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Assessment of 21st Century Skills: the Singapore Experience with Group Project at Grade 11

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Introduction

Global initiatives such as Assessment and Teaching of 21st Century Skills are calling for new assessments to measure the skills, knowledge, attitudes, and characteristics of self-directed and collaborative learning that are increasingly important for our global economy and fast changing world. The highly technological and interconnected world demands workers who possess abilities such as critical thinking, problem solving, learning to learn, communicating, and collaborating, among others. Such knowledge and skills are not new, untried or unknown. Different subject disciplines emphasise different combinations of these knowledge and skills.

In 2010, the Singapore Ministry of Education (MOE) produced a framework which articulates the 21st century competencies necessary for the globalised world. These are: Global Awareness and Cross-Cultural Skills; Critical and Inventive Thinking; and Communication, Collaboration and Information Skills. Prior to this, MOE had already implemented a curriculum initiative where students carry out an examinable group project to develop their thinking, communication and collaborative skills. This paper shares the Singapore experience in assessing these knowledge and skills through the group project in the national examination for Grade 11 over the last ten years.

Conceptualisation of the Examinable Component

In Singapore, the primary focus of exit examination for pre-university students is on achievement in the subject disciplines. Typically, students offer four to seven in the Singapore-Cambridge Advanced Level (A-Level) Examination conducted by the Singapore Examinations and Assessment Board (SEAB) in collaboration with the University of Cambridge International Examinations.

Towards the turn of the 21st century, there were extensive deliberations in Singapore and around the world on whether the education system was adequately preparing students for the new globalised and competitive environment. What new achievement constructs should students demonstrate? How should the education system emphasise the necessary skills of knowledge integration and application even as students prepare themselves in the fundamentals of subject disciplines that are expected of them when they pursue further education in universities or institutes of higher learning?

At that time, there were concerns that our students were too used to learning in silos and did not have the skills to integrate and apply knowledge that they had learnt across subject disciplines. It was also recognised that there was also over-emphasis in schools on content knowledge at the expense of thinking skills and process skills. As Tan, Chow and Goh. (2008: 127) commented: "To ensure that pupils are 'future-ready', it was no longer sufficient for them to be armed with factual knowledge. The ability to apply knowledge and to be creative and innovative became increasingly the more important facets of education." Hence, there was strong motivation to change some aspects of assessment and examination in Singapore so that students could undergo a different thinking and learning experience in schools in order to be more ready for the future.

In 2003, a new coursework was introduced in the A-Level curriculum whereby all pre-university students in Singapore were required to carry out an interdisciplinary group project at Grade 11 (aged 17). The aim of this coursework was to provide students with opportunities to integrate knowledge, skills and values learnt from different subject areas and apply them in a meaningful context. Besides encouraging students to exercise creative and critical thinking skills, a distinguishing feature of this coursework was that it sought to foster collaborative learning and co-construction of knowledge, as well as the acquisition of communication and process skills through undertaking the project task as a group. This coursework was to complement the broadening of the pre-university curriculum as the learning of such useful transferable skills and the enrichment of students' educational experience would better prepare them for university education and for the workplace of the 21st century.

This group project coursework was made compulsory and examinable, and graded as an A-Level qualification so as to underscore its importance and to ensure serious commitment from students and all other stakeholders.

Curriculum Design

The curriculum specification of this performance assessment states that "in today's dynamic and fast-changing world, students need to learn how to engage with issues, and process information that is presented in a manner that is open-ended, less structured and not subject-specific" (SEAB/MOE, 2014). Unlike the usual approach of testing within subject disciplines, the group project was conceptualised as a unique interdisciplinary coursework which focuses on the value of process skills. As a stand-alone component of the pre-university curriculum, the project task encourages students to draw on knowledge and skills from across different subject areas and to apply them in the context of a real life situation.

Students are organised in groups of four or five to work on a project task. To mirror real life conditions, they have no choice on who they like to work with in a group; the grouping of students is done by their teachers on a random basis and where necessary, factors such as gender ratio, language ability and ethnicity are taken into consideration in reviewing the group formation so that students would not feel that they have been put into a disadvantaged or weak group.

