Movement Science Report

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Introduction

This project was performed with Dr. Colleen Lewis and Dr. Christina Beaudoin from the movement science department in an effort to address the benefits, if any, of taking a FIT class at Grand Valley State University. The FIT courses offered at GVSU are one credit classes that students of all class standings may take. These classes are on a credit / no credit grading system. There are a wide range of FIT classes offered to students every year, including bowling, tennis, and scuba diving. There is a low barrier to taking these classes, meaning that there are no prerequisites and the fees associated with taking some courses are relatively low. Even though students of any class standing may take these classes, it is primarily taken by Freshmen. This is likely due to them already living on campus and not knowing many people coming into college, as this is a way for students to meet new people. Sophomores and Seniors tend to take it at comparable rates below Freshmen, followed by Juniors. However, hardly any Graduate level students take these classes.

Many Universities are deciding to cut these courses from being offered to students as there is not sufficient evidence, as of now, that there is a substantial benefit to taking these FIT courses. The results of this study may be used to argue for their value and reinstating them at institutions across the country.

The datasets obtained for this study contained records of every student from the 2018 fall semester through the 2023 fall semester. All of the students included in the datasets contained

either random id's or no type of identification attached to them to help with confidentiality. Some important variables to note from the datasets are *banterm*, *admittype*, *coursecnt*, *nocredit*, *ret1* through *ret5*, and *201910* through *202410*.

Table 1. Key Variables

Key Variables			
Variable Name	Description	Type	Class
banterm	The year and semester the student began taking classes.	Character	Character
admittype	Whether or not the student is a transfer student or first time in any college student.	Character	Character
coursecnt	The number of FIT classes taken their Freshman year of college.	Double	Numeric
nocredit	Indicates the number of FIT classes the student did not receive credit for, if any, that were taken.	Double	Numeric
graddate	The date in which the student graduated, if at all.	Double	Date
ret[n]	Whether or not the student either continued their education at Grand Valley State University or graduated after their [n]th year.	Double	Numeric
[yyyyss]	The GPA of the student in the semester identified by yyyy (academic year) and ss (10 = Fall, 20 = Winter, 30 = Summer).	Double	Numeric

The variable *banterm* indicates the academic year the student began at GVSU. For example, a *banterm* of *201910* indicates the fall semester of the 2018-2019 academic year. The variable *admittype* indicates the type of student this is, transfer student or first time in any college (FTIAC). The variable *coursecnt* indicates the number of FIT classes taken, if any, for that student during their first academic year at GVSU. The variable *nocredit* indicates the number of FIT classes, if any, the student took and did not receive credit for. The variables *ret1* through *ret5* indicate whether or not the student was retained through each year of their academic career at GVSU by either a 0 or 1. For example, a student that remained at GVSU for a second year has a 1 for the variable *ret1*, and so on. A student that graduates in their third year is given a

1 in all subsequent years as well indicating that the student has graduated. The *201910* through *202410* variables indicate the grade point average, GPA, of that student, on a four-point scale, for the corresponding academic year and semester. The year is given first followed by the semester, 10, 20, or 30 for the fall, winter, and spring/summer semesters, respectively. For example, *202020* indicates the GPA of a student during the winter semester of the 2019-2020 academic year.

The purpose of this research is to assess three main points of interest regarding the benefits of taking FIT classes. The first being whether or not a first-year student taking a FIT course influences retention rates into their second year at GVSU. The second being if taking a FIT course a student's first year changes their time to graduate. The last is whether or not a student's first year GPA was influenced by taking a fit class that year.

Methods

This analysis is an observational study based on data collected by the Institutional Analysis on students from GVSU. Records of all GVSU students who attended between the fall of 2018 and fall of 2023 are included within the two data sets provided. The population of students provided were used throughout the analysis.

