

An international comparison of the effect of work-integrated learning on academic performance: A statistical evaluation of WIL in Japan and Hong Kong

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As the popularity of work-integrated learning (WIL) grows, there is a need for standard and more quantitative methods for evaluating the features of WIL over time as well as between different institutions and over national frontiers. Regression analyses examined WIL's effects on academic performance in the final year of university from data obtained in Japan (2008, 2009, and 2010 graduates) and Hong Kong (2010 graduates). Independent variables included first year GPA, gender, and faculty/school membership. While the WIL systems differed in the two different institutions, both displayed some effects of WIL on final year GPA – Japan for 2008 and 2009, but not 2010 (student participation versus none). For the Hong Kong sample, final year GPA related to the learning outcomes reported by students from their WIL experiences. The results are discussed in terms of the connections between academic learning and WIL, and potential implications for international comparative research. (*Asia-Pacific Journal of Cooperative Education*, 2012(2), 77-88)

Keywords: international comparisons, academic performance, links between WIL and academic learning, statistical evaluation.

As the popularity of work-integrated learning (WIL) grows, there is a need for standard and more quantitative methods for evaluating the features of WIL over time as well as between different institutions and over national frontiers. Several papers have appeared in the recent WACE conferences to deal with the quantitative assessments of WIL such as Green (2009), Matsutaka, Tanaka, and Churton (2009), Carlson and Kwan (2010), Mendez (2010), and Tanaka and Matsutaka (2010). All of these studies – of a wide spectrum of sample sizes – utilized regression analysis as a tool to examine WIL's effects on students. Matsutaka et al. (2009) examined students' academic and employment outcomes. Carlson and Kwan (2010) investigated the effects of WIL on learning outcomes. Green (2009) and Mendez (2010) investigated the effect of work placement on academic performance. Despite the sample size variations and international/regional difference, they all concluded via regression analyses that WIL acted as a positive factor in determining academic and non-academic outcomes.

However, comparing studies of such a variation requires extra caution before accepting the result. Three aspects that require particularly careful considerations are the measurement of academic outcome, the features of WIL being examined, and a statistical method with its data specification. In terms of academic outcomes, probably the most popular index is Grade Point Average (GPA). However, some studies also include measurements such as honour degree system, i.e. first, upper and lower second, third, and so on, or a straightforward 1-100 point system for each subject to obtain the average 1-100 point assessment. The number of subjects and corresponding teaching hours for each subject that counts towards the degree may also vary among different institutions and countries.

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In regards to the features of WIL, its definition and nature varies largely among institutions – from cooperative education, sandwich courses, placements, internships, and so on. Groenewald, Drysdale, Chiupka, and Johnson (2011) appropriately describes WIL as an “umbrella term for those activities” mentioned above and as any programme consisting of “theoreticum” at university, “practicum” at workplace, and the interaction of these two. When comparing WIL and its factors and effects among institutions and between cultural settings, it is important for researchers to note such differences such as voluntary versus mandatory participation, as well as the intensity of the programmes (e.g., number of hours/time in the work setting), when interpreting the results – knowing that such factors cannot be statistically controlled or compared across contexts.

A choice of statistical method with its data specification varies among the researchers. Some utilize the subjective response of students (Heller & Heinemann, 1987) or of academic staff members (Zegwaard & McCurdy, 2008) measured by ordinal data such as 1 ~ 5 ranking, while others use more objective measures such as academic results (Duignan, 2003 ; Green, 2009 ; Gomez, Lush, and Clements, 2004 ; Mandilaras, 2004) measured by cardinal data of academic marks. The analytical framework also varies. Some use a more intuitive approach of observing the table of ratings (Hartley & Smith, 2000), while others use more statistically rigorous approaches such as Chi ² test (Heller & Heinemann, 1987), t test (Duignan, 2003), Analysis of Variance (van Gyn, Cutt, Loken, and Ricks, 1997) , or Regression analysis (Green, 2009 ; Mendez, 2010). It is worth noting that among these, Regression analysis, which is also used in the present paper, allows for more complex analyses among a set of factors influencing the outcome.