The curriculum is designed to emphasise the following desired learning outcomes: knowledge application, communication, collaboration, and independent learning. In knowledge application, students are expected to acquire the ability to make connections across different areas of knowledge and to generate, develop and evaluate ideas and information as they apply these skills to the project task. In communication, students are expected to acquire the skills to present ideas clearly and coherently, and to deliver them effectively to a specific audience in both the written and oral forms. In collaboration, students are expected to acquire teamwork skills through working in a group to achieve common goals for the project. In independent learning, students are expected to develop self-directed inquiry skills by actively initiating their own knowledge gathering, making own decisions, reflecting on their learning and taking appropriate actions to improve their ideas. These learning outcomes of carrying out a group project are the core life skills that students need for the workplace in the 21st century.

Assessment Design

The group project is based on broad task requirements set by the examination board and would typically require students to identify a problem or a case, carry out research on the nature and implications of the problem or case, and on how the problem or case was addressed (see Appendix 1 for an example of a task requirement). Students would then have to apply the knowledge learnt from one situation or community to another different situation or community. The task is designed such that it is sufficiently broad to allow for a wide range of project topics. As such, it is possible for students to consider a problem or case that is inter- or multi-disciplinary nature and in the local or foreign context. The task requirements provide some general guidelines on the task so that students can demonstrate all the four learning outcomes in completing the project.

Of the four learning outcomes only knowledge application and communication are examined summatively. Candidates are given feedback on collaboration and independent learning but these do not contribute to the overall score. The evidence of knowledge application and communication are assessed in three examination components: Written Report (WR), Oral Presentation (OP) and Group Project File (GPF). The group, as a whole, submits a written report with a word length between 2500 and 3000 words. All the students in the group will earn the same group score for WR. The WR is assessed on four assessment criteria: substantiation of ideas, generation of ideas, analysis and evaluation of ideas and organisation of ideas. For the GPF, each student in a group makes an individual submission that details how they have contributed to the generation, analysis and evaluation of ideas in the course of working towards the project goals. Depending on the quality of the individual submission, each student in the group will earn a score for the GPF component that commensurates with his/her achievement. The assessment of OP is about an hour long; every student in the group has about 5 minutes to present his/her portion of the presentation and another 5 minutes to respond to one question about the group project. Each student is assessed on fluency and clarity of speech; his/her engagement with the audience; and his/her response to questions. The group, as a whole, is assessed on the overall effectiveness of the group presentation. For the OP, each student will earn an individual score and a group score. The individual score

allows the student's performance to be differentiated from those of the other students in the group. As the focus of this course is on the demonstration of specific learning outcomes, all three components are assessed using analytic rubrics based on a pre-determined set of criteria.

Implementation of Group Project

Teaching and Learning

There are 28 weeks of dedicated curriculum hours for students to carry out a group project of their choice. Time is set aside every week in the time-table for the students to acquire the skills of working together on the project. Before the students embark on their projects, they would learn key essential project work skills such as conducting literature review, planning research design and methodologies, report writing, idea generation, communicating and collaborating as a group, as well as making an oral presentation. Students would learn brainstorming and problem-solving techniques and the use of concept maps or graphic organisers to generate ideas for their project. They also learn about cooperative learning styles to foster teamwork. Lessons on the importance of research ethics are taught to raise students' awareness of the need to acknowledge other people's work through proper citation and referencing, and what amounts to plagiarism in research work. Students also learn about presentation skills using information and communication technologies (ICT), for example, how to deliver an effective multi-media powerpoint presentation, how to engage an audience, and how to communicative clearly and in responding to questions.

Instead of the didactic approach, the pedagogy for group project is student-centred and the teacher's role is to facilitate, supervise and monitor the progress of the groups in carrying out their projects. Teachers also familiarise students with the coursework assessment criteria and scoring rubrics.

Assessment

The examination of the group project is carried out internally by the students' own teachers using pre-determined sets of generic assessment criteria and scoring rubrics for each of the three examined components. In supervising and guiding students during the course of their projects in the classroom, the teachers would be able to make formative and summative judgments of their students' performance. They could gather assessment evidence and provide qualitative feedback as the students carry out their research, analyse and evaluate sources of information, and work as a group over an extended period of time. Hence, the rationale for school-based assessment is that teachers would know best about the extent of effort put in by each group member. Black (1998) argues that in respect of performance assessment, "teacher assessed summative components are essential to securing adequate validity". To ensure that assessment is carried out accurately and consistently, standardisation of assessment among assessors in the school is carried out using national exemplars.