The datasets provided by the clients were very clean and minimal data cleaning was needed. However, some new variables were created that were necessary for the analysis. The first of which was the creation of the *firstYearGPA* variable. This variable looked at the *banterm* variable, indicating the first academic year for the student being observed and took an average of the three semesters of their corresponding starting year, giving their average GPA for their first academic year at GVSU. The second variable created was the *fitClass* variable. This was a

categorical variable in which if *coursecnt* was equal to zero, a “No” was given to the student indicating that they did not take a FIT course their first year at GVSU, and if *coursecnt* was greater than zero, a “Yes" was given to the student indicating a FIT course was taken their first year. The next variable that was created was the *freshmanRetained* variable. A “No” was given to students where *ret1* was equal to 0, indicating that the student was not retained for a second year at GVSU, and a “Yes” was given to students where *ret1* was equal to 1, indicating that they were retained for a second year. The last variable created was the *Credit* variable. A “Yes” was given to students where the variable *nocredit* was equal to 0. This meant that this student took at least one FIT class and received credit for all FIT classes taken. A “No” was given to students that took at least one FIT class and did not receive credit for at least one of the FIT courses taken, given by when the variable *nocredit* was greater than or equal to 1.

After a simple analysis of the datasets, none of the variables were deemed as extreme outliers, so none of the observations were removed from either dataset. However, there were many missing values from the dataset. Many of the variables that contained missing values did not need to be addressed, as those observations were not critical. The variables of missing values that did need to be addressed includes *nocredit*, *graddate*, *deghrs*, *ret2*, *ret3*, *ret4*, *ret5*, and *201910* through *202410*. The number of missing values for the variable *nocredit* indicates that 17,330 students did not take any FIT classes, therefore are not considered for whether or not they received credit. The 16,594 students that have missing values for *graddate* and *deghrs* indicates that this many students either never graduated or are still working towards graduating. The missing values for *ret2*, *ret3*, *ret4*, and *ret5* indicate the number of students that did not return to GVSU after the corresponding year. The missing values for the *201910* through *202410* variables indicate that the student did not take any classes that semester of the corresponding year,

therefore there is no GPA given. This is very important to check, as it can heavily skew or misrepresent the sample or population, if extrapolated. These missing values were accounted for in the analysis, if possible. It is also important to note that no errors were identified in either dataset.

Results

The statistical package R Studio was used to address the three main objectives that the clients were interested in were, which includes whether a student taking a FIT class their first year at GVSU has an impact on retention rates into their second year, time to graduate, and first year GPA. This includes all of the data cleaning, generating of tables and graphs, as well as the statistical analysis.

The first test was targeted at the goal of finding a relationship between involvement in a FIT class and retention to a second year at GVSU. For this, we utilized the *coursecnt*, *nocredit*, and *ret1* variables. We began by grouping the data *coursecnt*; given that so few students took more than a single FIT class, we constructed only two groups. One group was those students who took no FIT classes, the other was those students who took one or more FIT classes. We created a third group by breaking up those who did take a FIT class into two separate groups. One group was those students who took one or more FIT classes, but did not receive credit. The other group was those students who did receive credit. We compared the proportion of students who were retained (i.e. a ret1 value of 1) across each of the three groups, lumping together all freshmen classes across all values of banterm. The groups consisted of the “no FITclass” group, the “FIT class/no credit” group, and the “FIT class/credit” group. As Figure 1 shows, 76% of those students who did not take a FIT class returned for a second year at GVSU.

