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Generic Capabilities for Lifelong Education: Conceptualization and Construct Validity

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Abstract

To facilitate lifelong learning, recent education reforms have emphasized the development of generic capabilities. However, despite various lists found in previous studies, generic skills and capabilities have neither been well defined nor statistically validated. The present study attempted to (a) conceptualize generic capabilities in terms of 3 dimensions— socio-cognitive, academic, and self, and (b) test the construct validity of generic capabilities using confirmatory factor analysis. Students who attended a continuing education program that was designed to provide an alternative pathway for students who failed in the Hong Kong secondary school system to pursue continuing education (N=2,806) responded to 13 survey items about their generic capabilities before the program (Time 1) and 13 parallel items after it (Time 2). Results supported a multidimensional structure of generic capabilities with the three dimensions at each time point. The conceptualization of a multidimensional structure provides a useful framework for the study of generic capabilities. It also calls for attention to the importance of generic capabilities in curriculum design.

In the world of continuing changes, lifelong learning has received considerable attention in "practically every imaginable agenda for social change, educational policy preamble and mission statement" (Bagnall, 2000, p. 20). It is only by continual learning throughout the lifespan that one can adapt to the ongoing changes in the nature of work and to cope with the ever-increasing volume of information and knowledge. Effective lifelong learning is therefore a necessity at both individual and societal levels. As a consequence, recent studies on school curriculum have increasingly emphasized continuing and lifelong education (e.g., Bragg, 2000; Burkhalter, 2000; Education Commission, Hong Kong, 2000; Hughes & Smeaton, 2001; Nunley, Shartle-Galotto, & Smith, 2000; Richmond, 1981). Like many other countries, policy makers and curriculum designers in Hong Kong have included the development of lifelong learning in the agenda for educational changes in Hong Kong (see Curriculum Development Council, Hong Kong, 2001; Education

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Commission, Hong Kong, 2000). The emphasis on lifelong learning has also given rise to an increasing focus on the development of generic skills and capabilities for every individual, including those students who may not be successful in conventional schooling. However, different researchers and educators may have different interpretations of the concept of generic skills, and there is the lack of a uniform conceptualization and rigorous test of the validity of generic skills and capabilities. The present study attempts to (a) conceptualize the skills and attributes of individuals as generic capabilities for lifelong learning, and (b) examine the structure and validity of these psychological constructs.

Generic Capabilities for Lifelong Learning

Despite the emphasis on the development of students' lifelong learning capabilities in recent years (Curriculum Development Council, Hong Kong, 2001) and the descriptions of generic capabilities and skills found in numerous studies (Gilles, 2004; Hargreaves, 2004; Jensen & Loaker, 2001; Kearns, 2001), there does not seem to be a definitive conceptualization of such capabilities and skills. In Hong Kong, for example, the definition of generic skills found in educational policies and documents is that such skills are transferable to different learning situations; and there are no examples of how such capabilities and skills can be effectively nurtured. The present paper is therefore an attempt to conceptualize generic capabilities for lifelong learning and to empirically test the factor structure of such capabilities. Although most researchers tended to use the word "skill" in their descriptions (e.g., Gilles, 2004; Jensen & Loaker, 2001; Kearns, 2001), we prefer the term "capability" instead. The reason is that although some are skills that can be acquired through practice and perhaps also in more immediate terms, some other constructs are more of a psychological trait that can only grow gradually in the long term.

Hence, we prefer to use the term "capability" although the term "skill" may be used interchangeably. Further to the subtle distinction between capability and skill, Brown and McCartney (2004) defined capability in terms of two important conceptss. First, they defined capability as potential, that is, the extent to which the individual could achieve; and an individual's potential can be realized by the acquisition of skills and knowledge. In contrast, capability can also be defined as content, that is, what the individual can (or has learned to) do. By acquiring this content knowledge, the individual has the potential to develop further. Thus, in considering a range of capabilities that may be required for successful lifelong learning, we need to consider the capabilities in terms of both potential and content. Whereas content may be more associated with skills that are more concrete and achievable through practice, potential may be more remote but can be gradually nurtured in an appropriate learning environment. Because lifelong learning capabilities are generic in nature and are unlikely to be acquired through a single discipline in conventional schooling, researchers have labeled such capabilities as "generic" skills (e.g., Gilles, 2004; Jensen & Loaker, 2001; Kearns, 2001), which are referred to as *generic capabilities* here.

Generic capabilities are believed to be essential for lifelong learning. Because of the emerging interest of lifelong learning, there is an increasing interest in the development of such capabilities. It is generally believed that the development of

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generic capabilities and skills will enable individuals to adapt to ever-changing work and learning circumstances in the modern world (Kearns, 2001). Probably based on this belief, Kearns defines generic skills as "life and employability skills and attributes". Generic capabilities are, therefore, believed to be essential for both continuing education and a successful career. One difference between conventional schooling and the concept of lifelong education is that conventional schooling emphasizes outcomes in specific disciplines and demonstration of specifically required skills and capabilities within each discipline. When the emphasis of education is placed on lifelong learning, it is important to develop certain skills that are generic enough to enable the students to use them as building blocks for ongoing learning activities throughout life. For effective functioning in the workplace, generic skills are also essential for continual development of new skills and for adaptation to changes (Australian Council for Educational Research, 2001; Jensen & Loaker, 2001; Kearns, 2001; National Board of Employment, Education and Training, 1996).

