iEducator

21st Century Digital Learning Corps

iEd Effectiveness

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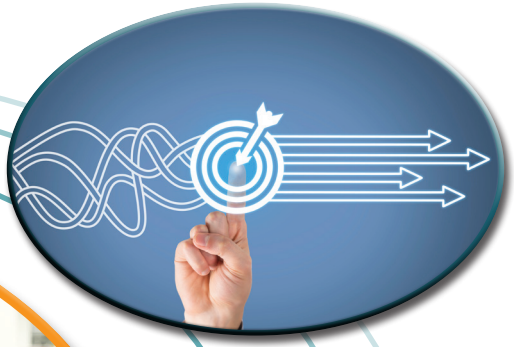

MICHIGAN VIRTUAL LEARNING
RESEARCH INSTITUTE

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About Michigan Virtual Learning Research Institute

In 2012, the Governor and Michigan Legislature passed legislation requiring *Michigan Virtual University*® (*MVU*®) to establish a center for online learning research and innovation, and through this center directed *MVU* to work on a variety of projects, The center, known formally as *Michigan Virtual Learning Research Institute*® (*MVLRI*®), is a natural extension of the work of *MVU*. Established in 1998, *MVU*'s mission is to advance K-12 education through digital learning, research, innovation, policy, and partnerships. Toward that end, the core strategies of *MVLRI* are:

- Research – Expand the K-12 online and blended learning knowledge base through high quality, high impact research;
- Policy – Inform local, state, and national public education policy strategies that reinforce and support online and blended learning opportunities for the K-12 community;
- Innovation – Experiment with new technologies and online learning models to foster expanded learning opportunities for K-12 students; and
- Networks – Develop human and web-based applications and infrastructures for sharing information and implementing K-12 online and blended learning best practices.

MVU dedicates a small number of staff members to *MVLRI* projects as well as augments its capacity through a Fellows program drawing from state and national experts in K-12 online learning from K-12 schooling, higher education, and private industry. These experts work alongside *MVU* staff to provide research, evaluation, and development expertise and support.

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Introduction

The mission of *MVU* is to "advance K-12 learning through digital learning, research, innovation, policy, and partnerships." With this mission in mind, *MVU* launched the iEducator (iEd) program in 2015, bringing together higher education, local school districts, and *MVU*, to propel forward not only digital education, but face-to-face education as well. At its core, the iEd program is a two-year digital teaching assignment with *MVU*. Beyond that, the iEd program involves ongoing professional learning, mentoring, and digital instruction experiences. In many ways, this is a novel professional development program for new online teachers; the novelty presents both opportunities and challenges to build an ideal professional learning program, one that meets the immediate needs of *MVU* as well as prepares the iEds to serve as digital learning leaders in traditional schools after they complete their two-year teaching assignment.

This report, part three in a series, analyzes the effectiveness of the iEds in their first year and part of their second year of teaching online for the *Michigan Virtual School (MVS)*. Of the 13 iEds, only two had previous experience teaching online (for one and two years respectively). Two of the iEds reported some experience teaching in blended settings, and nine reported no previous experience teaching online. Further, the nine iEds with no previous online teaching experience almost unanimously stated that they never considered online teaching as a possible career option prior to hearing about *MVS* and the iEd program. This group of teachers were novice online teachers going into their first year of the iEd experience.

Teaching is a demanding and difficult, yet rewarding profession. Teachers just out of their preparation programs, be it a Bachelor's, Master's, or other path of preparation, face high expectations and sometimes encounter situations for which they were not well prepared. While it no longer holds true that half of all beginning teachers leave the field within 5 years (Gray & Taie, 2015), a substantial number of teachers still leave within that time period, resulting in both significant time and financial burdens on the districts and schools they leave behind.

For example, Gray and Taie (2015) conducted a longitudinal analysis of the 5 years of data from 2007–08 through 2011–12 for public school teachers who began teaching at least one regularly scheduled class in the 2007–08 school year. Among those beginning teachers, the percentage of those who did not teach increased over the study years, from 10% in 2008–09, to 12% in 2009–10, 15% in 2010–11, and 17% in 2011–12. One of the larger discrepancies in retention was among first-year teachers who were given an experienced mentor: 86% were still teaching after 5 years compared to 71% who were not assigned a mentor. Using their own metric, The New Teacher Project (TNTP, 2013) also found that not all new teachers struggle; in fact, quite the opposite is true, with some starting as what they classified as "high-achievers" who continue to be "high-achievers" in subsequent years.