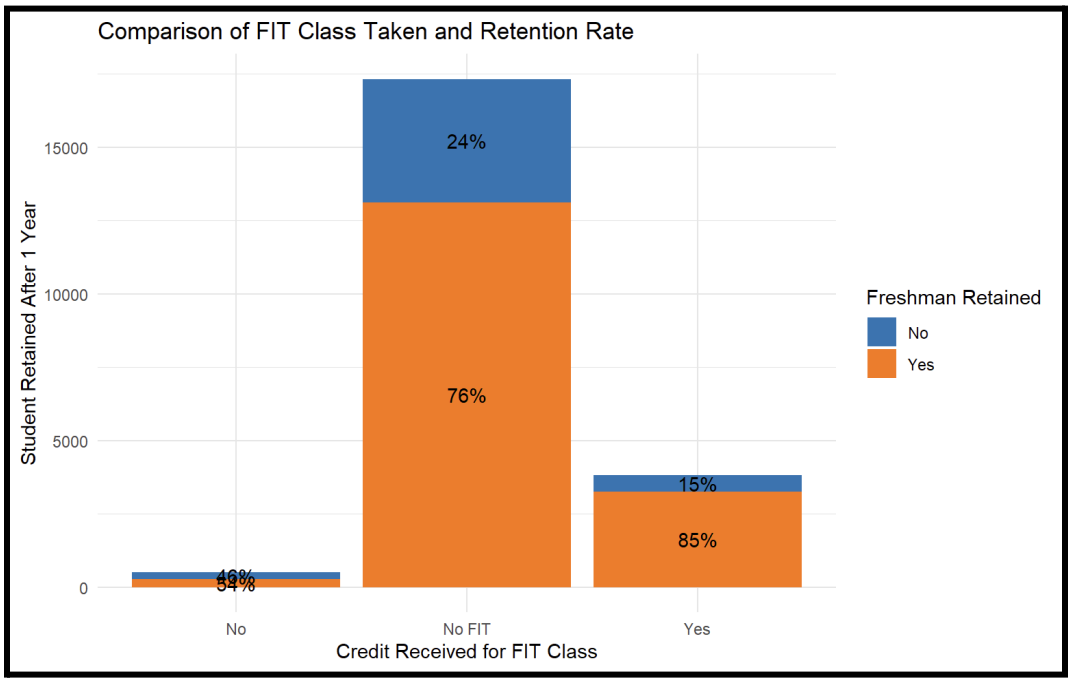

Figure 1. Comparison of FIT Class Take and Retention Rate

In contrast, 54% of those who take a FIT class and do not receive credit return, and 85% of those who take a FIT class and receive credit return for a second year. To test whether this difference was significant, we used a 2 sample test for equality of proportions, and compared the "no FIT class" and "FIT class/credit" groups. As Table 1 shows, with a p-value of < .0001, we conclude that the difference is significant.

Table 2. 2-sample test for equality of proportions

2 Sample Chi-Squared Test			
	df	X-Squared Statistic	P-Value
X-Squared	1	2.9753	<0.001

Upon confirmation that the proportion of students retained into their second year for these groups were different, we investigated whether this pattern was consistent for every year, not just overall. Figure 2 shows the difference in retention for the two groups (*fitclass* was not broken up into credit/no credit for visual clarity) across several years. These differences were not tested for significance. However, the pattern of the initial finding does seem to replicate every year.

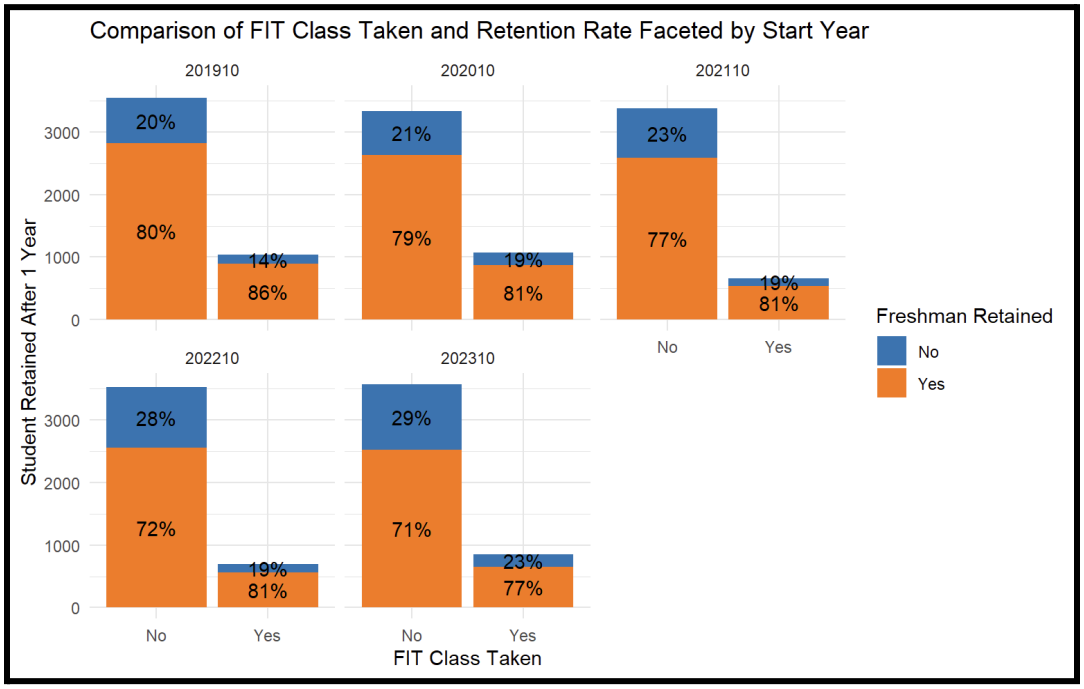

Figure 2. Comparison of FIT Class Take and Retention Rate Faceted by Start Year

The second test addressed the effect, if any, that taking a FIT class had on a student's time to graduate. For this test, a new variable had to be created which measured the elapsed time between a student's start date and their graduation date at GVSU. Start dates for each term were determined using previous GVSU-published academic calendars. The new start date and graddate were compared to find the time to graduate. This variable was in units of days, and was