For the conceptualization of generic capabilities for lifelong learning, we first attempted to search for an exhaustive list of such skills and capabilities. However, when we searched the literature for concepts related to generic skills for education and career, we found no definitive list of generic skills. Consistent with NCVER (2003), we found that what exists in the current literature is a number of different lists. Fortunately, the items in these lists are either life skills or personal attributes, as Kearns (2001) has suggested. Thus in essence, the lists of generic skills comprise competencies that enable a person to learn independently, to analyze information critically, and to communicate effectively. It seems that these lists are primarily derived from two major reports (Finn, 1991; Mayer, 1992) that provided a preliminary list of competencies that are believed to be essential for adolescents to successfully join the workforce. First, the Finn (1991) report identified six key areas that school leavers should be competent in. They are:

1. Personal and interpersonal skills
2. Language and communication
3. Problem solving
4. Cultural understanding
5. Mathematics
6. Scientific and technological understanding

Whereas the first four items on the list may be categorized as socio-cognitive skills, items 5 and 6 are more of an academic or intellectual nature. Following the publication of the Finn Report, a second committee in Australia, chaired by Mayer, published its report in the next year (Mayer, 1992). The report proposed seven key competencies that are regarded as generic to all kinds of environments, including the workplace, higher education, as well as social and home settings. The seven key competencies were:

1. Working with others and in teams
2. Communicating ideas and information
3. Solving problems
4. Collecting, analyzing and organizing information
5. Planning and organizing activities

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6. Using mathematical ideas and techniques
7. Using technology

Like those items in the Finn (1991) report, whereas the first five may be categorized as socio-cognitive skills, the other two are more related to academic competencies. When these key competencies were later adopted in Australian education, an eighth competency (i.e., cultural understanding, which was suggested earlier in the Finn (1991) report) was added to the list.

In Hong Kong, the Curriculum Development Council identified nine types of generic skills as essential components in schooling (Curriculum Development Council, Hong Kong, 2001). They are:

1. Collaboration skills
2. Communication skills
3. Creativity
4. Problem solving skills
5. Critical thinking skills
6. Numeracy skills
7. Information technology skills
8. Self-management skills
9. Study skills

Similarly, Hargreaves (2004) suggested a list of 9 generic skills including:

1. Social and interpersonal skills
2. Communication
3. Teamwork
4. Leadership
5. Problem solving
6. Thinking
7. Invention, enterprise and entrepreneurship
8. Research, enquiry and investigation
9. Managing one's own learning

These two lists differ from the Australian lists above in that they have added a new self-attribute dimension that was not considered in the Finn (1991) and Mayer (1992) studies. Indeed, it would be hard to imagine how lifelong learning can be realized without the important attributes of self-study and self-management capabilities. In fact, ACCI/BCA (2002) has placed special emphasis on this self-attribute dimension by providing a long list of personal attributes including loyalty, commitment, honesty and integrity, enthusiasm, reliability, balanced attitude to work and home life, and motivation. These attributes are clearly consistent with our notion of generic "capabilities" that are beyond the conventionally perceived "skills". Furthermore, in an international project in which Rychen and Salganik (2001) defined generic competencies from another perspective, they also emphasized a "self" dimension which they called "acting autonomously and reflectively". As commented in NCVER (2003), this dimension encompassing commitment to ongoing learning and self-improvement is becoming more common in lists of generic competencies worldwide and may reflect renewed international interest in the concept of the self-attribute dimension.

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In sum, generic capabilities may be defined as "skills and attributes of a generic nature that are essential for successful lifelong learning and employment". From the lists described above, three dimensions of capabilities can be conceptualized: (a) socio-cognitive, (b) academic, and (c) self. In the present investigation, we included in the socio-cognitive dimension communication skills, problem solving skills, creativity, and interpersonal skills. Whereas most studies on generic skills have focused mainly on employability (e.g., Conference Board of Canada, 2000; Confederation of British Industry, 1998; O'Neil, Allred, & Baker, 1997), the present study focuses on lifelong learning and therefore the academic dimension is also important. The academic skills included the basic and transferable skills that would enable academic learning in a variety of disciplines and changing environments. In a Hong Kong context, they include Chinese language skills, English language skills, Putongua (also known as Mandarin) skills, numerical competency, and computer knowledge. The self dimension is comprised of a sense of responsibility, initiative, effort, and self-learning.

Figure 1 provides a representation of the three dimensions of generic capabilities and their relationship with lifelong learning. The conceptualization in terms of the three dimensions will provide a useful framework for curriculum design as well as for the measurement and study of generic capabilities for lifelong education. However, for the conceptualized structure of generic skills to be applicable to the study of real teaching and learning issues, we need to vigorously test its validity and applicability with real data. Hence, the validation of the conceptualized structure of generic capabilities can only be achieved by testing a sample of students in a continuing education program where generic capabilities form a crucial outcome. In the present study, we used a sample of students from an innovative continuing education program which has a curriculum quite different from the conventional high school and which places a strong emphasis on the development of generic capabilities for lifelong learning.

Method

Participants

The participants of the present study were 3,224 students from two cohorts of a continuing education program called Project Yi Jin (PYJ), who responded to the survey items (85% response rate). Of these students, about 61% were from the first cohort and 39% were from the second cohort, which had just graduated at the time of data collection. All students had failed in the Hong Kong Certificate of Education Examination (HKCEE). The HKCEE is a standardized exam by the end of Grade 11 and is the basis for admission to subsequent study at the matriculation level. Failing to obtain satisfactory results in the HKCEE meant an end to further education. PYJ therefore has provided another route for those who failed in the HKCEE to pursue further studies.

The PYJ curriculum provides direct and indirect approaches to the development of the three dimensions of generic capabilities (see Appendix). In sum, most of the academic capabilities are directly covered in specific subjects whereas other capabilities are developed across the curriculum. As the PYJ students are generally weaker in purely academic subjects, the design of the PYJ curriculum is more practical in nature. Even for academic subjects, much attention is given to daily

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experiences and applications.

