Students' "Approach to Develop" in Holistic Competency – an Adaption of the 3P Model

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Students' "Approach to Develop" in Holistic Competency – an Adaption of the 3P Model

Abstract

In response to the global imperative of nurturing all-round students, educational institutions and schools worldwide have been developing learning activities targeting holistic competency development of students. However, there have been resistance and challenges on how to develop such competencies. Extending the Presage-Process-Product (3P) framework to holistic competency development, this study examined the relationship between students' motivation, perception, their approach to develop, and learning outcomes in those activities. To that end, 329 secondary-school students who participated in a school-based initiative to enhance holistic competencies responded to pre- and post- programme questionnaires regarding the aforementioned four constructs. Descriptive statistics, measurement modelling, and structural equation modelling analyses supported that learners who are more driven by self-directed motives such as enjoyment and friendship building perceive the learning activities more positively, and thus, engenders higher level of engagement which in turn enhances holistic competency development.

Keywords: Generic skills; Competencies; Motivation; Approach to Develop; Presage-Process-Product framework

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Introduction

In the past few decades, increasing efforts have been made around the globe to integrate holistic competencies into academic learning at schools and universities to facilitate all-round development of students (Humphrey, 2013; Weare, 2010; Zhang, 2013). However, these efforts have met a number of conceptual and operational challenges, including the different and often conflicting perceptions and understandings of holistic competencies held by key stakeholders such as teachers and students (Chan, 2012; Hughes & Barrie, 2010).

To ensure effective integration and implementation of holistic competency education, understanding the diversity of practices and views held by these stakeholders is crucial. What are the holistic competencies from their perspectives? Do they consider holistic competencies important? How do they teach and develop these competencies? These are all central to the design and implementation of any holistic competency programmes. What is even more important, as Chan and Fong (2018) and Chan, Zhao and Luk (2017) have explored, is the alignment of the views and approaches of these different stakeholders. As teachers, their perceptions of holistic competencies and approaches to teaching these competencies have a flow-on effect on the students. The lack of a systematic curriculum and variations in teaching practices would leave the students unclear about the purpose and expectations of holistic competency development, which, in turn, will reduce their motivation to develop holistic competencies.

With a view to contributing to the alignment of the perceptions and development approaches of teachers and students, the aim of this paper is twofold. Firstly, it will investigate students' motives and approaches to develop holistic competency. It will develop a model based on the *Presage-Process-Product* (3P) framework (Dunkin & Biddle, 1974), to explore how students' motives affect learning approaches by drawing on the data obtained from a personal

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development programme for secondary school students. Secondly, to conclude this paper, it will

also discuss the implications for the approaches teachers can use to facilitate students' holistic

competencies, as informed by the findings of this study. This study will deepen the

understanding on the impact of students' motives in holistic competency development activities

and underscore the significance of aligning learning activities with students' learning motives. It

will provide implications for the approaches teachers can adopt to develop students' holistic

competencies.

Conceptions of Holistic Competencies

Holistic competency is an umbrella term inclusive of different types of generic skills (e.g.

critical thinking, problem-solving skills), positive values, and attitudes (e.g. resilience,

appreciation for others) which are essential for students' life-long learning and whole-person

development (Chan, Fong, Luk, & Ho, 2017). It is used interchangeably with other terms such as

'employability skills', 'soft skills', '21st century skills', and 'generic attributes'. In university

policy missions and statements, it is often referred to as 'graduate attributes'. As Barrie (2005)

points out, this variety of terms used has indicated the absence of an agreed conceptual definition

for holistic competencies which is essential for the design of a coherent holistic competency

curriculum.

Given the ambiguity in definition, some scholars endeavour to categorize and

conceptualise holistic competencies in the education context to promote understanding (e.g.,

Bridges, 1993; Chadha, 2006). One of the most influential research would be Barrie's work

(Barrie, 2006, 2007) on the conception of holistic competencies and their teaching approaches.

By interviewing academics, Barrie (2006) observed prominent diversity in their

understanding of holistic competencies. Captured in his Conceptions of Generic Attributes

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Model, holistic competencies could be perceived additively as "*precursor*" which should have been developed before entering university or as "*complement*" that are separate from disciplinary knowledge, or perceived integrally as "*translation*" that help students apply disciplinary knowledge in non-disciplinary contexts or as "*enabling*" that infuse and enable all scholarly learning and knowledge. These varied conceptions on what holistic competencies are accordingly lead to different pedagogies these teachers would adopt (Barrie, 2007). To name one example, teachers who see holistic competencies as "*complement*" would tend to teach them in a separate curriculum instead of embedding the skills into disciplinary courses. Traces can also be found in earlier studies that similarly reveal diverse conceptions on holistic competencies (e.g. Drummond, Nixon, & Wiltshire, 1998; Chadha, 2006)

Beneficial as Barrie's research is, his papers are based on the views of teachers only. It would not be appropriate to leave out students' responses if we are to truly promote an effective and coherent curriculum. This also drives the current study to address the conceptual gap in understanding students' perceptions and approaches towards holistic competencies. In what follows, approaches to learning will be discussed to bring in students' role regarding this matter.

Deep and Surface Approach to Learning

Approach to learning has been the core concept of a research tradition (see e.g., Duff & McKinstry, 2007, for a review) originated from the seminal work of Marton and Säljö (1976), who identified two different approaches of learners in academic study tasks: a "deep" approach focusing on meaning and connections of the contents versus a "surface" approach focusing on fragmented memorization of ideas. Though the conceptualisations of students' learning approaches have subsequently evolved, the two approaches are still widely studied, and a general

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finding has been that deep learning strategies stimulate better quality of learning relative to

surface strategies (Duff & McKinstry, 2007).

While individual students may prefer particular learning approaches, the approaches they

use for academic studies are significantly determined by contextual factors like teaching and

assessment methods (Baeten, Kyndt, Struyven, & Dochy, 2010). Empirical investigations on the

antecedents affecting students' learning approaches can therefore inform how instructional

design and practices may induce a desirable learning approach and the ensuing outcomes. This

area of research has commonly been guided by the 3P framework (Dunkin & Biddle, 1974),

which organises the variables in a learning event or programme into three categories: presage

covers the aspects before learning takes place, including extant characteristics of students (e.g.,

students' prior knowledge) and learning contexts (e.g., teaching quality, assessment methods);

process covers how students engage themselves with the learning activities (e.g., their learning

approach); and product covers the learning outcomes (e.g., academic performance). In 3P

models, presage factors are typically hypothesised as affecting product outcomes through both

direct pathways and indirect pathways mediated by process variables.

Deep Approach for Holistic Competencies

3P models are commonly applied to study academic performance and students' approach

to learning is considered as a process variable determining the learning outcomes. For example,

Prosser and Trigwell (1999) have found that as students use a deep approach to connect elements

of subject matters, they can more readily draw on their knowledge to solve problems in novel

situations. A deep approach to learn entails connecting ideas to prior knowledge and critically

evaluating evidence and arguments for conclusions (Entwistle, McCune, & Walker, 2001),

which could also be facilitative of certain generic competency development. As Kember, Chan,

and Webster (2015) demonstrated, university students who used a deep learning approach would have more advanced cognitive generic attributes (e.g., problem-solving, critical enquiry), though the analogous effects were not observed for social attributes (e.g., collaboration, understanding others). A deep approach, in this sense, opens the possibility to understand the process of nurturing holistic competencies.

However, it would be problematic to simply copy approach to learning as the process variable in holistic competency development. Reasons for this incompatibility are twofold. While approach to learning mainly describes learning taking place in coursework, holistic competencies are favourably developed in authentic contexts (e.g., through community servicing) plus supporting students to construct meaning from the experiences (e.g., through reflection) (Billig, 2000; Chan, 2012; Zins, Bloodworth, Weissberg, & Walberg, 2004). Unlike most problems in academic coursework, authentic problems are usually ill-defined/unstructured and involve personal and social interactions (e.g., working with others, compromising different opinions, reflecting on previous experience). Given the differences in nature, holistic competencies can only be developed instead of learnt.

Another concern would be that it cannot be guaranteed that being a deep learner in academics equals being a deep developer in holistic competencies. In Chan's (2012) study, in which focus-group participants in an experiential activity were interviewed, the researcher found that students who were labeled as deep learners in learning academic knowledge were not necessarily willing to engage in holistic competency development; and those who were engaged might not be engaged deeply. A lack of engagement may be due to a lack of awareness in developing holistic competencies among these deep learners who assume academic knowledge

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weights more than holistic development. Hence, although certain attributes of deep learning

benefit generic skills as mentioned earlier, their association appear to be limited.

Therefore, we propose to adopt the 3P framework to elucidate holistic competency

development in authentic contexts with a renewed approach to learning, namely, the approach to

develop. Analogous to the deep and surface approach to learning, approach to develop is coined

as a construct (process variable) implying different levels of engagement in activities to promote

holistic competencies. Apart from approaches to develop (the process), the motivation

underlying the deep approach (the presage) has also not been investigated in authentic situations.

The adaptation and application of the 3P framework will facilitate understanding of the chain

mechanism (presage, process, product) of developing holistic competencies.

The validity of this construct (approach to develop) was tested in this study by adapting

the 3P framework. Predictions regarding the construct's antecedents (presage variables) and

effects (on the product) were generated and tested. The results of this validity testing would also

provide better understanding of the mechanisms involved in holistic competency development.

To operationalise this investigation, data were collected from the participants of a holistic

competency development programme for secondary school students in Hong Kong (see the

Methodology section for further details). Based on the 3P framework, participants' motivation to

attend and perception of programme were captured as the presage variables, their level of

engagement (approach to develop) was seen as the process variable, and the enhancement of the

participants' holistic competencies was measured as the product. To be more specific,

participants' motivation refers to students' reasons of attending the programme, which may, for

example, originate out of pure interest or be under parents' pressures. Their perception of the

programme refers to how they think of the programme after participation. For example, they

could perceive the programme as a good platform to interact with people or develop new ideas. While approach to develop captures the extent of their engagement, enhancement of holistic competencies means students' sense of improvement concerning highly-regarded skills in holistic competencies such as creativity and problem-solving.

To identify the presage constructs, we built on the well-replicated finding that learners' perceptions of the learning environment influence their choices of learning approaches (Baeten et al., 2010). Elen and Lowyck (2000) showed that students' perceptions/interpretations of the relevance of instructional components affect their engagement in learning activities. In this study we therefore predicted that the students' perception of learning experience would affect their approach to develop (that signified their degree of participation and engagement), and the students' motives to participate in the programme (e.g., for enjoyment, meaningful learning, or fulfilling school expectations) were measured as another presage factor. The programme was highly learner-centred and the participants were expected to derive meaningful learning for themselves through active participation. The students' perception of learning experience was thus hypothesised to be affected by their participation motives (Miller & Brickman, 2004).

In sum, three effects in a sequence were hypothesised: (a) learners' motives affect their perception of learning experience, (b) the perception affects their approach to develop, and (c) their approach to develop determines their holistic competency attainments. This sequential three-path mechanism (effects flowing from motives to perceptions, then to approach to develop, and further to competency development) was examined to test the three component hypotheses (one for each path) simultaneously. Examining this three-path mechanism served dual purposes: testing the construct validity of the approach to develop dimension as well as gaining knowledge

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on the roles of learner motivation, perception and approach in holistic competency development

programmes.

Methodology

Participants and Procedures

The data of this study were collected in Hong Kong from 329 participants (193 males;

136 females; mean age 15.8) of a school-based initiative to enhance the holistic competencies of

students in six partaking secondary schools The participants were to a large extent representative

of secondary school students in Hong Kong as the six partaking schools covered top-tier, mid-

range and low performance schools as well as private and government-aided schools, which has

contributed to heterogeneity in our student sample. Informed consents were received from

parents through the school principals before the programme. Participation was voluntary and the

participants were briefed about the research purpose.