As the group project coursework is a large scale assessment, manageability in terms of cost and efficiency of the assessment of oral presentation is an important consideration for adopting the school-based assessment approach. It is not uncommon for a school to have more than 1000 students. As assessment of oral presentation is based on live performance, it is more efficiently carried out by the teachers within the school.

To ensure that the national standards are applied consistently across all schools, the results of the school-based assessment are moderated internally as well as by an external team of moderators. The work of school-based assessors and internal moderators on all components and from all schools are sampled and checked by the external moderators, first for consistency, and then for leniency or severity in assessment. Where school-based assessment is deemed too lenient or severe, the external moderation ensures that the school-based assessment is brought in line with the national standards.

Assessment of 21st Century Skills

Singapore has implemented the group project coursework ahead of the present international focus on developing 21st century competencies. In what ways does the group project coursework assess 21st century skills?

Thinking and Collaborative Skills

The group project fosters creativity and metacognition as students have to demonstrate critical thinking skills, problem-solving skills, decision-making skills, communication skills and collaboration skills. In doing a group project, learning is very much self-directed as the teachers' role in the coursework process is largely supervisory in nature. Individually, students propose their own ideas; and together as a group, they deliberate and agree on a chosen project based on one of two given project tasks and plan their work schedule. As students do not choose who they like to work with, they have to learn to work with individuals with different personalities, strengths and weaknesses. They would learn about group dynamics and how to use interpersonal skills to negotiate and convince other group members of their ideas. As a group, the students have to demonstrate abilities in idea generation, problem-solving, teamwork and decision-making. The group learns to leverage on each other's strengths in distributing the tasks for the project and there are opportunities for the individual students to display self-confidence and show leadership skills within the group. Teamwork can also be demonstrated in the cohesiveness and effectiveness of the oral presentation, as well as in the quality of their written report.

Through providing individual insights and reflections on the project task, students have to demonstrate metacognitive skills as they write and evaluate on the lessons learnt and new ideas that can be adopted. They would reflect on the proposed project ideas and the process that the group has gone through, as well as analyse and evaluate critically the project ideas, and propose improvements.

Information Literacy Skills

As learning is largely self-directed, students have to be resourceful in data gathering for their chosen projects – they would have to examine the appropriateness of using primary sources as well as secondary sources. In order to substantiate their ideas for the chosen topic, students have to be discerning in selecting information – they need to analyse and evaluate the credibility and reliability of the sources. This is especially important given the pervasiveness and ease of accessibility of information on the Internet. They would also analyse and critically evaluate the ideas contained in the sources in terms of, for example, usefulness, feasibility, manageability, short and long term implications on stakeholders, among other criteria. As a group, students have to show how the ideas could be modified or adapted in solving a similar problem in a different situation or community. Highly motivated and enthusiastic students were able to generate insightful or innovative ideas that are applicable to their project. They were also able to analyse and evaluate the ideas with a high level of maturity and thoroughness.

Communication Skills

In producing their written report, students have to show evidence of the ability to communicate their ideas across to the audience, in terms of appropriate and judicious use of headings and flow charts, in both the textual and oral format, in a coherent, succinct and concise manner.

At the oral presentation, students not only have to demonstrate their ability to speak fluently and clearly but also to engage the audience when communicating their ideas across. In the "Question and Answer session" of the OP, students have to provide impromptu responses to unseen questions. As such they have to think on their feet and produce a response that is well thought out and elaborated. In fact, students who did well on this criterion showed engagement in their projects and were able to produce thoughtful and well-considered responses that went beyond the content of their presentation.

ICT Skills

As the coursework is undertaken over an extended period of time, it is a platform for the development of information and communication technology (ICT) skills by providing students with the opportunity to search and process information from a range of media, for example, hard copy prints and web-pages. Given the constraint of limited time in school for face-to-face meetings, group members would typically employ email and WhatsApp Group Chat as alternative means of collaboration. Emails are also used as a means to gather information from organisations or to carry out interviews for their project. The more ICT savvy students would also take advantage of freewares available from the Internet such as Survey Monkey to conduct their surveys and Google Docs for ease of editing, storage and retrieval of their working files. In proposing ideas for their project, students would commonly leverage on their familiarity with digital social media, for example, using Facebook and Twitter to publicise events or garner feedback and support for their project.