Our study demonstrates that meaningful comparisons can be made in spite of differences in such institutional features of WIL and evaluation data. A regression analysis is employed to statistically analyze several thousand panel data of students graduating in 2008, 2009, and 2010 from Kyoto Sangyo University (KSU) and in 2010 from The Hong Kong Polytechnic University (PolyU). Because WIL is organized differently in these institutions, straightforward comparisons between them about the effect of WIL are difficult. WIL at KSU is optional, while it is mandatory at PolyU. The KSU sample can be used to determine the effect of WIL through comparing students doing WIL and those who do not. In the case of PolyU’s mandatory WIL, the appropriate approach for examining the effects of WIL are via individual differences in the WIL experiences (such as differential learning outcomes, different WIL contexts and support).

Overall, it is also expected that this statistical framework can be applied to assess WIL programmes in other institutions and countries and that analysing the KSU and PolyU programmes serves as useful tool to learn more about the processes, support, and outcomes of programmes in different institutional and national contexts.

HYPOTHESES AND EVALUATION METHOD

The main theme of this paper is to determine the effects of WIL on students’ academic performance during undergraduate years. Therefore, our first hypothesis is:

Hypothesis 1: WIL is associated with increased final year GPA.

Previous studies have found a positive effect of WIL on student academic performance (Gomez, Lush, & Clements, 2004; Mandilaras, 2004). Often, the influence of WIL on academic performance is explained in terms of soft skills such as time management and organizational strategies that are acquired through the work experience. However, the possibility of conceptual and real-world linkages provided by WIL is often ignored in this literature base.

Even if we can prove a strong association between WIL and academic performance by, for example, comparing whether or not a student takes WIL and his/her GPA, sceptics may argue that those students with WIL were good academic performers in the first place, thereby negating the positive effect of WIL on the academic performance, i.e. good students do take WIL as well as achieving high GPA. In order to tackle this issue, we introduce the second hypothesis.

Hypothesis 2: Pre-university grade is associated with increased final year GPA.

It is conceivable that there would be various attributes in freshmen (e.g., academic background, motivation, etc.) that would eventually influence their academic performance at university. More specifically, the pre-university grades could produce a positive effect on the final year GPA. Considering the two hypotheses together suggests that the key issue is whether WIL has any added value beyond these components captured by pre-university grades. A regression analysis will allow us to disentangle these components and see the unique contribution of WIL beyond the pre-university attribute.

If a regression shows a significant and positive effect of WIL on final year GPA, (i.e. Hypothesis 1 is accepted) this would imply WIL is a clear indicator of a competent student upon graduation. Furthermore, if the pre-university grade has no significant effect on the final year GPA, (i.e. Hypothesis 2 is not accepted) we may conclude that the academic competence was achieved through WIL and working hard at university rather than as a result of the pre-university attributes.

Using the KSU and PolyU data, multiple regressions were run to observe the effect on the final year GPA of WIL and pre-university grade to verify the hypotheses above. The variable used for final year GPA is that of the third year GPA grade in both institutions; for PolyU it is indeed the final year, while for KSU the final year is the fourth year. For KSU, third year GPA is used for two reasons. First, the Japanese graduate employment environment requires students to start job hunting by the end of the third year, so that the fourth year grade cannot be an appropriate indicator of their academic level. Secondly, the final year GPA is used instead of overall GPA as early years' grades may be related to pre-university grade. As for the pre-university grade, first year GPA is used, since there is no reliable standard measure in the Japanese educational system such as a national examination.

DATA

Case 1: Kyoto Sangyo University (KSU)

Kyoto Sangyo University was founded in 1965 and is a medium sized private university in Japan with over 13,000 students among seven faculties (Economics, Business, Law, Foreign Languages, Culture, Science, and Engineering). Since 1999, KSU has been offering its students a range of career education courses in relation to domestic internships. But a significant step was taken when the government approved and funded our new project on

career education in 2004 and the Centre of Research and Development for Career Education was set up. Since then, the programme has expanded and as of 2009 there are 20 courses. Of the 20 courses, 11 are work-integrated learning courses such as “Internships 1-6” and “On/off campus fusion,” in which students have direct contact with industries, while 9 are induction courses such as “University life and career choice,” “Self-discovery and career plan,” and “Business Challenges of Twenty-first century” to introduce students to working life with no direct industrial contacts.