The programme was three-to-four day long and held at the respective school venues or on

the campus of the hosting university, aiming to promote nine competencies such as

communication, leadership, creativity, time, and self- management, as well as nine virtues such

as respect, appreciation, resilience, and self-confidence. The programmes for the respective

schools were of very similar design and rundown, comprising mostly of interactive learning

activities (e.g., role-plays, case studies, and excursions). Students needed to work in groups of

five to six under the guidance of a mentor. For example, in the "Stories of Hong Kong" activity,

student teams had to reach out to different people in the local community and understand their

life stories. Afterwards, students had to present the stories they collected from members of the

community to other teams. Through the activities, students not only developed teamwork,

creativity, and problem-solving competencies, but also the virtues of resilience and openness by

solving adolescent problems. Time was also allocated for the students to reflect on their

experiences and receive feedback from others.

The participants were assigned by their schools to attend the programmes as an

extracurricular event. For learning evaluation purposes, two paper questionnaires were

respectively administered to the participants before and after each programme. Ethical approval

was obtained from the Human Research Ethics Committee of a research-intensive university

prior to data collection.

Measures

The research hypotheses of this study related to four constructs: the participants' motives

or rationales, perception of learning experience (in the programme), approach to develop, and

holistic competency development (through the programme). These variables were measured by

rating items in the two aforementioned questionnaires. The items on participant's motives were

included in the pre-programme questionnaire, and the items on the other three constructs

(participants' perception of learning experience, their approach to develop, and enhancement of

their holistic competencies) were assessed in the post-programme questionnaire. Additionally,

the pre-programme questionnaire included a set of self-rating items on personality attributes (see

below). The personality ratings were collected to statistically control for the potential

confounding influences of personality attributes on the hypothesised relationships. The items on

the four constructs of the hypotheses and the personality attributes are shown in the Appendix.

Rationale for participation. Based on the research team's prior interactions with local

secondary school students, teachers, and parents, 14 items on reasons to join the programme

were constructed to assess the students' rationales for participation. The 14 items were intended

to represent seven common motive categories (two items per category), including work/career

related reasons, meaningfulness, family-related reasons, friendship, fun, school requirements,

and feeling uninterested to participate. Higher rating on an item signified stronger agreement to

its reason description.

Personality attributes. A brief 10-item instrument developed by Gosling, Rentfrow, and

Swann (2003) was used to assess the participants on openness, conscientiousness, extraversion,

agreeableness, and neuroticism (two items per trait). These dimensions were based on the "big

five" personality model which has been substantiated by extensive empirical research (see, e.g.,

John & Srivastava, 1999). On each item, respondents were asked to rate the extent to which two

adjectives apply to themselves that characterise a personality dimension, and each dimension had

two items covering its two ends respectively (e.g., "extraverted, enthusiastic" and "reserved,

quiet" were the items representing the two ends of the extraversion dimension). Gosling et al.

(2003) reported that this instrument was of adequate test-retest reliability and validity. Based on

pre-testing, the original item "open to new experiences, complex" (on openness) was modified as

"open to new experiences, original" for this study. Like "complex", "original" is a feature of

openness (McCrae, 1994), and "original" was found more easily understood by participants. A

score was derived for each personality trait by summing the rating on the item representing the

positive end of the trait and the reverse rating on the item representing its opposite end (e.g., the

extraversion score was computed by adding the rating on "extraverted, enthusiastic" and the

reverse rating on "reserved, quiet").

Perception of learning experience. The item block on perception of learning experience

comprised 16 rating items constructed based on the research team's knowledge on the students

and pre-testing. The items covered both task aspects (e.g., "exposure to real-life problems",

"thinking challenges") and interpersonal/relationship aspects ("authentic connections with

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people", "support from peers") commonly perceived by secondary school students. For each item, higher rating signified more positive perception.

Approach to develop. Based on the researchers' review of the literature, previous pilot studies, and discussion with school students, eleven items on approach to develop were constructed to operationalise and measure participants' approach to develop. The items covered the intensity of engagement (e.g., "persistent in overcoming challenges"), active participation (e.g., "actively explored solutions to problems"), and meaning construction (e.g., "reflected on my behaviours from time to time). Higher rating on each item indicated stronger engagement in processing learning experience for the development of holistic competencies.

Competency development. Self-assessment rating items were used to quantify holistic competencies enhanced through the programme. Individual participants assessed themselves on 13 holistic competencies. These competency choices were based on discussion with the principals and teachers of the partaking schools regarding the developmental needs of students which was how the programme was designed.

To facilitate understanding, all rating items were presented in both Chinese and English on the questionnaires. Back translation procedures were applied to examine whether the Chinese translation of the personality attribute items matched the English version developed by Gosling et al. (2003) and the bilingual version has been cross-checked by the researchers and research team members who are proficient in both languages. Although both Chinese and English are mandatory subjects in the local schools (students being literate in both languages), a bilingual version could increase accuracy in students' comprehension on the items as two languages enable these students to cross-reference the intended meaning of items. This also helps alleviate subtle meaning mismatch caused by translation if only monolingual version was provided.

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Data Analysis

Statistical data analysis was conducted in three stages. First, the quality of data was

reviewed primarily based on descriptive statistics. Second, the respective measurement models

of the constructs in the hypothesised mediation chain (rationales for participation, perception of

learning experience, approach to develop, and competency development) were elucidated.

Finally, a structural model was built based on the measurement models to test the research

hypotheses.

Data were computed using Mplus (version 8) and SPSS (version 23). The fit of models

with data was primarily evaluated using the Comparative Fit Index (CFI), the Root Mean

Squared Error of Approximation (RMSEA), and the Standardised Root Mean Squared Residual

(SRMR). Correspondingly, a CFI above .90, an RMSEA below .08, and an SRMR below .08

were taken as the minimum thresholds of acceptable model fit, as commonly adopted in the

structural equation modeling (SEM) research (Kenny, 2015). Standardised path estimates are

reported hereafter unless otherwise stated.

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Results

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Descriptive Statistics

The 329 participants completed both the pre-programme and post-programme

questionnaires. Overall the proportions of missing data by items were small (all less than 2.13%

with a mean of 0.46% across all items). The test procedure of Little (1988) further suggested that

the data were missing completely at random. Each item received a full range of responses and

the standard deviations of responses on individual items were all indicative of a reasonable level

of variability. The absolute values of the skewness and kurtosis of their distributions were below

1.16 and 3.10 respectively, which were within the ranges (skewness < 2; kurtosis < 7)

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appropriate for maximum likelihood estimation procedures (West, Finch, & Curren, 1995). To account for non-normality and missing data, models were estimated using the maximum likelihood estimator with robust standard errors (MLR) of Mplus.

Measurement Models

Pretesting ascertained the factorability of the ratings on each construct in the research hypotheses with respect to the (a) determinants of their correlation matrices, (b) Barlett's test of sphericity, and (c) Kaiser-Meyer-Olkin test of sampling adequacy. To elucidate the factor structure of each construct, its indicator items were first subject to parallel analysis to determine the number of underlying factors. If the number was greater than one, exploratory factor analysis (EFA) would be conducted to suggest the items' loading pattern before confirmatory factor analysis (CFA) was performed to finalise the measurement model. The factor structure of the personality attribute items was not analysed, as in the SEM testing model (see below), they were only used as manifested variables for statistical control of their potential confounding influences on the hypothesised mediation relationships.

Rationale for participation. Application of parallel analysis for the 14 reasons for participation suggested that a three-factor solution would be optimal for modeling their latent structure. The components with the highest three initial eigenvalues extracted from the sample data were 5.14, 2.64 and 1.13 respectively (the fourth one being 0.90), and they together accounted for 63.6% of the total variance. EFA using the MLR estimator and geomin rotation suggested a clear and interpretable loading pattern of the 14 items around three factors (based on the commonly used standardised loading cut-off of 0.35): The first factor comprised item 1, item 2, item 3, item 5, item 8, item 9, and item 13 (please refer to the Appendix for the items' wording). These reasons share the common theme of personal interest, like fun (item 1), friends

(item 5), and meaningfulness (item 8). The second factor had item 4, item 10, item 11, and item 12, which all involve meeting others' expectations, like family reasons/expectations (item 4, item 10), networking with potential employer (item 11) and receiving credit or a certificate (item 12). The third factor consisted of item 6 ("not sure why"), item 7 (school requirement), and item 14 ("actually not interested") that all indicated a lack of motivation to participate in the programme. These three factors were thus labelled as Self-directed, Externally Driven and Involuntary respectively.

This EFA structure, comprising three co-varying factors and the 14 items loading on their respective factors as listed above, was subject to CFA. When all items' residuals were constrained to be uncorrelated, this CFA model did not fit the data acceptably, MLRχ^2 = 243.8, df = 74, p < .001; CFI = .897; RMSEA = .084 [90% CI: 0.072 - 0.095]; SRMR = .064. Examination of the modification indices (one modification in one step) suggested that the residual correlations within three pairs of items could be allowed, and could be justified in terms of similarity in contents with each item pair: item 4 with item 10; item 6 with item 7; and item 2 with item 3. If these residual correlations (but no others) were allowed, reasonable fit for data was attained, MLRχ^2 = 169.1, df = 71, p < .001; CFI = .940; RMSEA = .065 [90% CI: 0.052 - 0.077]; SRMR = .055. In this model (with the three residual correlations allowed), each of the 14 items loaded on one and only one factor (i.e., no cross-loadings), and all item loadings were substantial (all loadings > .384) and statistically significant (all ps <.001). This three-factor structure was retained as the measurement model for rationales of participation. The internal consistency of the three factors ranged from satisfactory to modest as measured by McDonald's omega (ω): 0.89 for Self-directed (seven items), 0.72 for Externally Driven (four items), and 0.61 for Involuntary (three items). These levels of reliability were considered acceptable given

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that the measurement instruments of this research were at an early stage of development

(Nunnally & Bernstein, 1994).

Perception of learning experience. Regarding the 16 items on perception of learning

experience, parallel analysis suggested that their factor structure was essentially unidimensional

as intended. The first principal component had an eigenvalue of 7.30 and accounted for 45.6% of

the total variance. CFA revealed that, while a one-factor model with all item residuals

constrained to be uncorrelated did not fit the data acceptably (MLRχ^2 = 353.8, df = 104, p <

.001; CFI = .854; RMSEA = .085 [90% CI: 0.076 - 0.095]; SRMR = .059), the misfit could be

significantly alleviated by allowing the residuals to be correlated within two pairs of consecutive

items: item 10 with item 11 and item 15 with item 16. A one-factor model with only these two

item-residual correlations (i.e., no other) allowed was retained as the measurement model for

perception of learning experience: Its data fit was acceptable (MLRχ^2 = 246.3, df = 102, p <

.001; CFI = .916; RMSEA = .066 [90% CI: 0.055 - 0.076]; SRMR = .052), and all item loadings

were substantial (all above 0.531) and statistically significant (all ps <.001). The internal

consistency of this factor (ω = .91) was satisfactory.

Approach to develop. Parallel analysis conducted on the 11 items assessing approach to

develop likewise pointed to a unidimensional structure as intended. The first principal

component had an eigenvalue of 5.32 and accounted for 48.3% of the total variance. The data fit

of a one-factor structure with uncorrelated residuals was marginally acceptable (MLRχ^2 = 132.4,

df = 44, p < .001; CFI = .915; RMSEA = .078 [90% CI: 0.063 - 0.094]; SRMR = .052).