TNTP also found that those teachers who struggle or perform poorly in their first year rarely show dramatic improvements in their subsequent years. They concluded that "teachers who make a strong start are much more likely to become and remain strong educators over time."[1] The

[1] http://media.mivu.org/institute/pdf/iEd_1.pdf

relatively high overall retention of teachers over 5 years suggests that many teachers are entering the profession well-prepared; however, the significant disparity between the performance or persistence of those teachers who were provided a mentor and others who were not suggests that even well-prepared teachers benefit from having both professional supports and networks.

The first years of teaching present unexpected challenges to new teachers, evidenced by the 17% attrition rate after five years; however, teachers who begin their careers teaching online face an additional challenge of teaching in a context for which they may not have been well prepared. A recent study out of our Institute found that only 4.1% of teacher preparation programs (up from 1.3% since their 2012 study - see Kennedy and Archambault, 2012) are providing field experience opportunities in online teaching and learning to preservice teachers (Archambault, et al., 2016). Despite the growth in preparation opportunities for preservice teachers, the movement for online teacher readiness is slow going. Teachers new to online teaching at the K–12 level are typically trained by the online school or program where they are hired (Kennedy & Archambault, 2012). As many have found at both the K-12 and higher education level, online teaching requires a different skill set to traditional teaching (Archambault, 2011). Baran, Correia, and Thompson (2011) in a review of literature on the roles and competencies of online teachers at the higher education level concluded that teachers with little experience teaching online tend to transfer practices, at times ineffective ones, to their online classrooms. This creates a tension between the strategies that teachers are using and the unique pedagogies required by the online context. Baran et al. suggest that one of the most fundamental changes between face-to-face and online teaching is the nature of the interaction between student and teacher, a change that requires teachers to use different and innovative strategies to facilitate and support student learning. These new strategies may not be intuitive to all new online teachers, and as such, new online teachers and their students may struggle during the adjustment period. MVU, through its iEd program, attempted to mitigate as much as possible this adjustment period through extensive preparation prior to the start of teaching online, as well as to support new online teachers through regular professional development and the assignment of an experienced mentor teacher (see iEducator 21st Century Digital Learning Corps: Program Design and Reflection for more about this[2]).

While we don't yet have five-year longitudinal data to see whether iEds stay in the profession at similar rates to teachers nationally, we do have student performance data that can tell us whether students in courses taught by iEds performed at similar rates to those in courses taught by experienced online teachers. The work by TNTP suggests that teachers who perform well in their first year continue to do so while those who struggle often fail to catch up. While student performance is only a single indicator of teacher effectiveness, it is an important one and one that can be compared easily between novice and experienced teachers.

Methods

This formative evaluation was performed in the middle of the 2016-17 academic year (spring semester). The current analyses focus on enrollments for the entire 2015-16 academic year and only on those during the fall season for the 2016-17 academic year, which includes the fall semester

[2] http://media.mivu.org/institute/pdf/iEd_1.pdf

and trimester 1. The variable of instructor position type was used to specify four categories: lead instructor, full-time instructor, part-time instructor, and iEd. (The primary difference between full-time and lead instructors, is the additional roles lead instructors are expected to fill: they often collaborate with course development teams as subject content experts and also with colleagues as mentors.)

Some enrollment records showed multiple instructors (including iEds) were involved in the same course, mainly due to co-teaching, vacation, maternity leave, or other extended absences. In those instances, an instructor's unique identifying (ID) number and position type were re-coded for each enrollment record in which multiple instructors were involved. For example, a combination of instructor A and B was assigned a new instructor ID number and placed in a "multiple instructors" category for the instructor-type variable.

To gauge effectiveness, the current analyses centered on trends in instructor caseloads, student course completion status, and student course grades across the four academic terms since the iEd program launched. Results for the first full year and part of the second year were used to illustrate differences among iEds and other instructor groups and also to identify differences in iEds' performance over time. Specific analytic approaches are presented in the Results sections with findings.