The data was collected from 2572, 2588, and 2478 undergraduate students who graduated in 2008, 2009, and 2010 respectively. Data was provided via KSU Academic office on every student who graduated in those years. Of the total sample, 1847 were male and 725 were female in 2008, while the figures were 1794 and 794 in 2009, and 1747 and 731 in 2010. Average GPAs for first and third years were 1.86 and 1.89 in 2008, 1.94 and 1.90 in 2009, and 1.80 and 1.91 in 2010. Of 2572 students in 2008, 1555 took at least one career education course while 1017 took none. The figures for 2009 and 2010 were 1216 students with career education and 1372 without one out of 2588 students, and 1705 with career education and 773 without one out of 2478 respectively. In 2008, of the career education courses, 325 students took at least one WIL course, and 1230 students took at least one induction course. The corresponding figures stood at 367 and 1005 in 2009 and 298 and 1477 in 2010 (see Table 1).

Case 2: The Hong Kong Polytechnic University (PolyU)

Throughout its history, the Hong Kong Polytechnic University has been an application-oriented educational institution. Prior to attaining full university status in 1994, it was both a Polytechnic and even longer in its history a Technical College. PolyU is a large government-funded tertiary institution in Hong Kong with a total of 28,000 students (about 15,000 in government-funded programmes). Given this history, WIL has a long record at PolyU in those programmes where professional qualifications and licensure are required. However, this history is not pervasive across all students and programmes. In the 2005/6 Academic Year, PolyU admitted its first cohort that was subject to a compulsory WIL requirement for government-funded undergraduate degrees. Each student under this requirement must have at least one WIL placement at least equivalent to two full working weeks (e.g., 80 hours).

PolyU has six faculties and two schools --- Faculty of Applied Science and Textiles, Faculty of Business, Faculty of Construction and Land Use, Faculty of Engineering, Faculty of Humanities, Faculty of Health and Social Science, School of Hotel and Tourism Management, and School of Design.

A total of 1,373 undergraduate students were included in this study (58.8% male, 41.2% female). Only students who had complete data were included: these included an online survey, as well as complete university records for their first and third year GPA. The PolyU currently employs a three-year undergraduate curriculum. Average GPAs for the first and third years were 2.96 and 3.16 respectively.

Three variables were collected via an online exit survey on WIL: number of WIL placements completed, learning outcomes from WIL, and perceived working context. All other variables were collected via a centralized university unit responsible for maintaining student academic records.

An invitation to complete the online survey was emailed to all eligible students (i.e., those required to complete WIL for their undergraduate degree). The only incentive given to the students was a WIL transcript providing relevant details for use in future job applications. The overall response rate was 45.5 percent, which is fairly good for an institution-wide voluntary survey. The response rates varied by faculty/school affiliation – ranging from 14.4 percent to 57.3 percent, although five of the eight faculties/schools had response rates above 50 percent. Those faculties/schools with the lowest response rates were possibly caused by students not being motivated by the WIL transcript as they had other forms of documentation more valued by prospective employers (e.g., centralized records related to professional practice and qualification, professional portfolio). For many of these students, their WILs would have been well-structured and supervised – hence this sampling may have missed some of the higher quality WIL experiences. In addition, it was believed that students with lower quality WILs would also lack motivation to obtain a WIL transcript, as they would not be useful to gain employment. However, there was no way to substantiate this last claim.

As explained earlier, WIL is mandatory in PolyU, thus its effect on academic performance cannot be determined with one/zero dummy variable. In order to express the WIL experience of each student, three variables were used: Number of Placements, Overall Learning Outcomes, and Overall Learning Context. Number of Placements simply refers to the number of WIL placements a student completed during their undergraduate studies. While the range was very large (1-18), the average was 2.01 per student with a large majority completing one or two.

Learning outcomes during their WIL experiences were rated by each student on a 10 point scale – using 14 specific outcome items and one overall rating. These items covered such areas as initiative, responsibility, communication and teamwork skills, problem-solving, systematic thinking, applying academic knowledge to the real world, and a better understanding of the workplace environment. A 10-point scale was chosen for the learning outcomes as students are very familiar with having their learning rated on such a scale at the university. The variable Overall Learning Outcomes is derived by aggregating student ratings across all of these items. The range for this variable is large (15-150), with an average of 108.29.