However, if the residuals correlations within two pairs of consecutive items, item 1 with item 2

and item 5 with item 6, could be freely estimated, the unidimensional solution could fit the data

satisfactorily (MLRχ^2 = 96.0, df = 42, p < .001; CFI = .948; RMSEA = .062 [90% CI: 0.046 -

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0.079]; SRMR = .045). In this modified structure, all item loadings were substantial (all above

0.519) and significant (all *ps* <.001). Thus a one-factor structure with only the two item-residual

correlations (i.e., no other) allowed was retained as the measurement model for approach to

develop. The internal consistency of this factor (ω = .88) was satisfactory.

Competency development. Holistic competency enhancement through the programme

was self-rated by participants on a three-point ordinal scale, for which the weighted least squares

means and variance adjusted (WLSMV) estimator is appropriate for analysing the items' latent

structure (e.g., Beauducel & Herzberg, 2006). However, concerns have been noted for applying

parallel analysis on latent correlation matrices (Muthen, 2013) involved in WLSMV estimation.

Parallel analysis was thus conducted using the MLR estimator as an alternative (Finney &

Distefano, 2013) on the observed correlation matrix of the competency enhancement ratings,

which suggested that the ratings were essentially unidimensional. The first principal component

had an eigenvalue of 6.28 and accounted for 48.3% of the total variance. Unidimensionality of

the items was further ascertained by (a) the satisfactory data fit of a one-factor structure with

uncorrelated residuals for the items (MLRχ^2 = 168.1, *df* = 65, *p* < .001; CFI = .916; RMSEA =

.070 [90% CI: 0.057 - 0.083]; SRMR = .051), and (b) all 13 items loading on a single factor

(loading coefficients ranged from 0.568 to .728, all *ps* <.001).

Given this latent structure of the items (single factor, similar loading magnitudes, and

uncorrelated residuals), the overall improvement in the holistic competencies of each participant

was taken as reasonably represented by the unweighted mean of the 13 items' ratings. This

composite score was then useable as a continuous variable to betoken competency development

in the structural model (see below) for testing the research hypotheses, even though the

individual items were on a three-point scale. The internal consistency of this composite score

(ω = .91) was satisfactory. The mean and standard deviation of the composite score (M = 2.15

for a possible range of 1 to 3; SD = 0.39) suggested that the participants generally perceived their

holistic competencies as improved by the programme. The composite score's skewness and

kurtosis (- 0.065 and 0.491 respectively) were well within the absolute-value ranges (skewness <

2; kurtosis < 7) appropriate for maximum likelihood estimation procedures (West et al., 1995).

Structural Models

The schematic representation of this research's conceptual model was shown in Figure 1

and the structural model for testing the research hypotheses was set up as shown in Figure 2.

Each construct in the hypothesised mediation process corresponded to a latent variable, except

that competency development enhancement was represented by its composite score. The retained

measurement models for the latent constructs as detailed above were used to specify their

indicator items and the item residual correlations allowed respectively. Apart from the residual

correlational paths specified in the respective measurement models, all residuals or disturbances

in the model were constrained to be uncorrelated. The model parameters and mediation effects of

interest were estimated using the MLR estimator. As the effect estimates might deviate

considerably from symmetrical distributions (Bollen & Stine, 1990), bias-corrected bootstrap

95% confidence intervals (BC 95% CI) were computed using 5,000 bootstrap samples for the

tested effects to cross validate the results as commonly recommended (e.g., MacKinnon,

Lockwood, & Williams, 2004).

(INSERT FIGURE 1 ABOUT HERE)

The structural model (see Figure 2) fit the data reasonably well, MLRχ^2 = 1258.6, df =

798, p < .001; CFI = .917; RMSEA = .042 [90% CI: 0.037 - 0.046]; SRMR = .053. The loadings

of all indicator items on their respective latent variables were substantial and statistical

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significant (all loadings > .378; all *ps* <.001). Overall, the model accounted for 45.1% of the

variance of the composite score on competency enhancement. As Figure 2 displays, only four

direct effects among the constructs were significant based on both MLR standard error (*SE*)

estimates and bias-corrected bootstrap confidence limits: the direct effect of

(a) self-directed motivation on perception of learning experience (standardised path coefficient,

$b^* = 0.588$; $b^*/SE = 6.415$; $p < .001$; BC 95% CI: $0.389 - 0.804$);

(b) perception of learning experience on approach to develop ($b^* = 0.918$; $b^*/SE = 16.593$; $p <$

.001 ; BC 95% CI: $0.755 - 1.008$);

(c) approach to develop on competency development ($b^* = 0.498$; $b^*/SE = 3.031$; $p = .002$; BC

95 CI: $0.139 - 0.869$); and

(d) self-directed motivation on competency development ($b^* = 0.333$; $b^*/SE = 3.093$; $p = .002$;

BC 95% CI: $0.116 - 0.586$).

(INSERT FIGURE 2 ABOUT HERE)

This study hypothesised a three-path mediation effect that learner motives indirectly

affect competency development sequentially through perception of learning experience and

approach to develop as mediators. Among the three factors of participants' rationales, only self-

directed motivation predicted perception of learning experience. This study's research

hypotheses were thus evaluated based on the three-path indirect effect from the self-directed

factor to competency development transmitted through perception of learning experience and

approach to develop. The statistical significance of this three-path indirect path (standardised

effect estimate = 0.269, estimate/*SE* = 2.748; $p = .006$; BC 95% CI: $0.090 - 0.561$) supported the

research hypotheses, and the significant direct impact of self-direction motivation on competency

development [direct effect (d) discussed above] indicated that the three-path indirect effect was a case of partial mediation. This indirect effect was 45.7% of the total effect based on ratio of the standardised path coefficients, though as noted by MacKinnon, Warsi, and Dwyer (1995) this ratio may vary considerably across samples given the sample size (of less than 500), i.e., the ratio might not be a stable estimate.

To ascertain whether the effects observed in this study might be attributable to the potential confounding influences of personality characteristics, the aforementioned three-path indirect effect was re-tested with the five scores from this study's personality measures included as control covariates. The structural model with these personality covariates included fit the data acceptably, MLRχ^2 = 1551.0, df = 978, p < .001; CFI = .902; RMSEA = .042 [90% CI: 0.038 - 0.046]; SRMR = .052. The loadings of all indicator items on their respective latent variables remained substantial and statistical significant (all loadings > .387; all ps <.001). With respect to the specific statistical tests of interest, both the hypothesised three-path indirect effect (standardised effect estimate = 0.223, estimate/SE = 2.034; p = .042; BC 95% CI: 0.005 – 0.598) and the direct path from self-directed motivation to competency development (b^* = 0.328; b^*/SE = 2.759; p = .006; BC 95% CI: 0.070 – 0.640) remained significant. Therefore, the present results that supported the research hypotheses could not be attributed to confounding influences of personality attributes.

Discussion

While engaging students to address authentic problems has been found effective for cultivating their holistic competencies (Chan, 2012; Zins et al., 2004), the learning-behaviour mechanisms involved were not well understood. This study postulated that the 3P framework can be applied with modifications to gain insights on the mechanisms, and for this purpose the

process construct (approach to develop) needs to reflect the extent to which the learners are

meaningfully engaged with the authentic contexts. Specifically this study hypothesised that

learners' motives, perception of their learning experience, approach to develop, and development

of holistic competencies are linked by a three-path mediation effect chain: (a) learner motives

affect their perception on the value of the learning tasks/activities, (b) this perception affects

their approach to develop, and (c) their approach to develop determines their attainments on

holistic competencies.

The SEM model representing the hypothesised relationships and mediators fit the data

well. The measurement parts of the model indicated that students' rationales of participation

clustered interpretably without cross-loadings around three factors characterised by being self-

directed, externally driven, and involuntary respectively, while the items measuring perception of

learning environment, approach to develop, and competency development were essentially

unidimensional as intended. The structural relationships among the latent constructs were

consistent with the research hypotheses: Self-directed motivation engendered competency

development both through a direct (unmediated) effect and a three-path mechanism mediated by

perception of learning experience and approach to develop sequentially as hypothesised, whereas

the two mediator variables and competency development were not significantly affected by the

other two motivation factors. The direct and indirect effects of self-directed motivation were

statistically significant based on both robust maximum likelihood and bootstrap estimation, and

their effect sizes were substantial. Also, having self-directed motivation as the initial variable of

the mediational chain was justified given that participants' motives were measured (by the pre-

programme questionnaire) before the mediators and competency development (by the post-

programme questionnaire). Additionally, the direct and three-path mediation effects of self-

directed motivation remained significant after the potential confounding influences of personality

attributes had been controlled statistically.

The three-path mediation effects observed both validated the approach to develop

construct and enhanced the understanding on how learners' motives influence their approach to

develop and holistic competency development. To the extent a learning activity is aligned with

the learners' motives, the learners perceive it positively and participate actively, and their

engagement (in sub-processes like seeking meaningful experiences and feedback, observation,

and reflection) contribute positively to their holistic competencies. Nonetheless, in the present

study, this mediation path only accounted for part of the overall effect from self-directed

motivation to competency development outcome. Thus there might be other effect pathways

from learner motivation to learning outcomes that were not represented in the model.

The results that the hypothesised mediation effects were observed for self-directed

motives of participation but not for externally driven and involuntary rationales were consistent

with the self-determination theory (SDT; Deci & Ryan, 2012), which posits that motivation for

an action (e.g., joining a programme) can be distinguished qualitatively into different types with

different behavioural repercussions. In particular, learner motives characterised by a high degree

of autonomy have been found associated with stronger persistence and engagement in

performing and learning (Deci & Ryan, 2012). In line with this general finding, this study

showed that the degree of self-directed (i.e., autonomous) motivation significantly influenced

competency development while the intensity of the other rationales of participation (externally

driven or involuntary ones) did not significantly affect competency development.

Practical Implications

Schools and teachers should take this study's findings into consideration when designing the curricula and activities to develop students' holistic competencies. As this study revealed, secondary school students likely resonate with activities that will bring enjoyment, friendship and meaningfulness. These aspects can be incorporated and highlighted when learning activities are designed and communicated to target participants. As some students may not recognise any personal value in the activities initially, information on students' motives to participate can be collected pre-programme (e.g., using a pre-programme questionnaire as in this research) to help identify those participants who require prompt individual guidance. In this connection, this study suggested that the motives to meet others' expectations and token awards (e.g., certificates, school credits) per se are not associated with holistic competency enhancement, though practically the awards often provide incentives for students to join learning events in the first place.

This study has demonstrated that the 3P framework, which is typically applied to academic studies in university context, can also be extended to explain holistic competency development of secondary school students. Barrie's (2006, 2007) study revealed the views and practices of university teachers and academics, and this study provided findings from the students' perspectives. His study and the present study together provide some implications for the teachers regardless of levels and disciplines that can be used to facilitate students' holistic competency development. Barrie's (2006) study has shown that teachers, who hold the Translation and Enabling conceptions and believe in engaging students in learning activities to develop their holistic competencies (Barrie, 2007), can more likely encourage their students to develop self-directed motives and value holistic competency. Teachers should be made aware of

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the fact that holistic competencies are not an "adjunct", "supplementary", and "unrelated" to academic knowledge that can only be developed through remedial channels (Barrie, 2007), but rather they should be linked and taught in the context of academic knowledge so that students would understand the relevance of these competencies and develop self-directed motives to take part in learning activities. Furthermore, teachers should also be encouraged to pay more attention to how students engage in developing holistic competencies and their learning experience. From the findings, case studies (on a separate study), and observations, students are more readily engaged and willing if they expect the programme to be fun, meaningful and/or allow them to make friends. When students realise that the learning activities are relevant in the sense that activities contribute to their school and community life, they would be more engaged. This is undoubtedly true given the importance of social acceptance at this age. This kind of engagement is more effective than credits, rewards, or any external driven means. If their rationale or motives are negative and their perception of experience are also negative, it is possible their approach to develop will be less engaged, in fact, an *avoid* approach may be taken.