Results

Fall 2015 Academic Term

For the academic term when iEds started the program, the final dataset contained 9,803 student enrollment records after removing audit enrollments (those not taking the course for credit) from the analysis.

Table 1 presents the number of instructors included in the study and their average caseloads. Note that the total number of instructors does not correspond to the headcount of instructors who actually taught classes during the particular academic term. This is because of the unique coding scheme by which each enrollment with multiple instructors was assigned a new instructor ID code.

Table 1. Teaching Assignments by Instructor Type Fall 2015-16

Instructor Type	# of Instructors	# of Enrollments	Avg. Caseload
Lead	6	847	141
Full-time	10	1,937	194
iEd	13	1,566	120
Part-time	133	5,041	38
Multiple[1]	11	412	37
Total	**--**	**9,803**	**--**

Note 1: The statistics for specific combinations are as follows: Full-time + iEd (192), Full-time + Part-time (66), and the program for Chinese classes developed by Confucius Institute at Michigan State University (CI-MS) and offered by MVS (154).

The largest caseload was found in the full-time instructor group (194), followed by the lead instructor group (141). Each iEd appeared to be assigned 120 enrollments during the fall semester.

Completion and pass rates were explored as outcomes of students who received instruction from each instructor group. Completion rate was established by finding the proportion of completed (pass or fail) enrollment records out of the total number of enrollment records (total number would include cases such as withdraws and drops). The pass rate was calculated by dividing the percentage of enrollments earning 60% or more of the total course points (Completed/Passed) by the total number of enrollment records. Table 2 presents completion and rate statistics by the instructor group.

Table 2. Course Completion Status by Instructor Type Fall 2015-16

Instructor Type	# of Withdrawn	Completion Rate	# of Completed /Failed	# of Completed /Passed	Pass Rate	Total
Lead	16	98%	105	726	86%	847
Full-time	27	99%	264	1,646	85%	1,937
iEd	35	98%	239	1,292	83%	1,566
Part-time	69	99%	708	4,264	85%	5,041
Multiple	7	98%	61	344	83%	412
Total	**154**	**98%**	**1,377**	**8,272**	**84%**	**9,803**

Looking at the data from the perspective of completion and pass rates, full- and part-time instructor groups have the highest completion rate while the lead-instructor group shows the highest pass rate. The iEd group indicates one percent point lower in completion rate and three percent points lower in pass rate than the groups with the highest level results, suggesting that students who were taught by the iEd showed a lower level of outcomes by a narrow margin. Note that those results are within the context of the iEd caseload of 120 (see Table 1).

The second type of student outcomes is the course grade. Table 3 summarizes averages and standard deviations of course grades by instructor group. As average is sensitive to extreme values, median scores were also included in the table.

Table 3. Descriptive Statistics of Course Grade by Instructor Type Fall 2015-16

Instructor Type	Average	Standard Deviation	Median
Lead	80	24	89
Full-time	78	24	86
iEd	76	25	85
Part-time	78	25	88
Multiple	77	23	85
Total	**78**	**24**	--

The lead instructor group has the highest level of student outcomes from the perspective of student course grades. Of note, a descriptive difference in course grades among instructor groups was found, indicating a low average and median for the students who were taught by the iEd group.

As a descriptive gap between iEd and other groups was found, follow-up statistical tests were performed to determine if any descriptive difference was statistically significant. The data violated

the assumption of normal distribution so that the Kruskal-Wallis H test was chosen for the nonparametric analysis. The unit of analysis was the enrollment level, and the sample size was relatively large. For those reasons, we used a low significance level (alpha at 0.001) rather than the conventional level (alpha at 0.05) for the hypothesis test. The Kruskal-Wallis H analysis is used to test differences among three or more groups as a whole or, in the case of this study, all five instructor categories. In cases where a significant group difference was found from the Kruskal-Wallis H, each pair of instructor types was examined by a series of Mann-Whitney U tests to find which instructor group showed a difference in student course grade in comparison with the iEd group. Note that the study focused on the iEd group (i.e., its effectiveness as illustrated in the outcomes of students who received instruction from them) so that all pairs were constructed with the iEds as the reference.