Students also rated their perceived working context on 10 items on a 6-point scale. These items included questions about the quantity and quality of workplace feedback, self-motivation (efforts to learn things in their WIL), and interest and challenge of job tasks. A 6-point scale was chosen as being able to meaningfully differentiate student experiences. The questionnaire assessing the learning outcomes and learning context was piloted during a summer program (1,053 students) and was found to be a useful index of student experiences. This questionnaire can be obtained by contacting the second author. The variable Overall Learning Context is derived by aggregating student ratings across all of these items. The range for this variable is 10-60, with an average of 44.06. (see Table 1)

RESULTS

A multiple regression analysis was employed to estimate the effects on final year GPA of WIL and pre-university grade, using Ordinary Least Square method. The actual variables

used were the third year GPA as the dependent variable and WIL, the first year GPA, student gender, and faculty/school affiliation as the independent variables. For KSU, WIL was indexed via two variables: WIL participation (1 if yes and 0 otherwise), and induction course participation (1 if yes and 0 otherwise). For PolyU, the effects of WIL were indexed via the three other variables specified in the method section: Number of Placements, Overall Learning Outcomes, and Overall Learning Context. Therefore, the equations estimated are for KSU:

$$(3^{\text{rd}}\text{YrGPA})=\text{Constant}+b_1(\text{WIL})+b_2(\text{Induction})+b_4(1^{\text{st}}\text{yrGPA})+b_5(\text{Gender})+ b_6(\text{Faculty})$$

and for PolyU:

$$(3^{\text{rd}}\text{ Yr GPA})=\text{Constant}+b_1(\text{No. of WIL})+b_2(\text{OLO})+b_3(\text{OLC})+b_4(1^{\text{st}}\text{ yr GPA})+ b_5(\text{Gender})+ b_6(\text{Faculty})$$

where Constant and b 's are the coefficients to be estimated and the terms in brackets are the variables.

The results for KSU and PolyU are displayed in Table 2 and Table 3 respectively. Overall, the models work fairly well in estimating the equations, with KSU's adjusted R-squared ranging from .365 to .436 and PolyU's being .402. The estimated coefficients b 's are marked with a single asterisk if they are significant at 5 percent level and with double asterisks if they are significant at 1 percent level. For both institutions, WIL did show some effects. For KSU, the 2010 graduates showed no significant effects of WIL, while for the 2008 and 2009 graduates, WIL participation was shown to be related to higher third year GPA, both with a statistically significant level. Induction courses at KSU did not show a significant effect on the third year GPA.

For PolyU, the number of placements completed and overall learning context were not significant predictors. However, Overall Learning Outcomes was shown to be associated with higher third year GPA with a statistical significance. While these effects were quite modest, they show promise in terms of various ways to index the WIL experience and its possible effects.

For both institutions, first year GPA was a substantial predictor of third year GPA. While this finding is not surprising in general, it is surprising that in the both cases and across different cohorts in KSU, the weight of this predictor is somewhere between 0.5 and 0.6. Thus, first year GPA contributes as much as a half of third year GPA. Furthermore, at both institutions, females outperformed their male counterparts in their third year GPA. This result was statistically significant in both institutions with the effect being more pronounced in Japan. Namely, a KSU female student does better than her male counterpart by about 0.1 GPA in the third year, while the figure reduces to 0.05 in PolyU.

For PolyU, there was only one small effect of faculty/school membership. However, these effects seemed more pronounced at KSU. The possible explanation is either that the general academic standard of students varies or the grading standard varies among faculties. It is difficult at this stage to pinpoint the reason without further investigation. At PolyU, exams and grading are well monitored and hence may be more standardized than at many other universities worldwide.