divided by 365 to achieve the final variable: years taken to graduate. The data was grouped in the same manner as the first test, with the groups “no FIT class”, “FIT class/no credit”, and “FIT class/credit.” As Figure 3 shows, there is no apparent difference in time to graduate between those who did not take a FIT class and those who earned credit for a FIT class.

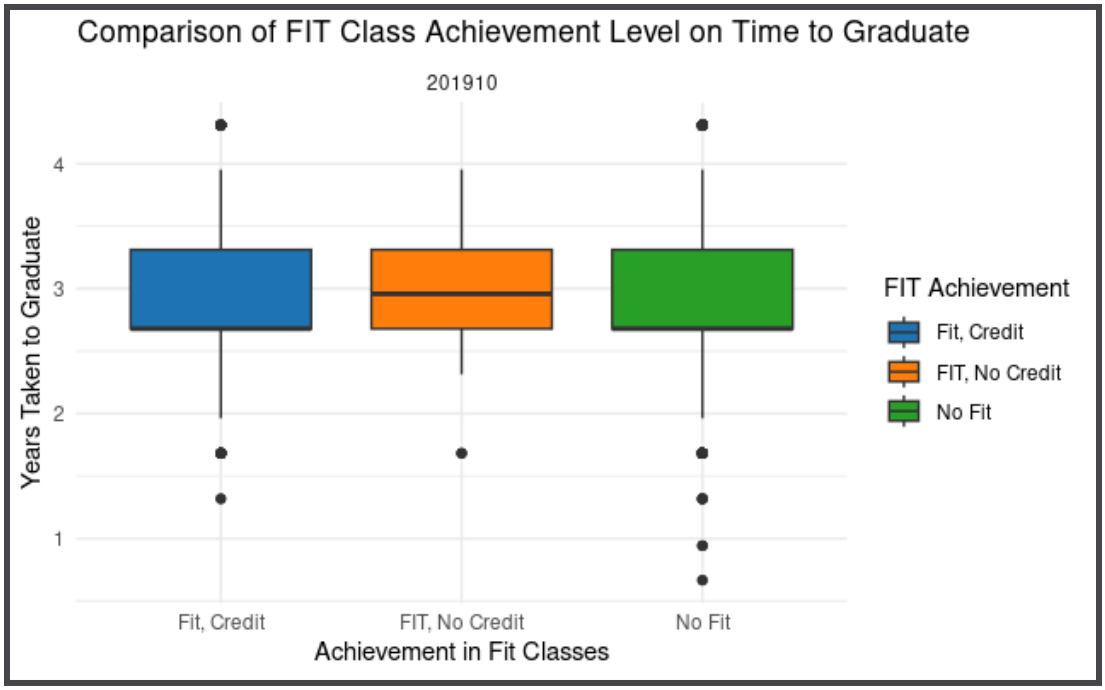

Figure 3. Comparison of FIT Class Achievement Level on Time to Graduate

A follow-up ANOVA was conducted to confirm this prediction. As Table 2 shows, the effect of fitclass was marginally significant related to time to graduate, although no strong conclusions can be drawn from this.

Table 3. ANOVA Table of Time to Graduate

Analysis of Variance Table					
TTGnumeric	df	Sum of Squares	Mean Squared	F-Value	P-Value
fitClass	1	0.76	0.7552	2.9753	0.0846
oncampus	1	3.46	3.4644	13.649	<0.001
firstgen	1	0.38	0.3786	1.4917	0.2220

The third test analyzed if there was an effect on first year GPA if the student took a FIT class that same year. This analysis began with the making of graphs to visually identify any trends in first year GPA as it relates to students taking FIT courses.