Limitations and Future Research

While we believe this study added both theoretical and practical insights, the findings should be delimited from methodological considerations. In terms of research design, as all data analysed were derived from self-report measures using similar multiple-choice question formats, common method related variance (e.g., arising from social desirability) might have affected our statistical estimates. The results can be further enriched by experimental design or observational methods in future studies. Generalizability with respect to the limited representativeness of our participant sample should also be noted. While a representative variety of schools (e.g., by

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academic performance tiers, private versus government-aided) were included, all participants

from the schools were of similar age and they have mostly grown up within the Hong Kong

Chinese culture. Our data in this study did not allow an assessment to what extent our findings

might have been affected by the students' age or cultural background. Our assumption is that as

our hypothesised relationships were built on general psychological theorizing, the results should

be of reference value across age and culture.

In our sample, the students were nested within schools, though multi-level analysis to

examine the potential influences of school-level factors was not feasible. At the individual level,

the key variables in our structural model were indicated by bespoke items constructed for this

research (apart from the items of the personality covariates). Since the measures had not been

studied elsewhere, nomological validity information of the measures independent of this study

were not available. In particular, the quality of the competency development measurement might

depend on the accuracy and candidacy of participants when reporting their learning from the

programme. The participation-rationale factors identified in this study might have also been

limited by the range of rating items presented to the participants, and some of the rationales to

participate might not be applicable or relevant to some learner populations. For example, in

Hong Kong nowadays secondary school graduates mostly continue with some forms of further

studies (e.g., tertiary or vocational) before commencement of their careers. Thus for school

students (as found in this study) the need "to network with potential employers", which is a self-

directed motive for participation, may not be relevant. However, the same rationale may load

more strongly on the self-directed factor for tertiary students who are about to join the

workforce.

For future research, the effects of self-directed motivation on competency development can be further explored using more fine-grained measures to find out how the effects may vary across populations (e.g., university versus school students) and learning events (e.g., personal development programmes, community service programmes). For practical purposes, future research may also explore various strategies to raise students' awareness of the importance of competency development activities to themselves (e.g., using different framing and/or orientation of the activities).

In conclusion, this study supported the overall proposition that students who are more driven by self-directed motives perceive personal development activities more positively, which engenders higher level of engagement in their approach to develop that in turn facilitates holistic competency development. These findings enhance the understanding on the mechanism through which learners' motives affect holistic competency development. The results also point to the need to ensure students appreciate the relevance of the learning activities to themselves when designing and communicating programmes for developing their holistic competencies.

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Appendix

Rating Items of This Study

  The data used in this study were collected from the rating statements below. A five-point Likert scale, from "1" (*strongly disagree*), "2" (*agree*), to "5" (*strongly agree*), was used unless otherwise stated. The items were presented to participants in both Chinese and English. Only the English version is included in this appendix for economy of space.

Rationale for participation

(1) I anticipate the programme will be fun.
(2) The programme is helpful to my work in the future.
(3) The programme's activities are of great value to me.
(4) I attend the programme because of family reasons.
(5) The programme can help me to make friends.
(6) I am not sure why I need to join the programme.
(7) It is a school requirement to participate in this programme.
(8) The programme's events are meaningful.
(9) Participating in the programme allows me to have extra time with my friends.
(10) I attend the workshop because of my family's expectations.
(11) The programme allows me to network with potential employers.
(12) I can receive a certificate or credit for completing the programme.
(13) I always enjoy extra-curricular activities.
(14) I am actually not interested to join the programme.

Perception of learning experience

This programme provided me with…

(1) exposure to real-life problems
(2) thinking challenges
(3) stimulation to develop new ways of thinking
(4) opportunities to interact with people outside of my school
(5) practices to influence others
(6) opportunities to exchange ideas with others
(7) authentic connections with people
(8) new perspectives on my relationships with others
(9) feedback on the impact of my behaviours
(10) opportunities to connect to myself
(11) opportunities for raising my self-awareness
(12) encouragement from mentors or teachers
(13) support from peers
(14) activities in line with my interests or values.
(15) Overall the programme was of learning value to me.
(16) Overall the programme was an enjoyable experience to me.

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Approach to develop

During the programme,

    (1)   I participated in teamwork
    (2)   I was persistent in overcoming challenges
    (3)   I motivated others to complete activities/tasks
    (4)   I exerted effort to participate beyond instructions
    (5)   I was touched by some of the experiences
    (6)   I was opened to others' suggestions and feedback
    (7)   I reflected on my behaviours from time to time
    (8)   I developed new ideas to make sense of my experiences
    (9)   I applied my learning to tackle new problems
    (10) I actively explored solutions to problems.
(11)   Overall I was engaged in the programme.

Competency development

Holistic competencies is an umbrella term that describes a person's general abilities and attributes, including creativity, critical thinking, problem-solving skills, teamwork, collaborative skills, and so on. Please rate the degree to which this programme has enhanced the following holistic competencies for you [on a three-point scale, from "1" (*not improved*), "2" (*somehow improved*), and "3" (*largely improved*)]

    (1)   Creativity
    (2)   Critical thinking
    (3)   Problem-solving
    (4)   Team work/collaboration
    (5)   Self-confidence
    (6)   Consideration for others
    (7)   Appreciation for others
    (8)   Respect for others
    (9)   Manners
    (10) Self-management
    (11) Responsibility
    (12) Resilience (learning from failure)
    (13) Leadership.

Personality attribute

The following characteristics apply to me [rated on a seven-point scale, from "1" (*strongly disagree*), "2" (*moderately disagree*), 3 (*disagree a little*), to "7" (*strongly agree*)].

(1)   Extraverted, enthusiastic
(2)   Critical, quarrelsome
(3)   Dependable, self-disciplined
(4)   Anxious, easily upset
(5)   Open to new experiences, original
(6)   Reserved, quiet
(7)   Sympathetic, warm
(8)   Disorganized, careless
(9)   Calm, emotionally stable
(10)   Conventional, uncreative.

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Fig.1. Schematic Representation of the Proposed Modified Holistic Competency Development Framework

Fig. 2. Structural Model for Testing the Hypothesised Two-Sequential-mediator Process That Transmits the Influences of Participation Rationales to Holistic Competency Development.

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Students' "Approach to Develop" in Holistic Competency – an Adaption of the 3P Model

Abstract

In response to the global imperative of nurturing all-round students, educational institutions and schools worldwide have been developing learning activities targeting holistic competency development of students. However, there have been resistance and challenges on how to develop such competencies. Extending the Presage-Process-Product (3P) framework to holistic competency development, this study examined the relationship between students' motivation, perception, their approach to develop, and learning outcomes in those activities. To that end, 329 secondary-school students who participated in a school-based initiative to enhance holistic competencies responded to pre- and post- programme questionnaires regarding the aforementioned four constructs. Descriptive statistics, measurement modelling, and structural equation modelling analyses supported that learners who are more driven by self-directed motives such as enjoyment and friendship building perceive the learning activities more positively, and thus, engenders higher level of engagement which in turn enhances holistic competency development.

Keywords: Generic skills; Competencies; Motivation; Approach to Develop; Presage-Process-Product framework

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Introduction

In the past few decades, increasing efforts have been made around the globe to integrate holistic competencies into academic learning at schools and universities to facilitate all-round development of students (Humphrey, 2013; Weare, 2010; Zhang, 2013). However, these efforts have met a number of conceptual and operational challenges, including the different and often conflicting perceptions and understandings of holistic competencies held by key stakeholders such as teachers and students (Chan, 2012; Hughes & Barrie, 2010).

To ensure effective integration and implementation of holistic competency education, understanding the diversity of practices and views held by these stakeholders is crucial. What are the holistic competencies from their perspectives? Do they consider holistic competencies important? How do they teach and develop these competencies? These are all central to the design and implementation of any holistic competency programmes. What is even more important, as Chan and Fong (2018) and Chan, Zhao and Luk (2017) have explored, is the alignment of the views and approaches of these different stakeholders. As teachers, their perceptions of holistic competencies and approaches to teaching these competencies have a flow-on effect on the students. The lack of a systematic curriculum and variations in teaching practices would leave the students unclear about the purpose and expectations of holistic competency development, which, in turn, will reduce their motivation to develop holistic competencies.

With a view to contributing to the alignment of the perceptions and development approaches of teachers and students, the aim of this paper is twofold. Firstly, it will investigate students' motives and approaches to develop holistic competency. It will develop a model based on the *Presage-Process-Product* (3P) framework (Dunkin & Biddle, 1974), to explore how students' motives affect learning approaches by drawing on the data obtained from a personal

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development programme for secondary school students. Secondly, to conclude this paper, it will also discuss the implications for the approaches teachers can use to facilitate students' holistic competencies, as informed by the findings of this study. This study will deepen the understanding on the impact of students' motives in holistic competency development activities and underscore the significance of aligning learning activities with students' learning motives. It will provide implications for the approaches teachers can adopt to develop students' holistic competencies.

Conceptions of Holistic Competencies

Holistic competency is an umbrella term inclusive of different types of generic skills (e.g. critical thinking, problem-solving skills), positive values, and attitudes (e.g. resilience, appreciation for others) which are essential for students' life-long learning and whole-person development (Chan, Fong, Luk, & Ho, 2017). It is used interchangeably with other terms such as 'employability skills', 'soft skills', '21st century skills', and 'generic attributes'. In university policy missions and statements, it is often referred to as 'graduate attributes'. As Barrie (2005) points out, this variety of terms used has indicated the absence of an agreed conceptual definition for holistic competencies which is essential for the design of a coherent holistic competency curriculum.

Given the ambiguity in definition, some scholars endeavour to categorize and conceptualise holistic competencies in the education context to promote understanding (e.g., Bridges, 1993; Chadha, 2006). One of the most influential research would be Barrie's work (Barrie, 2006, 2007) on the conception of holistic competencies and their teaching approaches.

By interviewing academics, Barrie (2006) observed prominent diversity in their understanding of holistic competencies. Captured in his Conceptions of Generic Attributes

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Model, holistic competencies could be perceived additively as "*precursor*" which should have been developed before entering university or as "*complement*" that are separate from disciplinary knowledge, or perceived integrally as "*translation*" that help students apply disciplinary knowledge in non-disciplinary contexts or as "*enabling*" that infuse and enable all scholarly learning and knowledge. These varied conceptions on what holistic competencies are accordingly lead to different pedagogies these teachers would adopt (Barrie, 2007). To name one example, teachers who see holistic competencies as "*complement*" would tend to teach them in a separate curriculum instead of embedding the skills into disciplinary courses. Traces can also be found in earlier studies that similarly reveal diverse conceptions on holistic competencies (e.g. Drummond, Nixon, & Wiltshire, 1998; Chadha, 2006)

Beneficial as Barrie's research is, his papers are based on the views of teachers only. It would not be appropriate to leave out students' responses if we are to truly promote an effective and coherent curriculum. This also drives the current study to address the conceptual gap in understanding students' perceptions and approaches towards holistic competencies. In what follows, approaches to learning will be discussed to bring in students' role regarding this matter.

Deep and Surface Approach to Learning

Approach to learning has been the core concept of a research tradition (see e.g., Duff & McKinstry, 2007, for a review) originated from the seminal work of Marton and Säljö (1976), who identified two different approaches of learners in academic study tasks: a "deep" approach focusing on meaning and connections of the contents versus a "surface" approach focusing on fragmented memorization of ideas. Though the conceptualisations of students' learning approaches have subsequently evolved, the two approaches are still widely studied, and a general

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finding has been that deep learning strategies stimulate better quality of learning relative to surface strategies (Duff & McKinstry, 2007).