DISCUSSION

This paper attempted to compare WIL programmes of different countries, probably one of the first attempts to do such evaluative international comparisons of WIL. Even when only two countries, such as Japan and Hong Kong, are compared, there are problems to solve in order to make it a meaningful comparison. For example, what can be used to measure the pre-university academic ability? Or, how can WILs of different formats be compared? In this sense, this paper's treatment is far from the ideal. Yet there is no doubt that the benefit of such an attempt clearly outweighs the problems, especially for the practitioners and advocates of WIL programmes who hope to spread the concept globally.

With respect to the comparisons made in the paper, several interesting results arose. First, Hypothesis 1 was partially supported. In Japan, the three graduating cohorts showed a positive effect of WIL on third year GPA, with two being significant i.e. 2008 and 2009. As for the non-significant result of 2010, the investigation needs to be continued for at least a few more years to verify whether this was a mere temporary outcome or a reflection of declining effect of WIL at KSU.

The Hong Kong sample also partially supported Hypothesis 1 – in that one of the three variables measuring individual differences in the WIL experience was significantly related to third year GPA. The number of WIL placements not being related to third year GPA is not surprising in that this is more a sheer number count that is not necessarily related to the actual quality of the placements. The individual differences in the quality of WIL were indexed by student-reported learning outcomes as well as the learning context. Only the overall learning outcomes variable was found to be significantly related to higher third year GPA. It is possible that the overall learning context variable functioned as a suppressor variable in the regression.

Overall learning outcomes being related to subsequent academic performance suggests possible linkages of what is learned in WIL back to the academic programme of the student. Oftentimes, this linkage has been discussed in terms of generic, soft skills related to organizational and study skills. However, this discussion surprisingly neglects the possibility of enhanced conceptual understanding from tackling problems in the real-world. Of course, this type of linkage would be stronger in placements related to the student's academic discipline. At PolyU, this type of data concerning the extent of placements being related to a student's discipline is now being collected and this issue can be further examined. In terms of the present data, some simple post hoc correlational item-level analyses were conducted and the top three item level correlations suggest both processes may affect subsequent academic performance. Two items of more a generic nature (developing initiative in the WIL, and gaining a better understanding of the workplace) were in the top three item level correlations with third year GPA. Furthermore, the item specifically querying improving the student's ability to apply theories and concepts learned at the university in the real world was also substantially related to subsequent academic performance. Investigating these workplace learning processes and their impact on academic development is a fruitful area of future research, especially since this may have implications for placement selection and approval by universities.

Second, Hypothesis 2 was supported both in Japan and Hong Kong, with very similar estimated values of around 0.5-0.6 in both institutions, suggesting that first year GPA

contributes to about a half of third year GPA. It would be interesting to see if this value holds for other countries.

Third, it is also worth noting that female students were observed to outperform their male counterparts in both KSU and PolyU. Again, it would be interesting to verify this in other countries. While there are many studies on gender differences in pre-university achievement and in terms of differential patterns of cognitive achievement, there is a surprisingly little amount of research literature on gender differences in overall university GPA (Conger & Long, 2010). A recent analysis by Conger and Long examining sixteen American universities (from Florida and Texas) found that female university students had higher GPAs in their first semester versus their male counterparts. Furthermore, this gap widened as these students continued their undergraduate studies. While these authors did not measure this variable directly, they partially explained this gap based upon previous research on gender differences in pre-university achievement suggesting that non-cognitive abilities (e.g., self-discipline, organization, dependability) promoted these differences (Duckworth & Seligman, 2006).

Finally, the theoretical framework and methodology employed in this paper were based on those often used by economists. But this by no means implies an exclusion of approaches of other disciplines such as Psychology and Sociology. It is hoped that eventually a standard approach will be developed with which the practitioners and advocates of WIL can collaborate globally.