The subjects are delivered in tutorials in which teacher-student and student-student interactions are highly encouraged. Problem-based learning projects are used in many modules so that students are trained for creativity and flexibility in problem solving processes. Through group work for projects, students also develop interpersonal and communication skills, and learn to manage their own learning processes with support and supervision from the tutor. Because these students have failed in the public examination, it is important to assist them to regain confidence. To rebuild their confidence and motivation in learning, continuous assessments instead of one-off examinations are used for assessing progress. Various types of continuous assessment, including portfolio, presentation, reflective journal, and application exercises, are used to stimulate self-initiation and independent learning. The sense of responsibility and effort in academic work are nurtured in the learning environment where students are expected to be responsible for their own learning and manage their own progress. The set up of the program in a tertiary education environment also gives students a feeling of mutual respect, which enables them to exercise effective interpersonal and communication skills as adults. As a result, via the development of generic capabilities, the students are expected to become more self-motivated, not only in the learning process and the school setting, but also in other settings including the workplace.

Consent to participate in the study was obtained from the participants before they completed the survey. The analysis used a sample size of 2,806 students after listwise deletion of missing data.

Material and Procedure

Apart from items that asked for demographic data, the survey contained 26 response items asking about the students' perceptions of their generic capabilities (see Appendix).

The six scales were:

Socio-cognitive—socio-cognitive capabilities before PYJ: Four items asked the students about their self-perceived abilities in communication, problem solving, creativity, and interpersonal skills.

Academic—academic/intellectual skills before PYJ: Five items asked the students about their self-perceived abilities in literacy, numeracy and computer competence. In a Hong Kong context where three languages are important in education and in employment, the five skills included Chinese language, English language, and Putonghua (also known as Mandarin Chinese which is the official language of the Chinese Government in the mainland) skills, numerical competency, and computer knowledge.

Self—self-attributes before PYJ: Four items asked the students about their beliefs and motivation that are essential for lifelong learning. They include their sense of responsibility, initiative, effort and willingness in self-learning.

Socio-cognitive dimension after PYJ: The same four items as those before PYJ were used.

Academic dimension after PYJ: The same five items as those before PYJ were used.

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Figure 1. Relationship between lifelong learning and 3 dimensions of generic capabilities

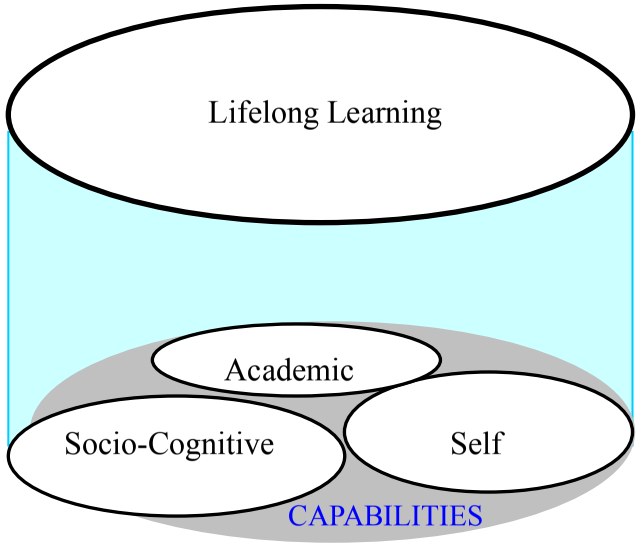

Table 1. *Goodness-of-fit Summary for Models*

Models	χ^2	(df)	TLI	RNI	RMSEA	Null χ^2	(df)	FacLoad
1. Three Time 1 factors	900.54	(62)	.92	.94	.07	13668.17	(78)	.54 to .82
2. Time 1 higher order factor	900.54	(62)	.92	.94	.07	13668.17	(78)	.54 to .82
3. One Time 1 factor	2808.66	(65)	.76	.80	.12	13668.17	(78)	.46 to .76
4. Three Time 2 factors	793.51	(62)	.94	.95	.06	15888.59	(78)	.61 to .84
5. Time 2 higher order factor	793.51	(62)	.94	.95	.06	15888.59	(78)	.61 to .84
6. One Time 2 factor	2718.73	(65)	.80	.83	.12	15888.59	(78)	.54 to .77
7. Six factors	11380.24	(284)	.70	.74	.12	43341.31	(325)	.52 to .84
8. Six factors, CU	1784.95	(271)	.96	.96	.04	43341.31	(325)	.56 to .84
9. Two factors	17944.13	(298)	.55	.59	.15	43341.31	(325)	.46 to .77
10. Two factors, CU	5100.18	(285)	.87	.89	.08	43341.31	(325)	.49 to .77
11. Two higher order factors	2805.49	(279)	.93	.94	.06	43341.31	(325)	.56 to .84

Note: N = 2,806. RNI= Relative noncentrality index. TLI= Tucker-Lewis index. RMSEA=Root mean square error of approximation. FacLoad=Factor Loadings. CU = correlated uniquenesses included in the model.

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Self dimension after PYJ: The same four items as those before PYJ were used.

The 26 survey items forming the six *a priori* scales are listed in Appendix. They were in a random order in the actual survey. The students were asked in a telephone interview to rate themselves on the 13 items before attending PYJ (Time 1) and after completing PYJ (Time 2). The parallel items across two time points enabled a test of the stability of the factor structure over time. The participants responded on a 5-point scale (1 = strongly disagree; 5 = strongly agree) and the items were scored such that higher scores reflected more favorable responses to the item. For strong validation of the *a priori* constructs of generic capabilities, the 26 items should be able to form three distinct factors in Time 1 and three parallel factors in Time 2.

Statistical Analysis for Construct Validation

Preliminary analysis included alpha estimates of internal consistency of each of the *a priori* measures and principal components analysis with the 13 items in Time 1 and 13 items in Time 2 separately to test their ability to form the three expected factors in support of the multidimensionality of the generic capabilities. The analysis was conducted with SPSS (Nie, 1994). For each time point, four items asking students about the socio-cognitive dimension, five items asking about the academic dimension, and four items asking about the self dimension were expected to form three distinct factors.