While individual students may prefer particular learning approaches, the approaches they use for academic studies are significantly determined by contextual factors like teaching and assessment methods (Baeten, Kyndt, Struyven, & Dochy, 2010). Empirical investigations on the antecedents affecting students' learning approaches can therefore inform how instructional design and practices may induce a desirable learning approach and the ensuing outcomes. This area of research has commonly been guided by the 3P framework (Dunkin & Biddle, 1974), which organises the variables in a learning event or programme into three categories: presage covers the aspects before learning takes place, including extant characteristics of students (e.g., students' prior knowledge) and learning contexts (e.g., teaching quality, assessment methods); process covers how students engage themselves with the learning activities (e.g., their learning approach); and product covers the learning outcomes (e.g., academic performance). In 3P models, presage factors are typically hypothesised as affecting product outcomes through both direct pathways and indirect pathways mediated by process variables.

Deep Approach for Holistic Competencies

3P models are commonly applied to study academic performance and students' approach to learning is considered as a process variable determining the learning outcomes. For example, Prosser and Trigwell (1999) have found that as students use a deep approach to connect elements of subject matters, they can more readily draw on their knowledge to solve problems in novel situations. A deep approach to learn entails connecting ideas to prior knowledge and critically evaluating evidence and arguments for conclusions (Entwistle, McCune, & Walker, 2001), which could also be facilitative of certain generic competency development. As Kember, Chan,

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and Webster (2015) demonstrated, university students who used a deep learning approach would have more advanced cognitive generic attributes (e.g., problem-solving, critical enquiry), though the analogous effects were not observed for social attributes (e.g., collaboration, understanding others). A deep approach, in this sense, opens the possibility to understand the process of nurturing holistic competencies.

However, it would be problematic to simply copy approach to learning as the process variable in holistic competency development. Reasons for this incompatibility are twofold. While approach to learning mainly describes learning taking place in coursework, holistic competencies are favourably developed in authentic contexts (e.g., through community servicing) plus supporting students to construct meaning from the experiences (e.g., through reflection) (Billig, 2000; Chan, 2012; Zins, Bloodworth, Weissberg, & Walberg, 2004). Unlike most problems in academic coursework, authentic problems are usually ill-defined/unstructured and involve personal and social interactions (e.g., working with others, compromising different opinions, reflecting on previous experience). Given the differences in nature, holistic competencies can only be developed instead of learnt.

Another concern would be that it cannot be guaranteed that being a deep learner in academics equals being a deep developer in holistic competencies. In Chan's (2012) study, in which focus-group participants in an experiential activity were interviewed, the researcher found that students who were labeled as deep learners in learning academic knowledge were not necessarily willing to engage in holistic competency development; and those who were engaged might not be engaged deeply. A lack of engagement may be due to a lack of awareness in developing holistic competencies among these deep learners who assume academic knowledge

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weights more than holistic development. Hence, although certain attributes of deep learning

benefit generic skills as mentioned earlier, their association appear to be limited.

Therefore, we propose to adopt the 3P framework to elucidate holistic competency

development in authentic contexts with a renewed approach to learning, namely, the approach to

develop. Analogous to the deep and surface approach to learning, approach to develop is coined

as a construct (process variable) implying different levels of engagement in activities to promote

holistic competencies. Apart from approaches to develop (the process), the motivation

underlying the deep approach (the presage) has also not been investigated in authentic situations.

The adaptation and application of the 3P framework will facilitate understanding of the chain

mechanism (presage, process, product) of developing holistic competencies.

The validity of this construct (approach to develop) was tested in this study by adapting

the 3P framework. Predictions regarding the construct's antecedents (presage variables) and

effects (on the product) were generated and tested. The results of this validity testing would also

provide better understanding of the mechanisms involved in holistic competency development.

To operationalise this investigation, data were collected from the participants of a holistic

competency development programme for secondary school students in Hong Kong (see the

Methodology section for further details). Based on the 3P framework, participants' motivation to

attend and perception of programme were captured as the presage variables, their level of

engagement (approach to develop) was seen as the process variable, and the enhancement of the

participants' holistic competencies was measured as the product. To be more specific,

participants' motivation refers to students' reasons of attending the programme, which may, for

example, originate out of pure interest or be under parents' pressures. Their perception of the

programme refers to how they think of the programme after participation. For example, they

> **Commented [JY1]:** Just hope to minimize the potential misunderstanding that the motivation construct here is a dichotomy (interest vs pressure)

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could perceive the programme as a good platform to interact with people or develop new ideas. While approach to develop captures the extent of their engagement, enhancement of holistic competencies means students' sense of improvement concerning highly-regarded skills in holistic competencies such as creativity and problem-solving.

To identify the presage constructs, we built on the well-replicated finding that learners' perceptions of the learning environment influence their choices of learning approaches (Baeten et al., 2010). Elen and Lowyck (2000) showed that students' perceptions/interpretations of the relevance of instructional components affect their engagement in learning activities. In this study we therefore predicted that the students' perception of learning experience would affect their approach to develop (that signified their degree of participation and engagement), and the students' motives to participate in the programme (e.g., for enjoyment, meaningful learning, or fulfilling school expectations) were measured as another presage factor. The programme was highly learner-centred and the participants were expected to derive meaningful learning for themselves through active participation. The students' perception of learning experience was thus hypothesised to be affected by their participation motives (Miller & Brickman, 2004).

In sum, three effects in a sequence were hypothesised: (a) learners' motives affect their perception of learning experience, (b) the perception affects their approach to develop, and (c) their approach to develop determines their holistic competency attainments. This sequential three-path mechanism (effects flowing from motives to perceptions, then to approach to develop, and further to competency development) was examined to test the three component hypotheses (one for each path) simultaneously. Examining this three-path mechanism served dual purposes: testing the construct validity of the approach to develop dimension as well as gaining knowledge

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on the roles of learner motivation, perception and approach in holistic competency development programmes.

Methodology

Participants and Procedures

The data of this study were collected in Hong Kong from 329 participants (193 males; 136 females; mean age 15.8) of a school-based initiative to enhance the holistic competencies of students in six partaking secondary schools The participants were to a large extent representative of secondary school students in Hong Kong as the six partaking schools covered top-tier, mid-range and low performance schools as well as private and government-aided schools, which has contributed to heterogeneity in our student sample. Informed consents were received from parents through the school principals before the programme. Participation was voluntary and the participants were briefed about the research purpose.

The programme was three-to-four day long and held at the respective school venues or on the campus of the hosting university, aiming to promote nine competencies such as communication, leadership, creativity, time, and self- management, as well as nine virtues such as respect, appreciation, resilience, and self-confidence. The programmes for the respective schools were of very similar design and rundown, comprising mostly of interactive learning activities (e.g., role-plays, case studies, and excursions). Students needed to work in groups of five to six under the guidance of a mentor. For example, in the "Stories of Hong Kong" activity, student teams had to reach out to different people in the local community and understand their life stories. Afterwards, students had to present the stories they collected from members of the community to other teams. Through the activities, students not only developed teamwork, creativity, and problem-solving competencies, but also the virtues of resilience and openness by

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solving adolescent problems. Time was also allocated for the students to reflect on their experiences and receive feedback from others.

The participants were assigned by their schools to attend the programmes as an extracurricular event. For learning evaluation purposes, two paper questionnaires were respectively administered to the participants before and after each programme. Ethical approval was obtained from the Human Research Ethics Committee of a research-intensive university prior to data collection.

Measures

The research hypotheses of this study related to four constructs: the participants' motives or rationales, perception of learning experience (in the programme), approach to develop, and holistic competency development (through the programme). These variables were measured by rating items in the two aforementioned questionnaires. The items on participant's motives were included in the pre-programme questionnaire, and the items on the other three constructs (participants' perception of learning experience, their approach to develop, and enhancement of their holistic competencies) were assessed in the post-programme questionnaire. Additionally, the pre-programme questionnaire included a set of self-rating items on personality attributes (see below). The personality ratings were collected to statistically control for the potential confounding influences of personality attributes on the hypothesisedzed relationships. The items on the four constructs of the hypotheses and the personality attributes are shown in the Appendix.

> **Commented [JY2]:** Hope these changes are sufficient for addressing the associate editor's point 2.

> **Commented [JY3]:** For style alignment. (We use "ise" elsewhere in the paper for "hypothesized")

Rationale for participation. Based on the research team's prior interactions with local secondary school students, teachers, and parents, 14 items on reasons to join the programme were constructed to assess the students' rationales for participation. The 14 items were intended

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to represent seven common motive categories (two items per category), including work/career

related reasons, meaningfulness, family-related reasons, friendship, fun, school requirements,

and feeling uninterested to participate. Higher rating on an item signified stronger agreement to

its reason description.

Personality attributes. A brief 10-item instrument developed by Gosling, Rentfrow, and

Swann (2003) was used to assess the participants on openness, conscientiousness, extraversion,

agreeableness, and neuroticism (two items per trait). These dimensions were based on the "big

five" personality model which has been substantiated by extensive empirical research (see, e.g.,

John & Srivastava, 1999). On each item, respondents were asked to rate the extent to which two

adjectives apply to themselves that characterise a personality dimension, and each dimension had

two items covering its two ends respectively (e.g., "extraverted, enthusiastic" and "reserved,

quiet" were the items representing the two ends of the extraversion dimension). Gosling et al.

(2003) reported that this instrument was of adequate test-retest reliability and validity. Based on

pre-testing, the original item "open to new experiences, complex" (on openness) was modified as

"open to new experiences, original" for this study. Like "complex", "original" is a feature of

openness (McCrae, 1994), and "original" was found more easily understood by participants. A

score was derived for each personality trait by summing the rating on the item representing the

positive end of the trait and the reverse rating on the item representing its opposite end (e.g., the

extraversion score was computed by adding the rating on "extraverted, enthusiastic" and the

reverse rating on "reserved, quiet").

Perception of learning experience. The item block on perception of learning experience

comprised 16 rating items constructed based on the research team's knowledge on the students

and pre-testing. The items covered both task aspects (e.g., "exposure to real-life problems",

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"thinking challenges") and interpersonal/relationship aspects ("authentic connections with people", "support from peers") commonly perceived by secondary school students. For each item, higher rating signified more positive perception.

Approach to develop. Based on the researchers' review of the literature, previous pilot studies, and discussion with school students, eleven items on approach to develop were constructed to operationalise and measure participants' approach to develop. The items covered the intensity of engagement (e.g., "persistent in overcoming challenges"), active participation (e.g., "actively explored solutions to problems"), and meaning construction (e.g., "reflected on my behaviours from time to time). Higher rating on each item indicated stronger engagement in processing learning experience for the development of holistic competencies.

Competency development. Self-assessment rating items were used to quantify holistic competencies enhanced through the programme. Individual participants assessed themselves on 13 holistic competencies. These competency choices were based on discussion with the principals and teachers of the partaking schools regarding the developmental needs of students which was how the programme was designed.

To facilitate understanding, all rating items were presented in both Chinese and English on the questionnaires. Back translation procedures were applied to examine whether the Chinese translation of the personality attribute items matched the English version developed by Gosling et al. (2003) and the bilingual version has been cross-checked by the researchers and research team members who are proficient in both languages. Although both Chinese and English are mandatory subjects in the local schools (students being literate in both languages), a bilingual version could increase accuracy in students' comprehension on the items as two languages

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enable these students to cross-reference the intended meaning of items. This also helps alleviate subtle meaning mismatch caused by translation if only monolingual version was provided.

Data Analysis

Statistical data analysis was conducted in three stages. First, the quality of data was reviewed primarily based on descriptive statistics. Second, the respective measurement models of the constructs in the hypothesised mediation chain (rationales for participation, perception of learning experience, approach to develop, and competency development) were elucidated. Finally, a structural model was built based on the measurement models to test the research hypotheses.

Data were computed using Mplus (version 8) and SPSS (version 23). The fit of models with data was primarily evaluated using the Comparative Fit Index (CFI), the Root Mean Squared Error of Approximation (RMSEA), and the Standardised Root Mean Squared Residual (SRMR). Correspondingly, a CFI above .90, an RMSEA below .08, and an SRMR below .08 were taken as the minimum thresholds of acceptable model fit, as commonly adopted in the structural equation modeling (SEM) research (Kenny, 2015). Standardised path estimates are reported hereafter unless otherwise stated.

