

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

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| Subject Code | AP2S01 |
| Subject Title | Enhancing Scientific Literacy through Daily Physics |
| Credit Value | 3 |
| Level | 2 |
| Pre-requisite / Co-requisite/ Exclusion | Nil |
| Objectives | <p>The objectives of this subject are to:</p> <ul style="list-style-type: none"> (a) Introduce to students the concept and practice of service learning; (b) Raise students' awareness of needs and challenges in science learning faced by children in underprivileged community; (c) Develop students' scientific thinking and scientific literacy; (d) Educate students about the impact and importance of scientific thinking and literacy; (e) Enhance students' generic competencies of innovative problem solving, communication and teamwork; (f) Nurture students' sense of social awareness, responsibility and engagement; and (g) Facilitate students' understanding of physics and its impacts on our lives through linking theories to daily phenomena. |
| Intended Learning Outcomes <i>(Note 1)</i> | <p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) Apply the science knowledge and classroom management skills to teach junior form students on daily physics in the service setting; (b) Articulate and empathize with the needs and challenges concerned with science learning faced by children in underprivileged community; (c) Understand the impact of scientific literacy on children and the community; (d) Work effectively in teams to solve problems encountered in planning and delivering the service; (e) Communicate effectively with clients and/or other stakeholders; and (f) Reflect on their role and responsibilities both as a professional in their chosen discipline and as a responsible citizen. |

**Subject Synopsis/
Indicative Syllabus**

(Note 2)

The topics in the course syllabus cover three areas:

Concept and Practice of Service Learning:

- Principles, concepts and myths of service learning
- Benefits of service learning to students, the university and the community
- Ethical issues in service learning
- Basic concepts and theories of social problems, developments and justice
- Social responsibilities of global citizens as intellectuals and professionals
- Proper attitudes and behaviours in service delivery
- Developing a service project proposal
- Effective team work and problem solving skills in service-learning projects
- Reflection as a tool for learning

Discipline-Specific Concepts, Issues and Skills

- Principles and concepts of scientific literacy and thinking
- Scientific methods and inquiry; formulation, hypothesis, prediction and experiment;
- Physics concepts in force and energy, weather and climate, health and environment, and working principles of different scientific equipment
- Impact of scientific literacy on society; fear of science; pseudo-science versus proto-science

Project-Specific Concepts, Issue and Skills

- Concepts and practices in teaching and demonstrating scientific concepts to young children, including teaching methods; Bloom's taxonomy; classroom management and development of teaching plans; communication skills and effective explanation of science principles to children without using technical jargons
- Financial, cultural and socioeconomic challenges faced by children in underprivileged community
- Moral, ethical and safety concerns related to teaching and supervising children

Teaching/Learning Methodology

(Note 3)

1. E-learning Module (10 hours)

The e-learning module is developed and delivered by the Office of Service Learning at PolyU, consisting of readings, exercises and assessments that are designed to introduce students to the basic concept and practice of service learning.

Students are required to successfully complete the e-learning module within the first four weeks of the semester in which they are taking the subject.

2. Discipline-Specific Lectures (4 hours)

These lectures will be designed and conducted by the subject team. They are designed to educate students on methods of scientific thinking and inquiry and the impact of scientific literacy on society. Specific physics concepts that are relevant to the science activities delivered to the target audiences (force and energy, weather and climate, health and environment) will be covered.

3. Project-Specific Seminars (4 hours)

These seminars will be designed and conducted by experts and speakers (e.g. colleagues from the Office of Service Learning and the serviced NGOs). They are designed to (a) develop students' understanding of the background and challenges faced by children in the underprivileged community; (b) provide training for students in moral, ethical and safety issues in teaching/classroom management skills for planning and delivering the service project; and (c) equip students with concepts and practices for proper behaviour as the senior buddies, mentorship skills, providing guidance and motivations to the children.

4. Project-Specific Workshops (12 hours)

The project-specific workshops will be designed and conducted by the subject team, with assistances from colleagues in OSL and NGO. They are designed (a) to refresh students on the various Physics concepts, experimental methods and demonstration techniques that they will encounter in the service project; (b) to give training to students in the skills and knowledge needed to create the necessary materials for the service project; and (c) to expose students to possible scenarios and educate them the appropriate responses as senior buddies in the presence of children.

Students are required to attend all of the lectures, seminars and all relevant workshops and successfully complete all of the required assignments/learning tasks prior to participation in the service learning project. Such assignments and tasks will be assessed by the corresponding instructors, with comments and suggestions by OSL and NGO colleagues.

5. Service Learning Projects (40 hours)

The service learning projects will be organized in conjunction with the Office of Service Learning. Students will work in groups and be attached to the partner NGOs with children coming from underprivileged communities (e.g. financial, cultural or socioeconomic difficulties) that negatively impact their learning performance. The focus of the projects will be on enhancing children's interest in learning and motivating them to explore the world of physics. In addition, through mentoring, PolyU students will serve as role models to the underprivileged children and inspire them to set higher future goals.