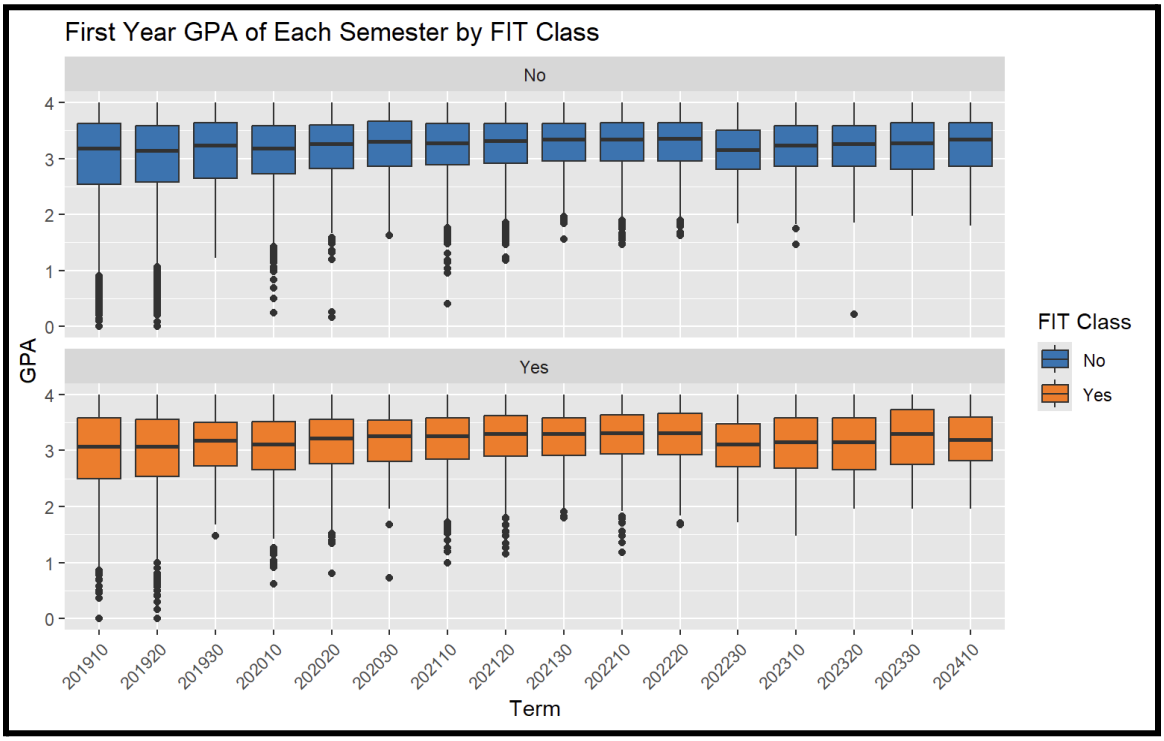

Figure 4. First Year GPA of Each Semester by FIT Class

The boxplots shown at the top in blue represent the students that did not take any kind of FIT class while the boxplots in orange show the students that took at least one FIT class their first year at GVSU. The students' GPA are given by the y-axis. It is clear to see that there is no distinct trend or difference between the GPA of students that took a FIT class over those that did not. To fully test the statistical significance that taking a FIT class has on first year GPA, an analysis of variance was performed with *firstYearGPA* as the response variable and *fitClass*, *oncampus*, and *firstgen* as the explanatory variables.

Table 4. ANOVA Table of First Year GPA

Analysis of Variance Table					
firstYearGPA	df	Sum of Squares	Mean Squared	F-Value	P-Value
fitClass	1	0.00	0.02	0.0246	0.8754
oncampus	1	136.00	136.05	159.4576	<0.001
firstgen	1	395.40	395.44	463.4898	<0.001

The most important results to note are the p-values and F-values. The explanatory variable *fitClass* has a p-value of 0.8754 indicating that there is not statistically significant evidence to suggest that *fitClass* has an effect on *firstYearGPA*. The *oncampus* and *firstgen* variables have very low p-values and high F-values, indicating that there is statistically significant evidence to suggest that there is a relationship between a student living on campus and an effect on first year GPA as well as there being a significant relationship between a student being a first generation college student and an effect on first year GPA. The difference in first year gpa can be seen further in Figure 5 where it is grouped by year.