A Kruskal-Wallis H test showed that there was a statistically significant difference among the five groups (x^2 [DF=4] = 52.031, p = 0.0001). With the results from the five-group-test, each pairwise test was conducted, suggesting that the higher median for two groups of lead instructors (z = 5.907, p = 0.0000) and part-time instructors (z = 5.843, p = 0.0000) in comparison to the iEd group was statistically significant. The significant difference between iEd and part-time groups must be interpreted with caution while taking into consideration a gap in average caseloads between the two groups (iEd = Avg. 120; Part-time = Avg. 38). At the alpha level of 0.001, median scores for full-time (z = 3.217) and multiple instructor (z = 0.340) groups are not statistically different from those for the iEd group.

Taken together in the first semester since the iEd program launched, iEds shouldered the caseload of 120 enrollments, on average. In that context, we found the student outcomes for the iEd group were statistically lower than the lead instructor group. However, the iEds and full-time instructors appear to perform on par with one another. Since the reference group in all follow-up analyses was the iEd instructor group, we cannot make any claims about the student outcome comparison between lead, full-, or part-time instructor groups.

Spring 2016 Academic Term

Spring semester data contained 12,134 enrollment records. Using the same methods as were used to examine fall semester, we explored instructors' caseloads and also compared their student outcome with the iEd group. Table 4 summarizes the instructor caseload.

Table 4. Teaching Assignments by Instructor Type Spring 2015-16

Instructor Type	# of Instructors	# of Enrollments	Avg. Caseload
Lead	6	851	142
Full-time	11	1,901	173
iEd	13	2,143	165
Part-time	136	6,783	50
Multiple[1]	16	456	29
Total		**12,134**	--

Note 1: The statistics of specific combinations are as follow: Multiple Full-time (134), Full-time + Part-time (165), multiple Part-time (19), and CI-MS (138).

In the spring semester, the full-time instructor group had the largest caseload once again but show a decrease compared to fall semester (from 194 to 173 enrollments). It is notable that the iEds' average case load increased by 45 enrollments from fall (120) to spring (165) term, reaching a level comparable to that of the full-time instructor group.

Table 5 summarizes course outcomes such as completion rate and pass rate by instructor type during the 2015-16 spring academic term.

Table 5. Course Completion Status by Instructor Type Spring 2015-16

Instructor Type	# of Withdrawn	Completion Rate	# of Completed /Failed	# of Completed /Passed	Pass Rate	Total
Lead	6	99%	93	752	88%	**851**
Full-time	13	99%	283	1,605	84%	**1,901**
iEd	24	99%	304	1,815	85%	**2,143**
Part-time	56	99%	908	5,819	86%	**6,783**
Multiple	3	99%	56	397	87%	**456**
Total	**102**	**99%**	**1,644**	**10,388**	**86%**	**12,134**

There is no difference in course completion rates among the five instructor types. When it comes to pass rate, the lead instructor group appears to show the highest level. Despite the increased caseload, iEds had a higher pass rate in the spring (85%) than in the fall (83%). Once again, a slightly lower pass rate for the iEd group (84%) than other instructor groups, in particular than the lead instructor group (88%), was found, following the trend set during the fall term.

Table 6 reports another aspect of student outcomes: the student course grade with its average, standard deviation, and median. Median was added because the average tended to be sensitive to skewed data and the final statistical tests were based on median scores.

Table 6. Descriptive Statistics of Course Grade by Instructor Type Spring 2015-16

Instructor Type	Average	Standard Deviation	Median
Lead	80	23	88
Full-time	76	25	84
iEd	77	24	85
Part-time	78	24	88
Multiple	79	24	88
Total	**78**	**24**	**--**

From both descriptive statistics of average and median, the iEd group is no longer the lowest in the student performance.

The group difference test reconfirmed the statistically equivalent median score for the full-time (Full vs. z = -1.668) and multiple (Multiple vs. z = 2.763) instructor groups, but different student outcomes favoring lead and part-time instructor groups (x^2 [DF=4] = 69.399, p = 0.0001; Lead vs. z = 3.527, p = 0.0004; and Part vs. z = 5.220, p = 0.0000), in comparison with the iEd group.