Confirmatory factor analysis (CFA) models were then tested. The conduct of CFA has been described elsewhere (e.g., Byrne, 1998; Joreskog & Sorborm, 1993; Marsh & Hocevar, 1985; Pedhazur & Schmelkin, 1991) and is not further detailed here. All analyses throughout this paper were conducted with the SPSS version of PRELIS and LISREL (Joreskog & Sorbom, 1988). The goodness of fit of models is evaluated based on suggestions of Marsh, Balla, and McDonald (1988) and Marsh, Balla, and Hau (1996) with an emphasis on the Tucker-Lewis index (TLI), but we present also the chi-square test statistic, the relative noncentrality index (RNI), and the root mean square error of approximation (RMSEA). For an acceptable model fit, the values of TLI and RNI should be greater than .9 and the RMSEA should be smaller than .08. For the validation of the structure of generic capabilities, a series of CFA models were tested based on a 26 x 26 (13 items for Time 1 + 13 items for Time 2) covariance matrix.

Model 1 used data in Time 1 to examine whether the 13 items would form three factors. A good model fit for Model 1 would provide support for a multidimensional structure of generic capabilities.

Model 2 used data in Time 1 to examine whether the 13 items would form three distinct factors which can be represented by a single higher order factor. Because the higher order factor would be derived from only three first-order factors, the model fit would be identical to that of Model 1. Whereas a good model fit for Model 2 would provide support for a multidimensional structure of generic capabilities, good factor loadings (> .5) for the higher order factor would also provide support for a hierarchical structure with a single higher order factor representing three first-order generic capability factors.

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Model 3 used data in Time 1 to examine whether the 13 items would form a single factor. Comparison of the fit between Models 1 and 3 would provide a stronger scrutiny of the multidimensional Model 1.

Model 4 is a model parallel to Model 1. It used data in Time 2 to examine whether the identical 13 items would form three factors. A good model fit for both Models 1 and 4 would provide strong support for a multidimensional structure of generic capabilities.

Model 5 is a model parallel to Model 2. It used data in Time 2 to examine whether the identical 13 items would form three distinct factors which can again be represented by a single higher order factor. Again, because the higher order factor would be derived from only three first-order factors, the model fit would be identical to that of Model 4. Whereas a good model fit for Model 4 would provide support for a multidimensional structure of generic capabilities, good factor loadings (> .5) for the higher order factor Model 5 would also provide support for a hierarchical structure with a single higher order factor representing three first-order generic capability factors. The validation of both Models 2 and 5 would provide particularly strong support for a multidimensional model of generic capabilities.

Model 6 used data in Time 2 to examine whether the 13 items would form a single factor. Comparison of the fit between Models 4 and 6 would provide a stronger scrutiny of the multidimensional Model 4.

Model 7 used data in both Time 1 and Time 2 to examine whether the two identical sets of 13 items for the two time points would form three distinct factors respectively for each time point. That is, the model tested whether the 26 items would form six factors (three factors for Time 1 and three factors for Time 2). A good model fit for Model 7 would reinforce the validity of the multidimensional structure of generic capabilities found in Models 1 and 4. However, according to Marsh and Yeung (1997), for data involving responses to parallel items at multiple occasions, for the model to fit the data, the uniquenesses of the same items used at multiple time points would need to be correlated. Hence, Model 7 which did not include correlated uniquenesses for identical items across time points would probably not provide a good fit to the data.

Model 8 differs from Model 7 in that Model 8 included a total of 13 correlated uniquenesses. That is, the residuals for each pair of identical items at two time points were posited to be correlated. Hence, Model 8 had 13 df less than Model 7. We expected a better fit for Model 8 than Model 7 and the good model fit for Model 8 would reinforce the validity of the multidimensional structure of generic capabilities found in Models 1 and 4.

Model 9 is a model for comparison with Model 7. Model 9 tested the ability of the 26 items to form two factors, one factor for each time point. A better model fit for Model 9 than Model 7 would support a unidimensional structure and refute a multidimensional structure.

Model 10 is a model for comparison with Model 8. Model 10 differs from Model 9 in that Model 10 had 13 correlated uniquenesses included. A better model fit for Model 10 than Model 8 would support a unidimensional structure and refute a multidimensional structure. Because the residuals for each pair of identical items at

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two time points were posited to be correlated in Model 10, the model had 13 df less than Model 8. A better fit for Model 7 than Model 9 and a better fit for Model 8 than Model 10 would provide further support for the validity of a multidimensional structure of generic capabilities.

Model 11 is an extension of Model 8. This model used data in both Time 1 and Time 2 to examine whether the two identical sets of 13 items for the two time points would form three distinct factors at each time point, which could be further represented by a single higher order factor for each time point respectively. If the higher order factors could represent the respective first-order factors such that the model fit of Model 11 would be equivalent to or better than Model 8 that posited a multidimensional structure, then there would be good support for a structure of generic skills that is both hierarchical and multidimensional. If Model 8 had a better fit than Model 11, then there would be stronger support for the multidimensional structure.

Results

Preliminary Analysis

The reliability of each scale was good (see Appendix). The alphas were .78, .75, and .85 respectively for the Time 1 generic capabilities of the Socio-cognitive, Academic, and Self dimensions; and .80, .79, and .86 respectively for the same factors in Time 2. A principal components analysis was conducted with the 13 generic capabilities in Time 1 using varimax rotation in the SPSS statistical package (Foster, 2001). The three *a priori* factors were extracted, explaining 60% of total variance. The factor loadings were .81, .70, .55, and .77 for Socio-cognitive, .55, .72, .75, .67, and .59 for Academic, and .72, .78, .80, and .70 for Self, respectively. Similarly, we conducted a principal components analysis with the 13 parallel items in Time 2 using varimax rotation. Again, the two *a priori* self-concept factors were extracted, explaining 63% of total variance. The factor loadings were .82, .70, .56, and .77 for Socio-cognitive, .57, .71, .74, .73, and .60 for Academic, and .74, .78, .81, and .71 for Self, respectively. The results have provided preliminary support for the distinctiveness of the three factors across two time points.