Students would also demonstrate their ease in using different modes of ICT to communicate their ideas convincingly across to the audience during oral presentation. Indeed, some students even showed that they were digital natives adept at using software applications such as Keynote, Adobe Photoshop, iMovie and Flash Player to create sophisticated video clips and web images to substantiate and enhance the effectiveness of their presentation.

Learning Points

Correlations between Components

How are the three components (WR, OP, and GPF) of the group project related to one another? How distinct are the learning outcomes of each component compared to the other components? Table 1 shows the proportion of scores that can be earned in each examination component.

Table 1: Weighting of examination components

Examination Component	Group Score	Individual Score	Total
Written Report (WR)	40%	Not assessed	40%
Oral Presentation (OP)	10%	30%	40%
Group Project File (GPF)	Not assessed	20%	20%
Total	50%	50%	100%

Findings from a study on the inter-correlation of the three components show moderately low correlations (0.15 to 0.30), suggesting that the three components are measuring learning outcomes that are somewhat related and yet are three different aspects of the coursework.

Multiple regression analyses of the overall project work score as dependent variable and the three components as independent variables show that WR contributes about 60% of the subject score variance; OP and GPF contribute the remaining 30% and 10% of the subject score variance respectively.

Preparation for Implementation of Group Project as an Examinable Component

Looking for a model to prepare group project as a nationally examination in the A-Level qualification was difficult as there was no such precedent in curriculum or examination. At the time when this course was conceptualised, the conventional approach to teaching was teacher-directed and didactic, and student learning was generally passive. The construct of this coursework that requires group work and student-directed learning was then an innovative initiative that most teachers and students were not familiar with. Being accustomed to the traditional pen-and-paper national examinations and the external examination of candidates' scripts by examination agencies, teachers were initially apprehensive having to assume dual roles as supervisor and assessor of the group project coursework. As it was to be an examinable component at the key stage of pre-university

education, there were serious reservations among teachers and students in the initial years on the validity and manageability of the about the school-based performance assessment.

In the five years leading up to the first examination in 2003, two small-scale trials and three full-scale field tests which mirrored the live examination were carried out to gather validity evidence, anticipate scalability and sustainability issues and, most importantly, assuage the anxieties of teachers and students over teaching and learning of the coursework and the new examination. The monitoring studies conducted then showed that the majority of teachers felt ill-equipped to teach generic skills such as information literacy, ICT literacy, critical thinking and teamwork. In response to these concerns, extensive training sessions were mounted to familiarise teachers with the construct of project work and to equip them with pedagogical skills for facilitating the coursework. To prepare teachers for the school-based assessment, exemplars of each component were collected during the trials and field tests and shown during training sessions to familiarise teachers with the project work assessment principles, processes and scoring standards. Alongside the preparations to ease teachers and students into the first year of group project examination, the Singapore Ministry of Education also provided extensive infrastructural and manpower support to schools. These included training teachers on a large scale in the teaching and assessment of process skills, and in allocating more teachers in schools to implement this new coursework.

As the group project is part of a high-stakes examination that counts for local university admission, measures were put in place to validate the processes and to ensure that the scores are highly reliable. In particular, the project tasks, assessment criteria and achievement standards are set externally by the examination board. All students and teachers involved in this coursework have to follow a rigorous internal assessment system and adhere to the regulations of a large scale national examination.

Over time, teachers and students have largely eased into the once unfamiliar mode of assessment of the group project coursework. Assessment evidence from students' work and oral presentation suggests that the quality of student performance has improved markedly over the years. In comparison with earlier years, there are now many more written products that showed creative ideas, good research skills, thoughtful analysis, and sound evaluation. It is noteworthy that many more students demonstrated strong confidence, ease with audience engagement and effective delivery during oral presentation. Whilst achieving positive student outcomes in the group project coursework, there are issues related to assessment that have to be carefully managed. These include assessing collaboration, group work, school-based assessment, and criterion-referenced assessment.