Combining findings from fall and spring semester analyses revealed that iEd program participants started the first semester with a caseload of 120 and show lower performance in student outcomes, especially in comparison with the lead instructor group. For the second semester, with an increase in caseload by (on average) 21 enrollments, the lower performance in comparison with the lead instructor remained.

Summer 2016 Academic Term

Summer data contained 2,373 enrollment records. Of note, the number of instructors who taught summer courses decreased when compared with regular semesters. Table 7 presents the summer-specific caseloads, including the reduced instructor numbers.

Table 7. Teaching Assignments by Instructor Type Summer 2015-16

Instructor Type	# of Instructors	# of Enrollments	Avg. Caseload
Lead	5	230	77
Full-time	9	455	51
iEd	12	541	45
Part-time	52	975	19
Multiple[1]	4	172	43
Total	**--**	**2,373**	

Note 1: The statistics of specific combinations are as follow: Full-time + iEd (80), Part-time + iEd (40), and Lead + iEd (52).

Overall, the average caseload decreased; in all cases of the multiple instructor group, iEds were involved. As such, iEds appear to make a considerable contribution to *MVU*'s summer course offerings.

Table 8 reports student course completion and pass rates during the summer semester.

Table 8. Course Completion Status by Instructor Type Summer 2015-16

Instructor Type	# of Withdrawn	Completion Rate	# of Completed /Failed	# of Completed/ Passed	Pass Rate	Total
Lead	4	98%	26	200	87%	230
Full-time	24	95%	83	348	76%	455
iEd	15	97%	56	470	87%	541
Part-time	24	98%	142	809	83%	975
Multiple	2	99%	42	128	74%	172
Total	**69**	**97%**	**349**	**1,955**	**82%**	**2,373**

The course completion rate for the iEd group is 2 percentage points greater than the full-time instructor group, and the highest level is found in the multiple category where iEds were involved in any combination (see Note 1 in Table 7). When it comes to the pass rate, the iEd group has the highest level.

Table 9 presents course grade by instructor group for the summer semester.

Table 9. Descriptive Statistics of Course Grade by Instructor Type Summer 2015-16

Instructor Type	Average	Standard Deviation	Median
Lead	80	26	90
Full-time	74	31	87
iEd	80	25	90
Part-time	79	27	91
Multiple	74	30	89
Total	**78**	**28**	**--**

Within the context of summer-specific case assignments, the iEd group no longer holds the lowest level among instructor groups in terms of the student course grade. Rather, we found descriptive differences in final scores between instructor groups with the groups of lead instructor and iEds at the highest level.

To determine whether or not those descriptive differences favoring the lead and iEd groups were statistically significant, the Kruskal-Wallis H test was performed. We found there was no statistical difference in median scores of student final scores among the five instructor groups at the alpha level of 0.001(x^2 [DF=4] =14.264). That is to say, all instructor groups were equally effective during the summer semester. Note that since the five-group test resulted in no significant difference, there is no need for a series of two-group tests.

Fall 2016-17 Academic Term

The fall of the 2016-17 year marks the first term of the iEd program's second year. There were 10,392 enrollment records in the dataset. Table 10 presents the number of instructors and the average caseload by instructor group. Of note, the number of full-time instructors consistently increased throughout the three regular academic terms: 10 in the fall 2015-16 year, 11 in the spring 2015-16, and 13 in the fall 2016-17.

Table 10. Teaching Assignments by Instructor Type Fall 2016-17

Instructor Type	# of Instructors	# of Enrollments	Avg. Caseload
Lead	6	597	100
Full-time	13	2,358	181
iEd	13	1,511	116
Part-time	129	5,467	42
Multiple[1]	10	398	40
Pilot[2]	1	61	--
Total	**--**	**10,392**	**--**

Note 1: The statistics of specific combinations are as follow: iEd + iEd (19); iEd + Part-time (156); and CI-MSU (223).
Note2: Pilot is a pilot program led by the product development team (iPD) and involved one instructor for the Astronomy course.

Overall, caseloads decreased for the lead, full-time, and iEd groups in comparison with the fall 2015 academic term with an increase in the number of full-time instructors. iEds shouldered their

caseload (116 enrollments) at a level similar to what they did in the fall 2015-16 year (120) when the program launched. Table 11 introduces instructors' performance results using their students' course completion and pass rates.