Confirmatory Factor Analysis

We tested 11 CFA models with the 26 items (Figure 2). A summary of the goodness of fit for each model is given at Table 1.

Model 1: Three Generic Capability Factors in Time 1

Model 1 (Table 1) positing three factors from 13 items at Time 1 provided a good fit to the data (TLI = .92, RNI = .94, RMSEA = .07). The factor loadings were also good (.54 to .82). The correlations among the factors were reasonable (the largest $r < .72$), showing that the factors were distinguishable from one another. Thus, Model 1 provided good support for the distinctiveness of the three *a priori* factors for Time 1 (Figure 2a). In other words, there was evidence in support of a multidimensional structure of generic capabilities.

Model 2: Time 1 Higher Order Factor

Model 2 (Table 1) positing a higher order factor representing three first-order factors derived from 13 items in Time 1 provided an identical fit as did Model 1 (TLI

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= .92, RNI = .94, RMSEA = .07). The critical concern was the factor loadings for the higher order factors (all should be > .5). The results showed that all the factor loadings were good (.82, .75, and .87 for Socio-cognitive, Academic, and Self, respectively). There was therefore preliminary support for the hierarchical structure of generic capabilities for Time 1 (Figure 2b).

Model 3: A Single Time 1 Factor

Model 3 (Table 1) positing a single factor in Time 1 did not fit the data (TLI = .76, RNI = .80, RMSEA = .12). The factor loadings were not as good as in Model 1 (.46 to .76). Comparing the goodness of fit for the models, Model 3 did not fit as well as Model 1 and there was no support for a single factor for Time 1 (Figure 2c).

Model 4: Three Generic Capability Factors in Time 2

Model 4 was similar to Model 1, but was derived from 13 items for Time 2 (Table 1). The model provided a good fit to the data (TLI = .94, RNI = .95, RMSEA = .06). The factor loadings were also good (.61 to .84). The correlations among the factors were reasonable (with the largest $r < .73$), showing that the factors were distinguishable from one another. Thus, Model 4 provided good support for the distinctiveness of the three *a priori* factors for Time 2. Together with Model 1, there was good support for a multidimensional structure of generic capabilities (Figure 2a).

Model 5: Time 2 Higher Order Factor

Model 5 (Table 1) is similar to Model 2, but Model 5 used Time 2 data. Model 5 positing a higher order factor representing three first-order factors derived from 13 items in Time 2 provided an identical fit as did Model 4 (TLI = .94, RNI = .95, RMSEA = .06). The critical concern was the factor loadings for the higher order factors (all should be > .5). The results showed that all the factor loadings were good (.84, .84, and .86 for Socio-cognitive, Academic, and Self, respectively). Like Model 2, there was therefore preliminary support for the hierarchical structure of generic capabilities for Time 2 (Figure 2b).

Model 6: A single Time 2 Factor

Model 6 (Table 1) positing a single factor in Time 2 did not fit the data (TLI = .80, RNI = .83, RMSEA = .12). There was no support for a single factor for Time 2. Considering the better fitting Models 1 and 4 for Times 1 and 2 respectively, there was support for a multidimensional structure with three factors for each time point. Considering Models 2 and 5, there was also support for a hierarchical structure of generic capabilities (Figure 2c).

Model 7: Six Generic Capability Factors at Two Time Points

Model 7 positing six factors derived from 26 items did not provide a good fit to the data (TLI = .70, RNI = .74, RMSEA = .12) although the factor loadings were good (.52 to .84). Thus, Model 7 without the inclusion of correlated uniquenesses for parallel items across two time points did not fit the data.

Model 8: Six Generic Capability Factors with Correlated Uniquenesses

Like Model 7, Model 8 posited six factors derived from 26 items but the uniquenesses of parallel items across the two time points were posited to be correlated. According to Marsh and Yeung (1997), the inclusion of correlated uniquenesses in the model with data involving responses to parallel items at multiple occasions would provide more accurate parameter estimates. Model 8 provided a

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good fit to the data (TLI = .96, RNI = .96, RMSEA = .04). The solution of the model is presented in Table 2. The factor loadings were good (.56 to .84). The correlations among the factors were reasonable, showing that the factors were distinguishable from one another. Thus, Model 8 provided good support for the distinctiveness of the three *a priori* factors for Time 1 and Time 2 respectively. There was therefore good support for a multidimensional structure of generic capabilities (Figure 2d). The relatively high correlations between the parallel factors across two time points (*r*s = .62, .67, and .64, respectively for socio-cognitive, academic, and self) also provided support for the stability of the factors over time.

Model 9: Two Factors at Two Time Points

Model 9 posited two factors, one for each time point, derived from 26 items. Model 9 did not provide a good fit to the data (TLI = .55, RNI = .59, RMSEA = .15). There was therefore no support for the two-factor model.

Model 10: Two Factors with Correlated Uniquenesses

Like Model 9, Model 10 posited two factors, one for each time point, derived from 26 items (Figure 2e), but the uniquenesses of parallel items across the two time points were posited to be correlated. Model 10 did not provide a good fit to the data either (TLI = .87, RNI = .89, RMSEA = .08). Thus again, there was no support for the two-factor model. Considering Models 7 to 10, there was support for Model 8 (TLI = .96) as the best fitting model. In essence, there was good support for a multidimensional structure of generic capabilities and no support for a unidimensional structure.