<div align="center">

Results

</div>

Descriptive Statistics

A total ofThe -329 participants from the six partaking schools, including 193 male and 136 female students, completed both the pre-programme and post-programme questionnaires. The students had a mean age of 15.8 and they are mostly Chinese. Overall the proportions of missing data by items were small (all less than 2.13% with a mean of 0.46% across all items). The test procedure of Little (1988) further suggested that the data were missing completely at

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random. Each item received a full range of responses and the standard deviations of responses on

individual items were all indicative of a reasonable level of variability. The absolute values of

the skewness and kurtosis of their distributions were below 1.16 and 3.10 respectively, which

were within the ranges (skewness < 2; kurtosis < 7) appropriate for maximum likelihood

estimation procedures (West, Finch, & Curren, 1995). To account for non-normality and missing

data, models were estimated using the maximum likelihood estimator with robust standard errors

(MLR) of Mplus.

Measurement Models

Pretesting ascertained the factorability of the ratings on each construct in the research

hypotheses with respect to the (a) determinants of their correlation matrices, (b) Barlett's test of

sphericity, and (c) Kaiser-Meyer-Olkin test of sampling adequacy. To elucidate the factor

structure of each construct, its indicator items were first subject to parallel analysis to determine

the number of underlying factors. If the number was greater than one, exploratory factor analysis

(EFA) would be conducted to suggest the items' loading pattern before confirmatory factor

analysis (CFA) was performed to finalise the measurement model. The factor structure of the

personality attribute items was not analysed, as in the SEM testing model (see below), they were

only used as manifested variables for statistical control of their potential confounding influences

on the hypothesised mediation relationships.

Rationale for participation. Application of parallel analysis for the 14 reasons for

participation suggested that a three-factor solution would be optimal for modeling their latent

structure. The components with the highest three initial eigenvalues extracted from the sample

data were 5.14, 2.64 and 1.13 respectively (the fourth one being 0.90), and they together

accounted for 63.6% of the total variance. EFA using the MLR estimator and geomin rotation

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suggested a clear and interpretable loading pattern of the 14 items around three factors (based on

the commonly used standardised loading cut-off of 0.35): The first factor comprised item 1, item

2, item 3, item 5, item 8, item 9, and item 13 (please refer to the Appendix for the items'

wording). These reasons share the common theme of personal interest, like fun (item 1), friends

(item 5), and meaningfulness (item 8). The second factor had item 4, item 10, item 11, and item

12, which all involve meeting others' expectations, like family reasons/expectations (item 4, item

10), networking with potential employer (item 11) and receiving credit or a certificate (item 12).

The third factor consisted of item 6 ("not sure why"), item 7 (school requirement), and item 14

("actually not interested") that all indicated a lack of motivation to participate in the programme.

These three factors were thus labelled as Self-directed, Externally Driven and Involuntary

respectively.

This EFA structure, comprising three co-varying factors and the 14 items loading on their

respective factors as listed above, was subject to CFA. When all items' residuals were

constrained to be uncorrelated, this CFA model did not fit the data acceptably, MLRχ^2 = 243.8,

df = 74, p < .001; CFI = .897; RMSEA = .084 [90% CI: 0.072 - 0.095]; SRMR = .064.

Examination of the modification indices (one modification in one step) suggested that the

residual correlations within three pairs of items could be allowed, and could be justified in terms

of similarity in contents with each item pair: item 4 with item 10; item 6 with item 7; and item 2

with item 3. If these residual correlations (but no others) were allowed, reasonable fit for data

was attained, MLRχ^2 = 169.1, df = 71, p < .001; CFI = .940; RMSEA = .065 [90% CI: 0.052 -

0.077]; SRMR = .055. In this model (with the three residual correlations allowed), each of the 14

items loaded on one and only one factor (i.e., no cross-loadings), and all item loadings were

substantial (all loadings > .384) and statistically significant (all ps <.001). This three-factor

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structure was retained as the measurement model for rationales of participation. The internal

consistency of the three factors ranged from satisfactory to modest as measured by McDonald's

omega (ω): 0.89 for Self-directed (seven items), 0.72 for Externally Driven (four items), and

0.61 for Involuntary (three items). These levels of reliability were considered acceptable given

that the measurement instruments of this research were at an early stage of development

(Nunnally & Bernstein, 1994).

Perception of learning experience. Regarding the 16 items on perception of learning

experience, parallel analysis suggested that their factor structure was essentially unidimensional

as intended. The first principal component had an eigenvalue of 7.30 and accounted for 45.6% of

the total variance. CFA revealed that, while a one-factor model with all item residuals

constrained to be uncorrelated did not fit the data acceptably (MLRχ^2 = 353.8, *df* = 104, *p* <

.001; CFI = .854; RMSEA = .085 [90% CI: 0.076 - 0.095]; SRMR = .059), the misfit could be

significantly alleviated by allowing the residuals to be correlated within two pairs of consecutive

items: item 10 with item 11 and item 15 with item 16. A one-factor model with only these two

item-residual correlations (i.e., no other) allowed was retained as the measurement model for

perception of learning experience: Its data fit was acceptable (MLRχ^2 = 246.3, *df* = 102, *p* <

.001; CFI = .916; RMSEA = .066 [90% CI: 0.055 - 0.076]; SRMR = .052), and all item loadings

were substantial (all above 0.531) and statistically significant (all *ps* <.001). The internal

consistency of this factor (ω = .91) was satisfactory.

Approach to develop. Parallel analysis conducted on the 11 items assessing approach to

develop likewise pointed to a unidimensional structure as intended. The first principal

component had an eigenvalue of 5.32 and accounted for 48.3% of the total variance. The data fit

of a one-factor structure with uncorrelated residuals was marginally acceptable (MLRχ^2 = 132.4,

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$df = 44$, $p < .001$; CFI = .915; RMSEA = .078 [90% CI: 0.063 - 0.094]; SRMR = .052).

However, if the residuals correlations within two pairs of consecutive items, item 1 with item 2

and item 5 with item 6, could be freely estimated, the unidimensional solution could fit the data

satisfactorily (MLRχ^2 = 96.0, $df = 42$, $p < .001$; CFI = .948; RMSEA = .062 [90% CI: 0.046 -

0.079]; SRMR = .045). In this modified structure, all item loadings were substantial (all above

0.519) and significant (all ps <.001). Thus a one-factor structure with only the two item-residual

correlations (i.e., no other) allowed was retained as the measurement model for approach to

develop. The internal consistency of this factor ($\omega = .88$) was satisfactory.

Competency development. Holistic competency enhancement through the programme

was self-rated by participants on a three-point ordinal scale, for which the weighted least squares

means and variance adjusted (WLSMV) estimator is appropriate for analysing the items' latent

structure (e.g., Beauducel & Herzberg, 2006). However, concerns have been noted for applying

parallel analysis on latent correlation matrices (Muthen, 2013) involved in WLSMV estimation.

Parallel analysis was thus conducted using the MLR estimator as an alternative (Finney &

Distefano, 2013) on the observed correlation matrix of the competency enhancement ratings,

which suggested that the ratings were essentially unidimensional. The first principal component

had an eigenvalue of 6.28 and accounted for 48.3% of the total variance. Unidimensionality of

the items was further ascertained by (a) the satisfactory data fit of a one-factor structure with

uncorrelated residuals for the items (MLRχ^2 = 168.1, $df = 65$, $p < .001$; CFI = .916; RMSEA =

.070 [90% CI: 0.057 - 0.083]; SRMR = .051), and (b) all 13 items loading on a single factor

(loading coefficients ranged from 0.568 to .728, all ps <.001).

Given this latent structure of the items (single factor, similar loading magnitudes, and

uncorrelated residuals), the overall improvement in the holistic competencies of each participant

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was taken as reasonably represented by the unweighted mean of the 13 items' ratings. This

composite score was then useable as a continuous variable to betoken competency development

in the structural model (see below) for testing the research hypotheses, even though the

individual items were on a three-point scale. The internal consistency of this composite score

($\omega = .91$) was satisfactory. The mean and standard deviation of the composite score ($M = 2.15$

for a possible range of 1 to 3; $SD = 0.39$) suggested that the participants generally perceived their

holistic competencies as improved by the programme. The composite score's skewness and

kurtosis (- 0.065 and 0.491 respectively) were well within the absolute-value ranges (skewness <

2; kurtosis < 7) appropriate for maximum likelihood estimation procedures (West et al., 1995).

Structural Models

The schematic representation of this research's conceptual model was shown in Figure 1

and the structural model for testing the research hypotheses was set up as shown in Figure 2.

Each construct in the hypothesised mediation process corresponded to a latent variable, except

that competency development enhancement was represented by its composite score. The retained

measurement models for the latent constructs as detailed above were used to specify their

indicator items and the item residual correlations allowed respectively. Apart from the residual

correlational paths specified in the respective measurement models, all residuals or disturbances

in the model were constrained to be uncorrelated. The model parameters and mediation effects of

interest were estimated using the MLR estimator. As the effect estimates might deviate

considerably from symmetrical distributions (Bollen & Stine, 1990), bias-corrected bootstrap

95% confidence intervals (BC 95% CI) were computed using 5,000 bootstrap samples for the

tested effects to cross validate the results as commonly recommended (e.g., MacKinnon,

Lockwood, & Williams, 2004).

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(INSERT FIGURE 1 ABOUT HERE)

The structural model (see Figure 2) fit the data reasonably well, MLRχ^2 = 1258.6, df = 798, p < .001; CFI = .917; RMSEA = .042 [90% CI: 0.037 - 0.046]; SRMR = .053. The loadings of all indicator items on their respective latent variables were substantial and statistical significant (all loadings > .378; all ps <.001). Overall, the model accounted for 45.1% of the variance of the composite score on competency enhancement. As Figure 2 displays, only four direct effects among the constructs were significant based on both MLR standard error (*SE*) estimates and bias-corrected bootstrap confidence limits: the direct effect of

(a) self-directed motivation on perception of learning experience (standardised path coefficient, b^* = 0.588 ; b^*/SE = 6.415 ; p < .001 ; BC 95% CI: 0.389 – 0.804);

(b) perception of learning experience on approach to develop (b^* = 0.918 ; b^*/SE = 16.593 ; p < .001 ; BC 95% CI: 0.755 – 1.008);

(c) approach to develop on competency development (b^* = 0.498 ; b^*/SE = 3.031; p = .002 ; BC 95 CI: 0.139 – 0.869); and

(d) self-directed motivation on competency development (b^* = 0.333 ; b^*/SE = 3.093 ; p = .002 ; BC 95% CI: 0.116 – 0.586).

(INSERT FIGURE 2 ABOUT HERE)

In Figure 2, the thick solid lines represent the paths whose standardised regression coefficients are statistically significant (p < .05) with respect to both MLR and bootstrap estimation. The other (statistically non-significant) paths are represented by thin dotted lines. Only the standardised path coefficients of statistical significance (based on both MLR and bootstrap estimates) are displayed.

> **Commented [JY5]:** I moved these three sentences to the footnote of Figure 2, i.e., in "2019Jul07StudentApproachtoDevelopHDCFfigure2_JY.docx"
>
> My consideration: if Figure 2 will not be placed immediately above these sentences (physical layout), these notes will become a bit reader unfriendly.
>
> Hope this is fine.