Assessing collaboration

In the original conception of the group project, the collaboration of group members was assessed. However, this proved to be challenging for teachers in awarding a score to individual students in the group as they had to grapple with how to credit the effort contributed by each member towards the teamwork. Students also tended to 'put up a show' for the sake of this meeting this criterion. Following a review of the coursework

specification, it was decided that collaboration would not be assessed summatively and it would not count towards the overall score from 2005 onwards. The consensus among teachers and students was that excluding the assessment of collaboration in the summative assessment would not diminish the construct validity of the group project as teamwork among the members would still be a key factor for the successful planning and execution of a project. How then do we address issues of students who are not willing to collaborate as a team? In such instances, the school management including the principal, has to advise and counsel the student concerned, including the parents. Should such intervention measures fail and the student persists in not collaborating with the group members, the student could face a penalty for non-contribution to the group work.

Group Work

An inherent problem with group work is that only one person's idea could be chosen for the group project. As a result, some members might be unhappy if they felt that they could have performed better had their own idea been selected instead. The students often fail to realise that each member in a team has the opportunity to convince their members that his/her proposed idea is worthy for adoption but only one idea could eventually be adopted. The final choice of a project idea is a group decision. In such a situation, the learning opportunities about teamwork for students mirror the real world and they provide valuable life skill lessons that are most relevant in the global workplace of the 21st century. Associated with group work is the issue of 'free riders' in a group. In groups where there are members who do not contribute their allocated share of work, other members in the group would feel that it is unfair for these 'free riders' to gain credit for the work that they have not contributed to. Again, such a scenario reflects the real world and provides some teachable moments for students to learn how to function as a team in the future world. The onus is on the teacher supervising the group to monitor the individual members' contributions closely and to counsel and guide those who do not put in as much effort. It is also important for teachers to document all evidence of intervention actions undertaken by the school.

School-based Assessment

It is well documented that in school-based assessment, there would be some tension between teaching and assessing (Black, 1998). The issue with school-based assessment is best framed by the following question: *Are teachers clear as to when their role as supervisor stops and when their role as assessor begins so that there is no conflict in the two roles?* In their role as supervisor of the coursework, the teachers are expected to monitor and provide formative feedback to guide students along in their projects. However, in their zealousness to help their students achieve good results, some teachers may be excessive and do more than what is expected of them in guiding students. They may even end up doing much of the thinking for their students by providing working-templates to execute project tasks and suggesting ideas to their students without realising they are depriving the students of the opportunity to learn project work skills. Some other teachers may require their students to submit excessive number of drafts of their written work in their zeal to help students refine their evidence of achievement. Not only do these extra efforts deprive students of valuable learning

opportunities and wasting much of students' time, they may also not truly reflect the efforts of the students and thus compromise the validity of the test scores.

Given the high-stakes nature of examination, failure to manage the dual roles as a supervisor and as an assessor would engender public suspicion about the validity and fairness of the school's internal assessment even though rigorous external moderation is carried out. The perceived reliability of the test scores would also be an issue if there were stark differences in assessment practices within and across schools due to varying teacher effect. To ensure standardise assessment practices across schools, measures and procedures such as the publication of Examination Handbook on supervision and assessment guidelines, examination briefings and school visits have to be put in place for schools to strictly adhere to.

Criterion-referenced assessment

The desired student outcomes of the group project which involve the demonstration of key skills are best assessed using explicit sets of assessment criteria and analytic scoring rubrics that are aligned to the aim and objectives of the course. Such criterion-referenced performance assessment would, over time, naturally result in improved performance before stabilising. This is because with good teaching, guidance and practice, the group project skills are achievable by students irrespective of academic ability or prior achievement.

Conclusion

The present learning outcomes and model of assessment of group project work are closely aligned with the skills required of the workplace for the 21st century. Despite the implementation issues, group project school-based coursework assessment is worthwhile and meaningful as there is clear empirical evidence from students' performance over the years that doing group project can foster valuable skills and abilities such as creativity, critical thinking, problem solving, collaboration, independent learning and communication. Notwithstanding, there will be ongoing review of this curriculum initiative to find out if there are other skills and competencies that Singapore students need to acquire for the workplace of the 21st century.

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Project Task	**"Modernisation"**
Aim	This project task encourages you to look at the impact of modernization on communities (e.g. economic, environmental, cultural, employment, etc.).
Task Requirements	▪ Identify a positive or negative impact of modernization on society and show how this has had a significant impact on a specific sector of the community. ▪ Suggest how this impact could be either extended or prevented in the management of future developments of this type.