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TABLE 1

Basic Statistics for KSU and PolyU

<u>University</u>	KSU			PolyU
<u>Graduating year</u>	2008	2009	2010	2010
<u>No. of students</u>	2572	2588	2478	1373 (sampled)
Male	1847	1794	1747	807
Female	725	794	731	566
<u>Average 1st yr GPA</u>	1.86	1.94	1.80	2.96
<u>Average 3rd yr GPA</u>	1.89	1.90	1.91	3.16
<u>No. of students with</u>				<u>Average no. of</u>
At least 1 CE* course	1555	1216	1705	WIL placements 2.01
None of CE* course	1017	1372	773	<u>Average rating of</u>
At least 1 WIL	325	367	298	OLO** 108.29
At least 1 Induction course	1230	1005	1477	OLC*** 44.06

(*) CE: Career Education=WIL and Induction course

(**) OLO: Overall Learning Outcomes

(***) OLC: Overall Learning Context

TABLE 2

KSU Regression Results: 2008, 2009, 2010 Graduates

Estimated Equation: $Y = C + b_1X_1 + b_2X_2 + b_4X_4 + b_5X_5 + b_{61}X_{61} + b_{62}X_{62} + b_{63}X_{63} + b_{64}X_{64} + b_{65}X_{65} + b_{66}X_{66}$

Dependent variable(Y): 3rd year GPA

Independent var.	2008		2009		2010	
	Coef.	P-value	Coef.	P-value	Coef.	P-value
WIL (X ₁) (D)	.119**	.001	.104**	.000	.038	.330
Induction (X ₂) (D)	.005	.826	-.027	.250	0.01	.954
1 st year GPA (X ₄)	.548**	.000	.620**	.000	.582**	.000
Gender (X ₅) (D)	-.105**	.000	-.096**	.000	-.093**	.001
Economics (X ₆₁) (D)	-.080	.175	-.126*	.021	-.151**	.010
Business (X ₆₂) (D)	.002	.977	-.035	.525	.087	.127
Law (X ₆₃) (D)	.110	.066	-.033	.548	-.049	.394
Languages (X ₆₄) (D)	.102	.110	.149*	.012	.112	.071
Cultures (X ₆₅) (D)	.270**	.000	.163*	.011	-.045	.500
Science (X ₆₆) (D)	.030	.673	-.151*	.025	-.172*	.016
Constant (C)	.893		.779			.947
<i>Adjusted R² =</i>	.365		.436			.398
<i>Sample size</i>	2572		2588			2478

Note. **: $p < .01$; * : $p < .05$, D: Dummy variable

TABLE 3

PolyU Regression Results: 2010 Graduates

$$\text{Estimated Equation: } Y = C + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_{61}X_{61} + b_{62}X_{62} + b_{63}X_{63} + b_{64}X_{64} + b_{65}X_{65} + b_{66}X_{66} + b_{67}X_{67}$$

Dependent Variable(Y): 3rd year GPA

Independent variable	Coefficient	P-value
Number of WIL Placements (X1)	-.008	.178
Overall Learning Outcomes (X2)	.002*	.016
Overall Learning Context (X3)	-.003	.104
1 st year GPA (X4)	.574**	.000
Gender (X5) (D)	-.050*	.017
Applied Science & Textiles (X61) (D)	-.070	.369
Business (X62) (D)	.017	.822
Construction & Land Use (X63) (D)	.156*	.052
Engineering (X64) (D)	.014	.851
Humanities (X65) (D)	-.061	.471
Health & Social Science (X66) (D)	.036	.667
Hotel & Tourism Management (X67) (D)	.000	.992
Constant (C)	1.444	
<i>Adjusted R²</i>	.402	
<i>Sample size</i>	1373	

Note. **: $p < .01$; *: $p < .05$, D: Dummy variable



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If the manuscript is deemed acceptable for publication, and reviewers' comments have been satisfactorily addressed, the manuscript is prepared for publication by the Copy Editor. The Copy Editor may correspond with the authors to check details, if required. Final publication is by discretion of the Editor-in-Chief. Final published form of the manuscript is via the Journal webpage (www.apjce.org), authors will be notified and sent a PDF copy of the final manuscript. There is no charge for publishing in APJCE and the Journal allows free open access for its readers.

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Types of manuscripts the Journal accepts are primarily of two forms; *research reports* describing research into aspects of Cooperative Education and Work Integrated Learning/Education, and *topical discussion* articles that review relevant literature and give critical explorative discussion around a topical issue.

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Research reports should contain; an introduction that describes relevant literature and sets the context of the inquiry, a description and justification for the methodology employed, a description of the research findings-tabulated as appropriate, a discussion of the importance of the findings including their significance for practitioners, and a conclusion preferably incorporating suggestions for further research.

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