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This study hypothesised a three-path mediation effect that learner motives indirectly affect competency development sequentially through perception of learning experience and approach to develop as mediators. Among the three factors of participants' rationales, only self-directed motivation predicted perception of learning experience. This study's research hypotheses were thus evaluated based on the three-path indirect effect from the self-directed factor to competency development transmitted through perception of learning experience and approach to develop. The statistical significance of this three-path indirect path (standardised effect estimate = 0.269, estimate/SE = 2.748; p = .006; BC 95% CI: 0.090 – 0.561) supported the research hypotheses, and the significant direct impact of self-direction motivation on competency development [direct effect (d) discussed above] indicated that the three-path indirect effect was a case of partial mediation. This indirect effect was 45.7% of the total effect based on ratio of the standardised path coefficients, though as noted by MacKinnon, Warsi, and Dwyer (1995) this ratio may vary considerably across samples given the sample size (of less than 500), i.e., the ratio might not be a stable estimate.

To ascertain whether the effects observed in this study might be attributable to the potential confounding influences of personality characteristics, the aforementioned three-path indirect effect was re-tested with the five scores from this study's personality measures included as control covariates. The structural model with these personality covariates included fit the data acceptably, MLRχ^2 = 1551.0, df = 978, p < .001; CFI = .902; RMSEA = .042 [90% CI: 0.038 - 0.046]; SRMR = .052. The loadings of all indicator items on their respective latent variables remained substantial and statistical significant (all loadings > .387; all ps <.001). With respect to the specific statistical tests of interest, both the hypothesised three-path indirect effect (standardised effect estimate = 0.223, estimate/SE = 2.034; p = .042; BC 95% CI: 0.005 – 0.598)

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and the direct path from self-directed motivation to competency development ($b^* = 0.328$; b^*/SE = 2.759; $p = .006$; BC 95% CI: 0.070 – 0.640) remained significant. Therefore, the present results that supported the research hypotheses could not be attributed to confounding influences of personality attributes.

Discussion

While engaging students to address authentic problems has been found effective for cultivating their holistic competencies (Chan, 2012; Zins et al., 2004), the learning-behaviour mechanisms involved were not well understood. This study postulated that the 3P framework can be applied with modifications to gain insights on the mechanisms, and for this purpose the process construct (approach to develop) needs to reflect the extent to which the learners are meaningfully engaged with the authentic contexts. Specifically this study hypothesised that learners' motives, perception of their learning experience, approach to develop, and development of holistic competencies are linked by a three-path mediation effect chain: (a) learner motives affect their perception on the value of the learning tasks/activities, (b) this perception affects their approach to develop, and (c) their approach to develop determines their attainments on holistic competencies.

The SEM model representing the hypothesised relationships and mediators fit the data well. The measurement parts of the model indicated that students' rationales of participation clustered interpretably without cross-loadings around three factors characterised by being self-directed, externally driven, and involuntary respectively, while the items measuring perception of learning environment, approach to develop, and competency development were essentially unidimensional as intended. The structural relationships among the latent constructs were consistent with the research hypotheses: Self-directed motivation engendered competency

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development both through a direct (unmediated) effect and a three-path mechanism mediated by

perception of learning experience and approach to develop sequentially as hypothesised, whereas

the two mediator variables and competency development were not significantly affected by the

other two motivation factors. The direct and indirect effects of self-directed motivation were

statistically significant based on both robust maximum likelihood and bootstrap estimation, and

their effect sizes were substantial. Also, having self-directed motivation as the initial variable of

the mediational chain was justified given that participants' motives were measured (by the pre-

programme questionnaire) before the mediators and competency development (by the post-

programme questionnaire). Additionally, the direct and three-path mediation effects of self-

directed motivation remained significant after the potential confounding influences of personality

attributes had been controlled statistically.

The three-path mediation effects observed both validated the approach to develop

construct and enhanced the understanding on how learners' motives influence their approach to

develop and holistic competency development. To the extent a learning activity is aligned with

the learners' motives, the learners perceive it positively and participate actively, and their

engagement (in sub-processes like seeking meaningful experiences and feedback, observation,

and reflection) will contribute positively to their holistic competencies. Nonetheless, in the

present study, this mediation path only accounted for part of the overall effect from self-directed

motivation to competency development outcome. Thus there might be other effect pathways

from learner motivation to learning outcomes that were not represented in the model.

The results that the hypothesised mediation effects were observed for self-directed

motives of participation but not for externally driven and involuntary rationales were consistent

with the self-determination theory (SDT; Deci & Ryan, 2012), which posits that motivation for

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an action (e.g., joining a programme) can be distinguished qualitatively into different types with different behavioural repercussions. In particular, learner motives characterised by a high degree of autonomy have been found associated with stronger persistence and engagement in performing and learning (Deci & Ryan, 2012). In line with this general finding, this study showed that the degree of self-directed (i.e., autonomous) motivation significantly influenced competency development while the intensity of the other rationales of participation (externally driven or involuntary ones) did not significantly affect competency development.

Practical Implications

Schools and teachers should take this study's findings into consideration when designing the curricula and activities to develop students' holistic competencies. As this study revealed, secondary school students likely resonate with activities that will bring enjoyment, friendship and meaningfulness. These aspects can be incorporated and highlighted when learning activities are designed and communicated to target participants. As some students may not recognise any personal value in the activities initially, information on students' motives to participate can be collected pre-programme (e.g., using a pre-programme questionnaire as in this research) to help identify those participants who require prompt individual guidance. In this connection, this study suggested that the motives to meet others' expectations and token awards (e.g., certificates, school credits) per se are not associated with holistic competency enhancement, though practically the awards often provide incentives for students to join learning events in the first place.

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This study has demonstrated that the 3P framework, which is typically applied to academic studies in university context, can also be extended to explain holistic competency development of secondary school students. Barrie's (2006, 2007) study revealed the views and practices of university teachers and academics, and this study provided findings from the students' perspectives. His study and the present study together provide some implications for the teachers regardless of levels and disciplines that can be used to facilitate students' holistic competency development. Barrie's (2006) study has shown that teachers, who hold the Translation and Enabling conceptions and believe in engaging students in learning activities to develop their holistic competencies (Barrie, 2007), can more likely encourage their students to develop self-directed motives and value holistic competency. Teachers should be made aware of the fact that holistic competencies are not an "adjunct", "supplementary", and "unrelated" to academic knowledge that can only be developed through remedial channels (Barrie, 2007), but rather they should be linked and taught in the context of academic knowledge so that students would understand the relevance of these competencies and develop self-directed motives to take part in learning activities. Furthermore, teachers should also be encouraged to pay more attention to how students engage in developing holistic competencies and their learning experience. From the findings, case studies (on a separate study), and observations, students are more readily engaged and willing if they expect the programme to be fun, meaningful and/or allow them to make friends. When students realise that the learning activities are relevant in the sense that activities contribute to their school and community life, they would be more engaged. This is undoubtedly true given the importance of social acceptance at this age. This kind of engagement is more effective than credits, rewards, or any external driven means. If their rationale or motives

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are negative and their perception of experience are also negative, it is possible their approach to develop will be less engaged, in fact, an *avoid* approach may be taken.

Limitations and Future Research

While we believe this study added both theoretical and practical insights, the findings should be delimited from methodological considerations. In terms of research design, Aas all data analysed were derived from self-report measures using similar multiple-choice question formats, common method related variance (e.g., arising from social desirability) might have affected the our statistical estimates in the results. The Rresults can be further enriched by experimental design or observational methods in future studies, but given the large number of participant students and limited time schedule of the holistic competency programme, self-report measures appear most feasible and avoid overtaxing our participants. Generalizability with respect to the limited representativeness of our participant sample should also be noted. While a representative variety of schools (e.g., by academic performance tiers, private versus government-aided) were included, all participants from the schools were of similar age and they have mostly grown up within the Hong Kong Chinese culture. Our data in this study did not allow an assessment to what extent our findings might have been affected by the students' age or cultural background. Our assumption is that as our hypothesised relationships were built on general psychological theorizing, the results should be of reference value across age and culture.

In our sample, the students were nested within schools, though multi-level analysis to examine the potential influences of school-level factors was not feasible. At the individual level, Apart from the personality covariate measures, the other the key variables in the our structural

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model were indicated by bespoke items constructed for this ~~study~~research (apart from the items of the personality covariates). Since the measures had not been studied elsewhere, nomological validity information of the measures independent of this study were not available. In particular, the quality of the competency development measurement might depend on the accuracy and candidacy of participants when reporting their learning from the programme. The participation-rationale factors identified in this study might have also been limited by the range of rating items presented to the participants, and some of the rationales to participate might not be applicable or relevant to some learner populations. For example, in Hong Kong nowadays secondary school graduates mostly continue with some forms of further studies (e.g., tertiary or vocational) before commencement of their careers. Thus for school students (as found in this study) the need "to network with potential employers", which is a self-directed motive for participation, may not be relevant. However, the same rationale may load more strongly on the self-directed factor for tertiary students who are about to join the workforce.

For future research, the effects of self-directed motivation on competency development can be further explored using more fine-grained measures to find out how the effects may vary across populations (e.g., university versus school students) and learning events (e.g., personal development programmes, community service programmes). For practical purposes, future research may also explore various strategies to raise students' awareness of the importance of competency development activities to themselves (e.g., using different framing and/or orientation of the activities).

In conclusion, this study supported the overall proposition that students who are more driven by self-directed motives perceive personal development activities more positively, which engenders higher level of engagement in their approach to develop that in turn facilitates holistic

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competency development. These findings enhance the understanding on the mechanism through

which learners' motives affect holistic competency development. The results also point to the

need to ensure students appreciate the relevance of the learning activities to themselves when

designing and communicating programmes for developing their holistic competencies.

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Appendix

Rating Items of This Study

    The data used in this study were collected from the rating statements below. A five-point Likert scale, from "1" (*strongly disagree*), "2" (*agree*), to "5" (*strongly agree*), was used unless otherwise stated. The items were presented to participants in both Chinese and English. Only the English version is included in this appendix for economy of space.

Rationale for participation

(1)   I anticipate the programme will be fun.
(2)   The programme is helpful to my work in the future.
(3)   The programme's activities are of great value to me.
(4)   I attend the programme because of family reasons.
(5)   The programme can help me to make friends.
(6)   I am not sure why I need to join the programme.
(7)   It is a school requirement to participate in this programme.
(8)   The programme's events are meaningful.
(9)   Participating in the programme allows me to have extra time with my friends.
(10) I attend the workshop because of my family's expectations.
(11) The programme allows me to network with potential employers.
(12) I can receive a certificate or credit for completing the programme.
(13) I always enjoy extra-curricular activities.
(14) I am actually not interested to join the programme.

Perception of learning experience

This programme provided me with…

    (1)   exposure to real-life problems
    (2)   thinking challenges
    (3)   stimulation to develop new ways of thinking
    (4)   opportunities to interact with people outside of my school
    (5)   practices to influence others
    (6)   opportunities to exchange ideas with others
    (7)   authentic connections with people
    (8)   new perspectives on my relationships with others
    (9)   feedback on the impact of my behaviours
    (10) opportunities to connect to myself
    (11) opportunities for raising my self-awareness
    (12) encouragement from mentors or teachers
    (13) support from peers
    (14) activities in line with my interests or values.
(15) Overall the programme was of learning value to me.
(16) Overall the programme was an enjoyable experience to me.

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Approach to develop

During the programme,

(1) I participated in teamwork
(2) I was persistent in overcoming challenges
(3) I motivated others to complete activities/tasks
(4) I exerted effort to participate beyond instructions
(5) I was touched by some of the experiences
(6) I was opened to others' suggestions and feedback
(7) I reflected on my behaviours from time to time
(8) I developed new ideas to make sense of my experiences
(9) I applied my learning to tackle new problems
(10) I actively explored solutions to problems.
(11) Overall I was engaged in the programme.