Table 11. Course Completion Status by Instructor Type Fall 2016-17

Instructor Type	# of Withdrawn	Completion Rate	# of Completed /Failed	# of Completed/ Passed	Pass Rate	Total
Lead	10	98%	71	51	86%	**597**
Full-time	2	99%	392	1,942	82%	**2,358**
iEd	39	97%	229	1,243	82%	**1,511**
Part-time	95	98%	953	4,419	81%	**5,467**
Multiple	10	97%	47	341	86%	**398**
Pilot	1	98%	7	53	87%	**61**
Total	**179**	**98%**	**1,699**	**8,514**	**82%**	**10,392**

The full-time instructor group shows the highest level of completion rate, and the iEd group shows a 2-point gap from that. Except for the one instructor case in the pilot program, the lead instructor group again has the highest pass rate, and the iEd group shows a 4-point gap from that rate.

Another aspect of student outcomes – the course grade – was explored. Table 12 summarizes the results. Note that the enrollment records from the pilot were excluded from the analysis.

Table 12. Descriptive Statistics of Course Grade by Instructor Fall 2016-17

Instructor Type	Average	Standard Deviation	Median
Lead	80	22	87
Full-time	75	26	86
iEd	76	25	85
Part-time	76	27	87
Multiple	81	22	90
Total	**76**	**26**	

Comparing the averages, the iEd group is no longer at the lowest level. We also found the median scores for four instructor groups, including lead, full-time, part-time, and iEd, to be close.

To determine whether or not descriptive group differences in student outcomes were statistically significant, the Kruskal-Wallis H test was performed; the results indicated a group difference (x^2 [DF=4] = 37.347) among the five instructor categories. In an attempt to understand the potential source of that group difference, a series of Mann-Whitney U tests was conducted for each instructor group versus the iEd group. It has been found that there was no significant difference in the median scores of final scores between lead (z = 2.558), full-time (z = 0.266), or part-time groups (z = 2.598) versus the iEd group, at the alpha level of 0.001. The statistic test for the multiple instructor category versus the iEd category is significant with z = 5.256 (p = 0.000).

The findings for the fall 2016-17 year has led to the following general observation: from the perspective of student final scores, the iEd group has consistently shown a gap between the most effective instructor group, the lead instructor group, but that gap became statistically non-significant in the fall semester after the program's one-year implementation period. Accordingly, the results of this study should be considered as empirical evidence to substantiate the effectiveness of iEd program.

Discussion & Implications

Teachers' early years are important as their attitudes, perceptions, and beliefs from formative years tend to carry over their entire career (Ingersoll & Strong, 2011). Unpacking previous experiences can help to make space for and enhance new experiences (Dana & Silva, 2003). Those desired outcomes have the potential to be achieved by well-planned programs that "encompass hiring procedures, protected initial assignments, steady provision of mentor and other support, and improved evaluation to help novices" (Darling-Hammonds & Sykes, 2003, p. 34). *MVU*'s iEd program is deemed as exhibiting those concepts in the arena of K-12 online education. For example, the program began with careful hiring procedures and protected initial assignments. Furthermore, support systems were incorporated through various professional development activities that were framed by the concept of communities of practice. Finally, *MVU* maintained ongoing evaluation to facilitate its learning from and continuous improvement in the iEd program. Thus this report presents results from informative evaluation using student learning outcomes.

In the fall semester of the 2015-16 academic year, iEd participants started the program with a slightly lower caseload than the full-time or lead instructors. The pass rate of students they taught was two or three percentage points lower than their counterparts at the full-time base position. Additionally, it was found that the differences in student course grades favoring position types other than iEd was statistically significant. All results of the first semester since the program launched offer an insight into new entrants' needs for iEd program supports intended to promote the use of effective practices. Results of the fall semester 2016-17 resonate with both novice instructors' growth under the supports by communities of practice and the induction program's success in the various contexts of the K-12 online environment. As a result of program supports and *MVU's* efforts to improve teaching assignment practice, with a similar level of caseload seen in the fall 2015-16 semester, there was no statistically significant difference in course grades of students taught by iEd participants in comparison with full-time, part-time, or lead instructors.

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