Table 2. *CFA Solution for Model 8*

	T1 Variables			T2 Variables		
	Socio-cognitive	Academic	Self	Socio-cognitive	Academic	Self
Factor Coefficients						
Item 1	.76*	.60*	.72*	.78*	.65*	.77*
Item 2	.74*	.63*	.81*	.75*	.69*	.82*
Item 3	.56*	.65*	.82*	.60*	.69*	.84*
Item 4	.69*	.62*	.70*	.70*	.64*	.71*
Item 5	--	.56*	--	--	.63*	--
Uniquenesses						
Item 1	.42*	.64*	.48*	.40*	.58*	.42*
Item 2	.45*	.60*	.34*	.43*	.52*	.33*
Item 3	.68*	.58*	.32*	.64*	.53*	.29*
Item 4	.52*	.62*	.51*	.51*	.59*	.49*
Item 5	--	.68*	--	--	.60*	--
Factor Correlation						
T1 Socio-cognitive	--					
T1 Academic	.61*	--				
T1 Self	.71*	.65*	--			
T2 Socio-cognitive	.62*	.42*	.46*	--		
T2 Academic	.38*	.67*	.44*	.70*	--	
T2 Self	.41*	.46*	.64*	.71*	.72*	--

Note: $N = 2806$. Parameters estimates are completely standardized. *$p < .05$. Responses to items ranged from 1 (strongly disagree) to 5 (strongly agree) and were coded such that higher scores reflected more favorable responses. The uniqueness of each item is the residual variance associated uniquely with that item and is independent of residual variances associated with other measured variables.

Model 11: Two Higher Order Factors

Based on Model 8, Model 11 posited two higher order factors each representing

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three factors for each time point. That is, 13 items for Time 1 were posited to form three factors, which were represented by one higher order factor. Then, 13 items for Time 2 were posited to form the next three factors, which were represented by one higher order factor for Time 2 (Figure 2f). The two higher order factors were posited to be correlated and the uniquenesses of parallel items across the two time points were posited to be correlated. Model 11 provided a good fit to the data (TLI = .93, RNI = .94, RMSEA = .06). However, Model 11 did not fit as well as Model 8 (TLI = .96). Therefore, the higher order factors were unable to perfectly represent the first-order factors, as some of the variances could not be explained by the higher order factors. In other words, despite the fact that the good model fit of Model 11 did provide some support for the hierarchical structure of the generic capabilities considered here, there was stronger support for the multidimensional structure of generic capabilities in Model 8.

Discussion

There were two goals in the present study. First, we attempted to establish a model that conceptualizes generic capabilities that are believed to be essential for lifelong learning. Second, we attempted to vigorously validate the structure of generic capabilities so as to provide a strong measurement model for further studies on generic capabilities. The conceptualization of generic capabilities beyond what has been labeled as generic skills in previous studies may be more appropriate. Although most researchers tended to use the word “skill” in their descriptions of various capabilities (e.g., Gilles, 2004; Jensen & Loaker, 2001; Kearns, 2001), we have used the term “capability” instead so as to include attributes that are more of a psychological construct that can be nurtured gradually in the learning process. With this conceptualization, generic capabilities in terms of potentials and content can be both included in the model (see Brown & McCartney, 2004). This conceptualization may have important implications for curriculum designers because by considering curriculum contents and delivery in terms of capabilities, both long-term and short-term goals of education can be addressed.

In conceptualizing generic capabilities, the multidimensional model provides a useful framework for the development of curriculum contents for continuing education. The conceptualization of generic capabilities in terms of the three dimensions, namely, socio-cognitive, academic, provides a framework that is useful for empirical studies on change and growth in generic capabilities. Without a well-defined and validated framework, the design of curriculum with an aim to facilitate generic capabilities may at best be providing a list of competencies that are assumed to be essential for lifelong learning. Hence, the conceptualization of the structure of generic capabilities in the present study may have a significant contribution to curriculum designers by providing a clear perspective of the specific education outcomes we should expect. The conceptualization and validation of the multidimensional model of generic capabilities enables us to systematically evaluate lifelong education programs such as PYJ in the present investigation, which places an emphasis on the development of generic capabilities.

Unlike academic subjects which can be easily defined with measurable criteria to accomplish, there is often no clear specification of what generic capabilities are

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and how these capabilities may be acquired. So far, there have been different lists of generic capabilities suggested by different researchers and educators. Although it may not be necessary to draw up an exhaustive list of generic capabilities, it will be useful for researchers and program designers to have a general framework of generic capabilities for program development and program evaluation. The present study has attempted to conceptualize a reasonable range of generic capabilities into three dimensions and to apply the state-of-the-art confirmatory factor analysis approach to the validation of a multidimensional model of generic capabilities such that future studies on generic capabilities can be conducted with a well-defined framework. It will also provide useful reference for curriculum design such that educators can make well-informed decisions on the focus of the design, whether it puts emphasis on a single dimension or a balance of two or all of the three dimensions.

The conceptualization in terms of multiple dimensions is important. The present conceptualization in terms of three dimensions of generic capabilities was possible due to the pioneer works reported in the Finn Report and the Mayer Report (Finn, 1991; Mayer, 1992) and later in Hargreaves (2004), ACCI/BCA (2002), and Curriculum Development Council, Hong Kong (2001) particularly for the local Hong Kong school context. In fact the thoughts of previous investigators have been very close such that the lists of generic capabilities tended to be very similar. The listings, however, cannot be and should not be exhaustive as the capabilities and skills may vary in accordance with social, cultural and contextual factors and are expected to change over time and in different environments. The conceptualization of generic capabilities into the three dimensions should thus provide a flexible framework such that other capabilities (e.g., culture-specific capabilities or context-related skills) can also be added to the dimensions. On the basis of this framework, the development of generic capabilities in programs can be evaluated in light of the various dimensions.

