Survey questions for gauging students' perception did not cover all the major learning outcomes for each module in sufficient detail. This has limited the depth of the comparison between participants' perceptions and their actual computing abilities. Similarly, the findings of the research may be specific to the cohort of General Foundation Program at National University of Science and Technology, limiting the generalizability of the results to broader populations or different educational settings.

The research solely focused on overall student's performance in all the computing modules. Detailed analysis of student's strengths and weaknesses in these modules was not done when they joined the foundation program. The vast amount of data collected during the research presents an opportunity for further investigation into the cohort's strengths and weaknesses before and after joining the Foundation program. This deeper understanding of pre-foundation test data can aid in refining lesson plans, identifying areas for improvement, and optimizing the curriculum to better meet students' needs. Analyzing post-foundation test scores can help in identifying achieved learning outcomes and areas requiring further attention. Additionally, it can give insights to enhance the future teaching strategies and curriculum.

The study examines the effectiveness of the General Foundation Program in enhancing students' computing abilities but overlooks variations in teaching methodologies and instructors' effectiveness. These factors could significantly impact students' learning outcomes and performance. Future research should consider these aspects for a more comprehensive evaluation of the program's effectiveness.

7 Conclusion

This study was set out to achieve two main goals: To investigate the students' perceptions about their computing abilities and to assess the effectiveness of the General Foundation Program at National University in enhancing their knowledge in various computing modules. Through the analysis of survey data, pre-foundation and post foundation test scores, we obtained useful insights into both aspects.

Firstly, our findings reveal that students hold a significantly high perception of their computing abilities, which aligns with the phenomenon known as the Dunning-Kruger effect- wherein individuals with limited skills overestimate their proficiency. Despite differences in individual skill levels, a significant number of students believed they had a strong level of proficiency in all the computing modules. This suggests a positive self-assessment bias among students regarding their computing abilities, potentially influenced by factors such as self-confidence and prior experience. However, it's crucial to acknowledge that students' self-perception of their abilities might not always align with their actual capabilities. Therefore, it's necessary to delve deeper into the factors influencing how students perceive their abilities.

Secondly, the results of the study highlight the remarkable effectiveness of the General Foundation Program at National University in fostering skill development among students across various computing modules. Through rigorous analysis of pre-foundation and post-foundation test scores, we observed a significant increase in students' knowledge levels for each module following their participation in the program. This indicates that the program has successfully met its objectives in imparting essential computing abilities and knowledge to the students.

In summary, this research has provided valuable insights into students' perceptions of their computing abilities and the program's effectiveness in enhancing their knowledge. While students generally have a positive perception

of their computing abilities, the program has been instrumental in equipping them with essential computing skills and knowledge. Addressing the limitations of the program and building on its strengths can further enhance its impact on students' learning outcomes. It also fosters continuous improvement in computing education initiatives, ensuring that students are well-prepared for the digital future. This effort aligns with Oman Vision 2040's aim of equipping all citizens with digital skills.

References

[1] Kim, H.-Y. (August 2014). Statistical notes for clinical researchers: Nonparametric statistical methods: 1. Nonparametric methods for comparing two groups. *Restorative Dentistry & Endodontics, 39*. doi:10.5395/rde.2014.39.3.235

[2] Abdullah, L., Amin, A., Mansor, N. R., & Maizura, N. (2011). First year students perceptions of their computer-related skills: A Preliminary Study. *Journal of Information Systems: New Paradigms, 1*. doi: ISSN: 2224-2465

[3] Alhabsi, R. S., & Alfawair, A. M. (2023). The Reality of Competitive Advantage in the Ministry of Education in the Sultanate of Oman in the Context of Oman Vision 2040. *International Journal of Membrane Science and Technology, 10*(3), 129-135. doi:10.15379/ijmst.v10i3.1733

[4] Berkman, E. T., & Reise, S. P. (2012). *A Conceptual Guide to Statistics Using SPSS.* Thousand Oaks: SAGE Publications, Inc. doi:https://doi.org/10.4135/9781506335254

[5] Bhaduri, S., & Matusovich, D. M. (2017 June). Student Perceptions on Learning - Inside and Outside Classrooms. *2017 American Society for Engineering Education (ASEE) Annual Conference & Exposition.* Columbus, Ohio. doi:10.18260/1-2--28868

[6] Carroll, M., Razvi, D., & Goodliffe, T. (2009). Using Foundation Program Academic Standards as a Quality Enhancement Tool. *INQAAHE CONFERENCE.* Abu Dhabi, UAE.

[7] Carroll, M., Razvi, S., Goodliffe, T., & AL-Habsi, F. (2009). Progress in developing a national quality management system for higher education in Oman. *Quality in Higher Education, 15*(1), 17–27. doi:https://doi.org/10.1080/13538320902731328

[8] Durango, A. M., & Refugio, C. (2018). *An Empirical Study on Wilcoxon Signed Rank Test.* doi:10.13140/RG.2.2.13996.51840

[9] Economic and Social Commission for Western Asia (ESCWA). (2016, November 15). *Digital Oman Strategy.* Retrieved from United Nations Economic and Social Commission for Western Asia: https://archive.unescwa.org/digital-oman-strategy#:~:text=Realizing%20His%20Majesty's%20grand%20vision,Digital%20Society%20and%20e%2Dgovernment.

[10] Grant, D. M., Malloy, A. D., & Murphy, M. C. (2009). A Comparison of Student Perceptions of their Computer Skills to their Actual Abilities. *Journal of Information Technology Education , 8*, 20.

[11] *How is Oman's digital strategy progressing?* (2015, April 15). Retrieved from World Economic Forum (WEF): https://www.weforum.org/agenda/2015/04/how-is-omans-digital-strategy-progressing/

[12] Kruger, J., & Dunning, D. (2000). Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments. *ournal of Personality and Social Psychology , 77*(6), 1121-34.

[13] *OAAAQA-General Foundation Programme Accreditation*. (2024). Retrieved January 26, 2024, from https://oaaaqa.gov.om/external-quality-assurance/general-foundation-programme-accreditation/?lang=en-GB#:~:text=The%20national%20Quality%20Plan%202006,Standards%20for%20General%20Foundation%20Programme

[14] Pawlicka, A., Tomaszewska, R., Krause, E., Jaroszewska-Choras, D., Pawlicki, M., & Choras, M. (2022). Has the pandemic made us more digitally literate? *Journal of Ambient Intelligence and Humanized Computing*, 1-11. doi:https://doi.org/10.1007/s12652-022-04371-1

[15] Ponto, J. (March-April 2015). Understanding and Evaluating Survey Research. *Journal of Advanced Practice Oncology, 6*(2), 168–171.

[16] Sari, M. K., & Yoni, E. (2021). The impacts of COVID-19 pandemic in terms of technology literacy usage on students' learning experience. *Jurnal Sosial Humaniora*, 43.

[17] Wallace , P., & Clariana , R. B. (2005). Perception versus Reality—Determining Business Students' Computer Literacy Skills and Need for Instruction in Information Concepts and Technology. *Journal of Information Technology Education , 4*, 11.

[18] York, R. O. (December 2016). *Statistics for Human Service Evaluation* (1 ed.). SAGE Publications, Inc.