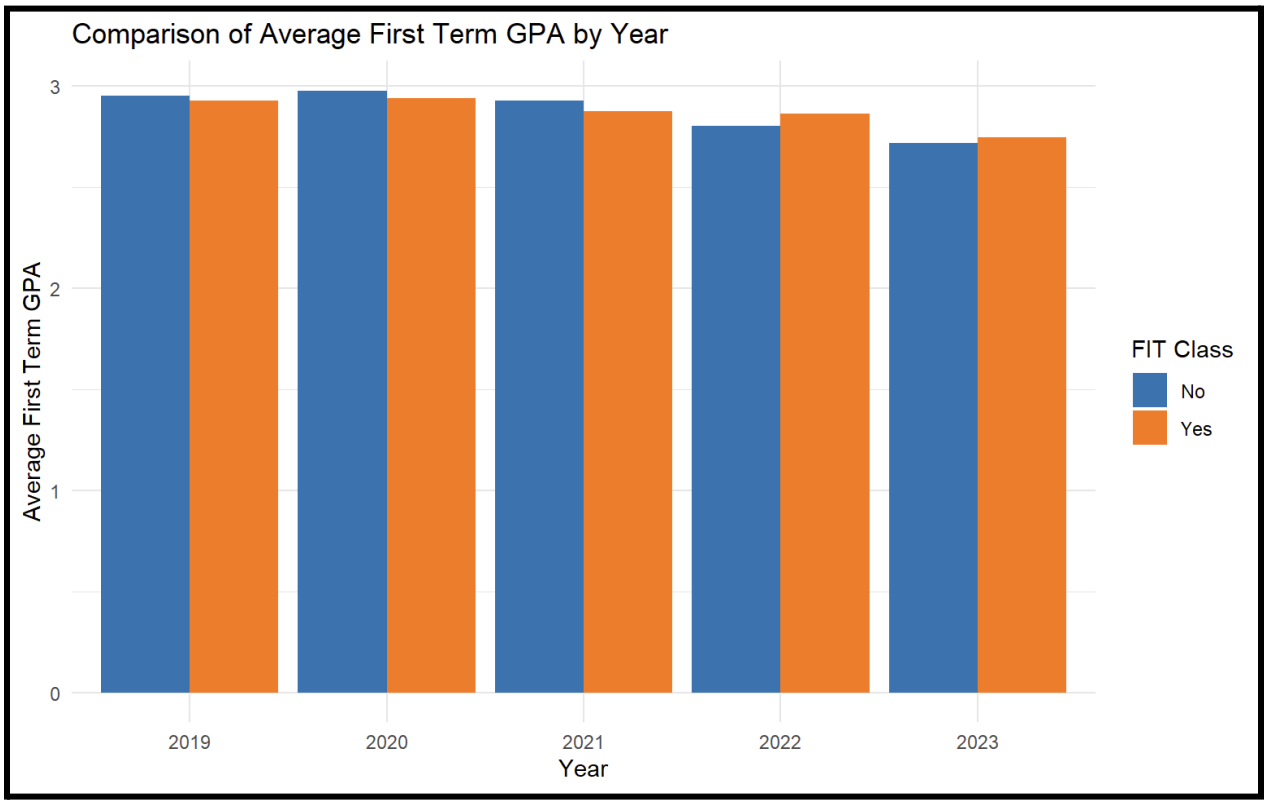

Figure 5. First Year GPA of Each Year by FIT Class

Where, again, the blue represents the students who did not take a FIT class their first year and the orange indicates that they did. The GPAs between the two groups are very comparable. In some years the GPA of students that did not take a FIT class were higher than those that did, and in other years, the opposite happened. However, one interesting thing to note about the graph in Figure 5 is that there has been a negative trend in first year GPA for all students in the last few years.

The relationship between level of success in FIT classes and markers of student success varies across different markers of interest. In our analysis we were interested in whether freshman students' average first year GPA, retention rate, and eventual time to graduate related to their level of success in FIT classes. Since FIT classes run as credit/no credit, we separate degrees of success into three groups: no FIT class, FIT class with no credit earned, and FIT class with credit earned. We found that success in FIT classes did relate to retention rate, but did not relate to first year gpa or time to graduate. This analysis offers support for the value that FIT courses offer first year students and Grand Valley State University as an institution.