The present study has provided support for the validity of the multidimensionality of generic capabilities. Because the development of generic capabilities may not be easy to measure, we have used students' self-reflections as indicators of their development. In general, the validation of these measures has provided researchers and practitioners with a useful instrument for measuring the constructs of generic capability and the instrument can in turn be used for program evaluation. In this way, we can test the effectiveness of a program in terms of the dimensions or in terms of each individual capability designated in the program design, depending on the purpose. However, further research should investigate the generic capabilities also from the perspectives of people other than the students themselves. Data from teachers or parents will serve as external criteria to provide even stronger validation of the multidimensional structure of generic capabilities (see Yeung & Lee, 1999). The data obtained from these significant others will perhaps also provide a more objective measure of students' generic capabilities.

Furthermore, although the structure of generic capabilities has been validated, the applicability of the measures to other samples should be further scrutinized in future research. Thus, whereas the three dimensions of generic capabilities have been clearly validated in the present study with lower achievers, the same dimensions may not be equally applicable to higher-achieving students. Hence, although the findings

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of the present investigation have at least provided a clearly defined framework for further work in this area of inquiry, further studies should scrutinize the applicability of the structure and measurement of generic capabilities with other samples.

In sum, the present study has (a) provided researchers and educators a well defined framework for the study of generic capabilities and the design of curriculum with generic capabilities as a focus, and (b) validated the measures of generic capabilities, which would enable the measure of changes in these constructs. We hope that the findings will provide teachers and curriculum designers a framework for incorporating a comprehensive list of generic capabilities in life-long education programs with all three dimensions included in the design. This also calls for attention to the importance of generic capabilities and the multidimensional features of such capabilities in modern curriculum design.

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Appendix

Factor/Items	**Time 1 Alpha**	**Time 2 Alpha**
SOCIO-OGNITIVE	.78	.80
[a] Communication skills.		
[b] Problem solving skills.		
[b] Creativity.		
[b] Interpersonal skills.		
ACADEMIC	.75	.79
[a] Chinese language skills.		
[a] English language skills.		
[a] Putonghua skills.		
[a] Numerical competency.		
[a] Computer knowledge.		
SELF	.85	.86
[b] Sense of responsibility.		
[b] Initiative.		
[b] Effort.		
[b] Self-learning.		

Note: Parallel items were used for the two time points. [a] Core subjects in PJY curriculum. [b] Capabilities indirectly developed in the PYJ curriculum.

Figure 2. Models testing the structure of generic capabilities

Note: (a) Models 1 and 4 tested a 3-factor model for each time point. (b) Models 2 and 5 tested a higher order factor representing 3 dimensions of generic skills. (c) Models 3 and 6 tested a single factor for each time point. (d) Models 7 and 8 tested a 6-factor model for 2 time points. (e) Models 9 and 10 tested a 2-factor model for 2 time points. (f) Model 11 tested the ability of a higher order factors to represent 3 dimensions of generic skills respectively at 2 time points. The parallel items for Time 1 and Time 2 were: (1) communication, (2) problem solving, (3) creativity, (4) interpersonal, (5) Chinese, (6) English, (7) Putonghua, (8) numerical, (9) computer, (10) responsibility, (11) initiative, (12) effort, and (13) self-learning. Models 8, 10, and 11 had correlated uniquenesses included in the models.

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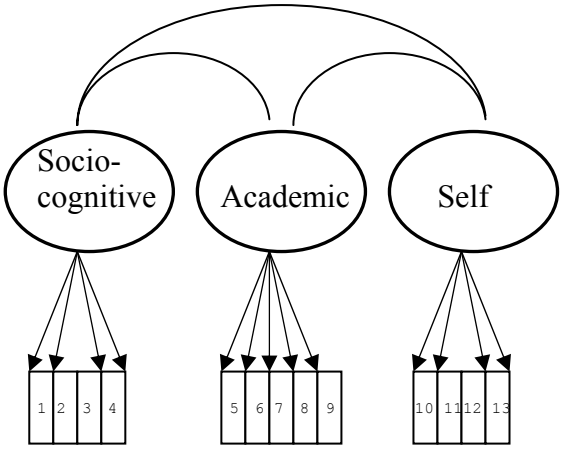

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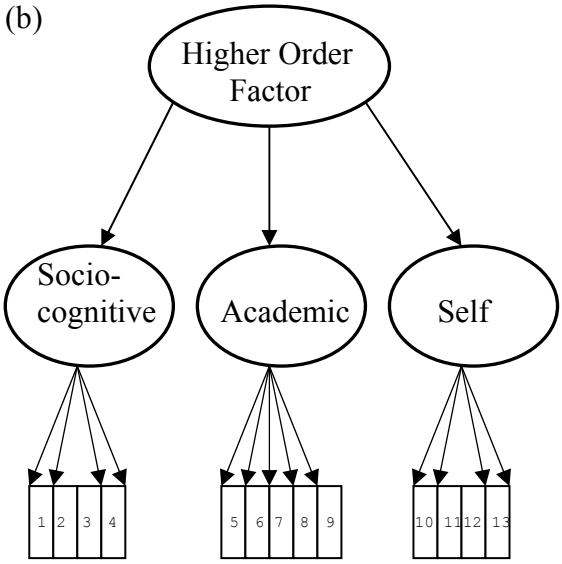

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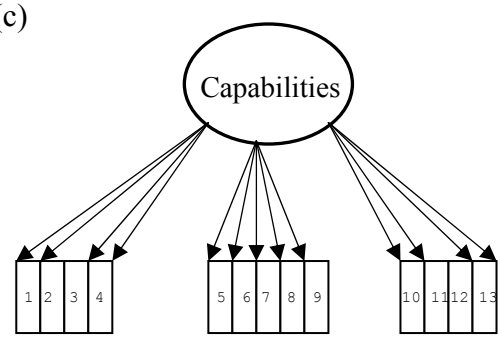