Competency development

Holistic competencies is an umbrella term that describes a person's general abilities and attributes, including creativity, critical thinking, problem-solving skills, teamwork, collaborative skills, and so on. Please rate the degree to which this programme has enhanced the following holistic competencies for you [on a three-point scale, from "1" (*not improved*), "2" (*somehow improved*), and "3" (*largely improved*)]

(1) Creativity
(2) Critical thinking
(3) Problem-solving
(4) Team work/collaboration
(5) Self-confidence
(6) Consideration for others
(7) Appreciation for others
(8) Respect for others
(9) Manners
(10) Self-management
(11) Responsibility
(12) Resilience (learning from failure)
(13) Leadership.

Personality attribute

The following characteristics apply to me [rated on a seven-point scale, from "1" (*strongly disagree*), "2" (*moderately disagree*), 3 (*disagree a little*), to "7" (*strongly agree*)].

(1) Extraverted, enthusiastic
(2) Critical, quarrelsome
(3) Dependable, self-disciplined
(4) Anxious, easily upset
(5) Open to new experiences, original
(6) Reserved, quiet
(7) Sympathetic, warm
(8) Disorganized, careless
(9) Calm, emotionally stable
(10) Conventional, uncreative.

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Fig.1. Schematic Representation of the Proposed Modified Holistic Competency Development Framework

Fig. 2. Structural Model for Testing the Hypothesised Two-Sequential-mediator Process That Transmits the Influences of Participation Rationales to Holistic Competency Development.

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Fig 1. Students' Approaches to Holistic Competency Development Framework (HCDF)

Presage   Process   Product

Learner Character (e.g., personality, learning motives, prior experience)

Actual Learning Experience (e.g. learning activities and experience, work and assessment, workload, quality of supervision and interaction with peers)

Student's Perception & Interpretation Based on the Learning Experience (e.g., perception of their experience and reflection)

Student's Approaches to Develop – Degree of Engagement Engage and Avoid continuum (e.g., reflection, feedback seeking, meaningful social interactions)

Competency Development Outcomes

Rationale/Motives for Learning (e.g.,
- meaning-driven
- career-driven
- enjoyment-driven
- course-driven
- family-driven)

A learner is considered as an "engager" if he/she takes the opportunity of engaging in an activity; the development of generic skills is welcomed and practiced. A learner is considered as an "avoider" if he/she avoids an activity and thus there is little room for generic skills development.

Note: Assumption is that students who go through the process described by this framework are already willing to participate the learning activity.
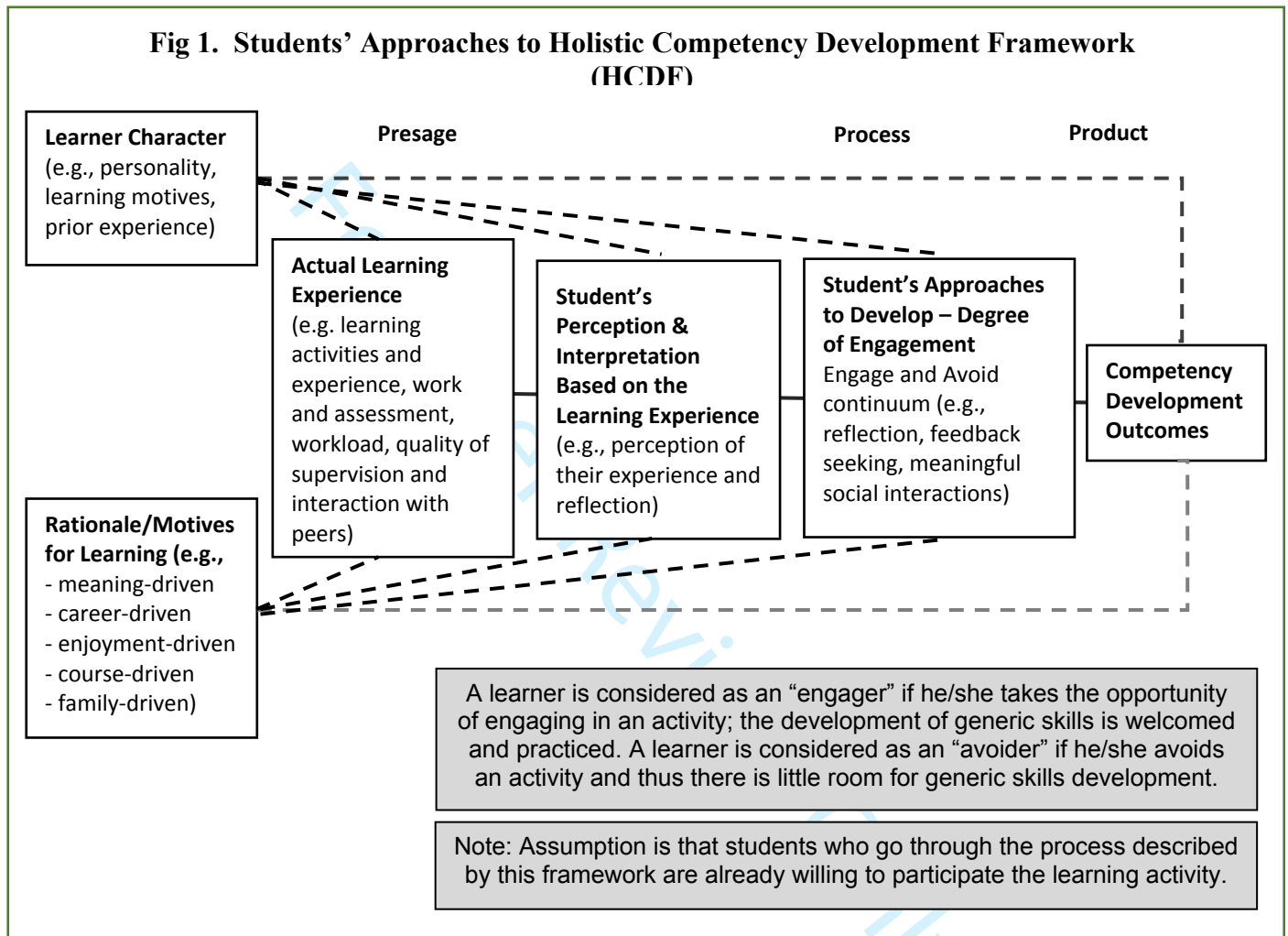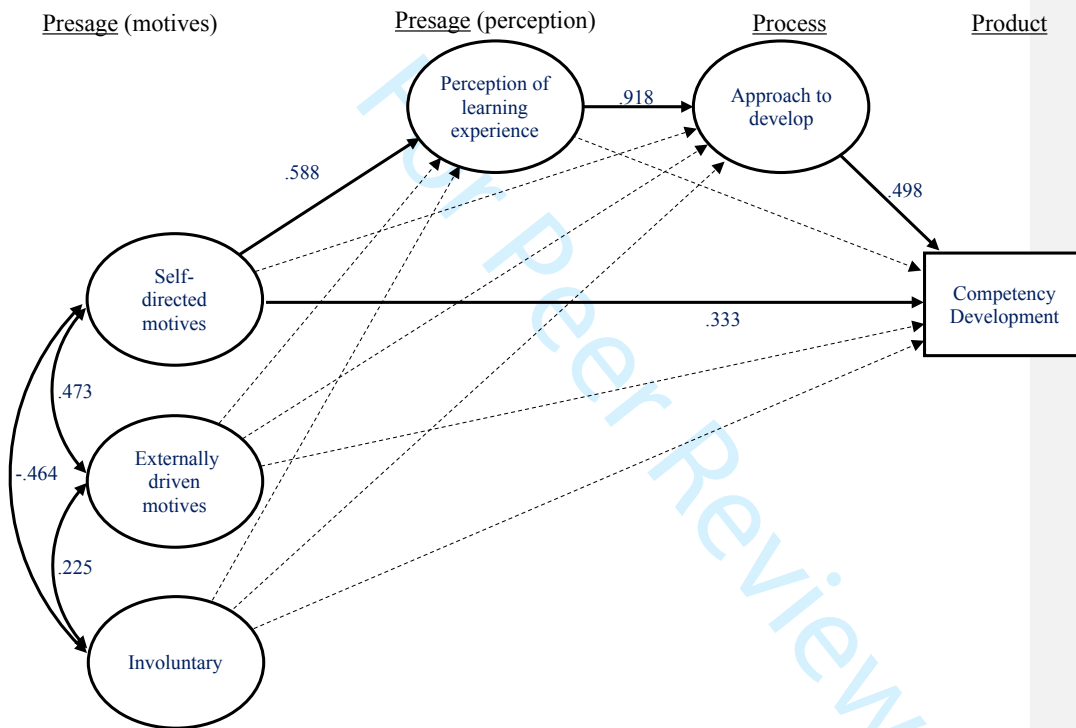
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Fig. 2. Structural Model for Testing the Hypothesised Two-Sequential-mediator Process That Transmits the Influences of Participation Rationales to Holistic Competency Development.

Note: For visual simplicity, all indicators of latent variables and residuals of dependent variables are not shown in this diagram; (a) the Self-directed Motives factor was indicated by the Rationale item 1, 2, 3, 5, 8, 9 and 13 (with the residuals of item 2 and 3 allowed to co-vary); (b) the Externally Driven Motives factor was indicated by the Rationale item 4, 10, 11, and 12 (with the residuals of item 4 and 10 allowed to co-vary); (c) the Involuntary factor was indicated by the Rationale item 6, 7, and 14 (with the residuals of item 6 and 7 allowed to co-vary); (d) Perception of Learning Experience was indicated by all its 16 items (with two pairs of residuals correlations allowed – item 10 with 11 and item 15 with 16 respectively; (e) Approach to Develop was indicated by all its 11 items (with two pairs of residuals correlations allowed – item 1 with 2 and item 5 with 6 respectively). Competency Development was represented by the unweighted mean of the 13 competency enhancement ratings.
 The thick solid lines represent the paths whose standardised regression coefficients are statistically significant (p < .05) with respect to both MLR and bootstrap estimation. The other

Commented [JY1]: I follow the point 3 of the associate editor to delete these lines. (Actually these sentences were added to address the comments of a previous journal review.)

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(statistically non-significant) paths are represented by thin dotted lines. Only the standardised path coefficients of statistical significance (based on both MLR and bootstrap estimates) are displayed.

Commented [JY2]: These sentences were moved from the main manuscript text to here – please see my corresponding comment box in the manuscript for the rationale of this move.

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Response to reviewers' comments

Comments to the Author from Reviewer 1
The authors have satisfyingly addressed all comments raised in my previous review. In my opinion, the manuscript can be published in its present form. I have no former comment, except to congratulate the authors for their work.

Comments to the Author from Reviewer 2
The critical points from the review were not or not sufficiently addressed. See the initial report...

Reviewer 2 stated that "The critical points from the previous review were not or not sufficiently addressed." I checked this reviewer's comments, and it seems that you have not addressed his or her following comments:

(1)   "The explanations point to the occasional sample, which would have to be discussed much more critically in view of the limited representativeness of the sample and the generalizability of the results.

(2)   The discussion part and especially the discussed implications from the study should be discussed much more cautiously in view of the deficits of the sample. For instance, this sample does not allow multi-level analyses, although the data show a hierarchical structure. Thus, the expected composition and cohort effects could not be tested.

The above two comments have been addressed in the limitations of the study on page 25.

Comments to the Author from Associate Editor
1.   Description of the sample in Results (the first two sentences in Descriptive Statistics in Results) should be removed because this is a repetition of the information provided in Participants and Procedure.

This has been removed from the 'Descriptive statistics' section on page 13.

2.   The surveys were administered before and after the programme. Please explain if the data used in the study's analysis came from the pre- or post-programme time point? If it is a mix of both, please specify in a great detail in Participants and Procedure.

This has been added to explain in the 'Measures' section on page 10.

3.   Figure 2 note: the information or explanation on the composition of items of each construct is not necessary to be provided under this figure. This information has been provided in the text.

This has been removed and words modified in figure 2.