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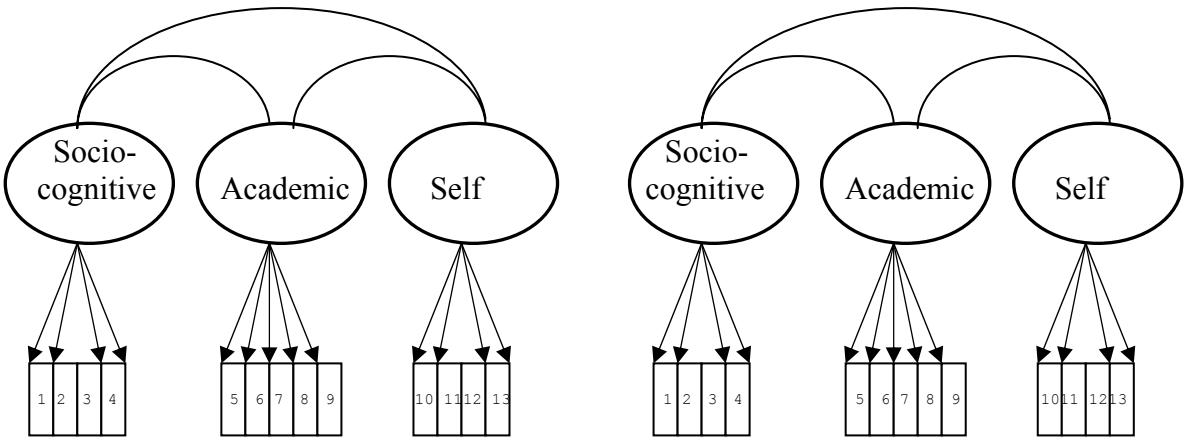
(d)



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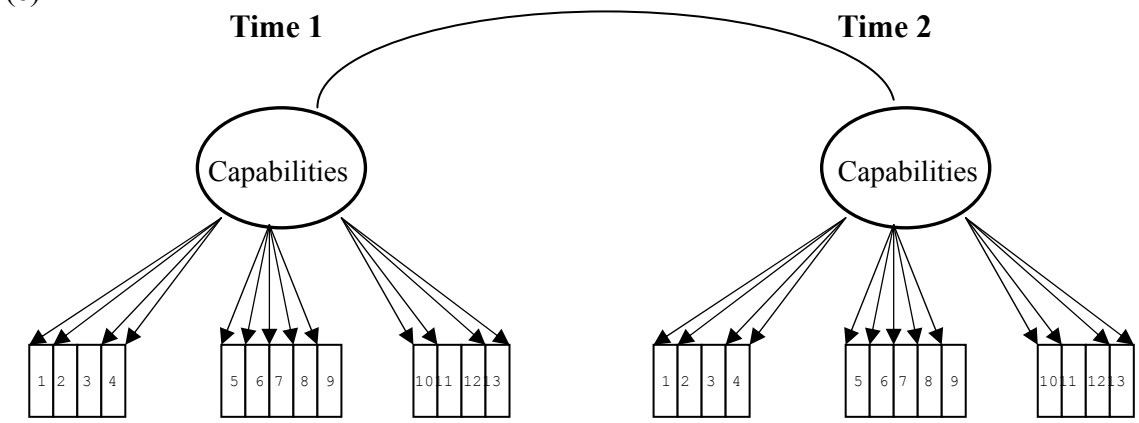
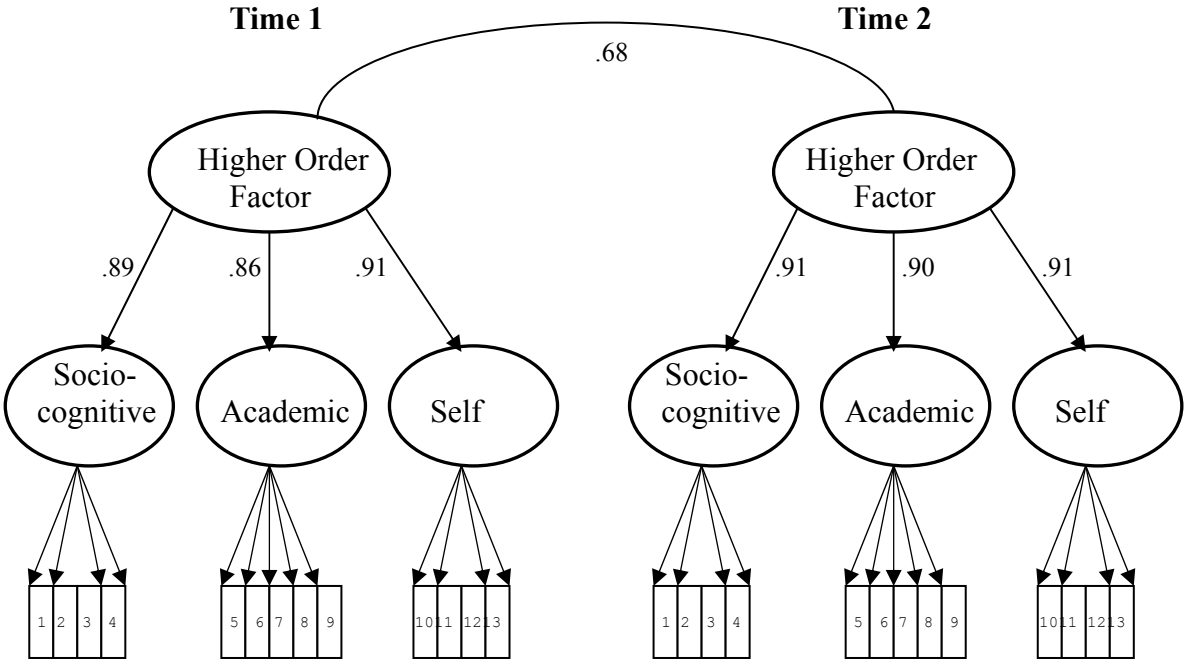
(f)