The Service Learning project is divided into two parts. In the first part, PolyU Students will visit the after-school programmes of the community centers in groups during weekdays and weekends. They will engage in small homework tutorial groups with the children and understand their needs. Small-group educational activities related to daily physics, such as weather and climate, will be demonstrated. Around 24 hours of services will be allocated to these outreach activities.

Besides outreach activities held in the community centers, in-campus activities including two one-day summer workshops will be held in PolyU campus. More interesting topics about physics and environment, such as concepts of force and energy in mechanical motions, weather and environment, and the relations between particulate matter and health, will be introduced via presentations, experimental demonstrations in AP's laboratories and scientific competitions. Students are expected to serve 16 hours for such in-campus activities.

In all cases, student will be required to spend the 40 required hours rendering direct service to the targeted children. Students' behavior during services will be supervised, and their performances will be regularly assessed by on-site supervisors from AP, with comments and suggestions from OSL and the serviced NGOs.

6. Reflective Journals & Report and Review Sessions

Students will be required to write two reflective journals during the project. The purpose of these reports are to (a) document their work, (b) reflect upon their service learning experiences, (c) identify their learning gains and their weakness, and also to (d) propose areas of change for future sessions.

After the services, students will be required to write a final summative report and to give a group presentation. The report and presentation will require students to demonstrate their capabilities to (a) link their service learning experiences with the academic focus/discipline-specific content of the subject, (b) reflect on their service learning experience to identify their leaning gains as well as areas for future improvements, and (c) reflect on their roles and social responsibilities.

To guide students in using reflection as a tool for learning, and to assess their ability in achieving the above learning objectives, reflection and review sessions will also be held both during and after the service learning project. Experts and facilitators from outside the subject team (e.g. Office of Service Learning, NGOs) will be invited to contribute to some of these sessions as appropriate.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Students' performance in this subject will be assessed using a letter-grading system in accordance with the University's convention from grade F (failure) to A+. The relative weighting of the different assessment components are as follows:

| Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed (Please tick as appropriate) | | | | | |
|--|--------------|--|---|---|---|---|---|
| | | a | b | c | d | e | f |
| 1. E-learning modules and Project-specific seminars and workshops (I) | 20% | | ✓ | ✓ | | | ✓ |
| 2. Plans/proposals for service (I/G) | 20% | ✓ | | | | ✓ | |
| 3. Performance in service (I) | 30% | ✓ | ✓ | | ✓ | ✓ | |
| 4. Reflective journal/report (I) / final presentation (I/G) | 30% | | ✓ | ✓ | | | ✓ |
| Total | 100 % | | | | | | |

Note for table: I – Individual tasks; I/G: Combination of individual and group tasks.

Students must obtain a pass in all of the components in order to pass the subject.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The e-Learning Module and Project-specific seminars and workshops will include assignments and learning tasks that are designed to assess students' ability to understand the impact of scientific literacy on children and the community (ILO c), their understanding and empathy for the underprivileged (ILO b) as well as their understanding of their role and responsibilities in society (ILO f).

Students will be asked to write proposals or plans for the service projects as preparation for service. These proposals and plans may include project designs, sample project deliverables, lesson plans, worksheets, etc. These will clearly require students to demonstrate their understanding of the relevant Physics concepts, as well as their ability to apply their grasp of scientific knowledge and scientific literacy (ILO a). They will be working in groups and be required to demonstrate their ability to work collaboratively (ILO e).

During the execution of the project, students will be working in groups at the partner NGOs. This will expose them to the issues and challenges face by the

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| | <p>children at these NGOs (ILO b). They will have to be able to communicate effectively with the children (ILO e) and to empathize with their situation (ILO b). Since students will be working in groups, this will also require them to demonstrate their ability to work collaboratively (ILO d) to apply their knowledge and skills to deal with real problems in the service setting (ILO a).</p> <p>Students will be supervised throughout the service component either by members of the teaching team, or by staff of the Office of Service Learning. They will be assessed by their <u>attitude</u> and <u>performance</u> in the rendering of service, their degree of <u>engagement</u> with the children, their <u>collaboration</u> with other fellow students, and <u>interactions</u> with the service recipients and the collaborating NGOs.</p> <p>Students' reflective journals and report, and their presentations and discussions during the reflection and review sessions and tutorials, will testify to the students' reflection on their learning experience, and the breadth and depth of their learning. This assesses their ability to reflect upon the impact and importance of scientific literacy on the community (ILO c), their understanding of and empathy for the challenges faced by the children that they serve (ILO b), and their ability to reflect on their role and responsibilities in the society (ILO f).</p> |
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| Student Study Effort Expected | e-Learning Module | 10 Hrs. |
| | Class contact: | |
| | ▪ Discipline-Specific Lectures and Seminars | 4 Hrs. |
| | ▪ Project-Specific Lectures, Seminars, Tutorials and Workshops | 16Hrs. |
| | Other student study effort: | |
| | ▪ Planning and Preparation for the project | 30 Hrs. |
| | ▪ Service delivery | 40 Hrs. |
| | ▪ Reflection and reporting | 30 Hrs. |
| | Total student study effort | 130 Hrs. |
| Reading List and References | <p>Service-Learning Handbook (downloadable at Service-Learning@PolyU)</p> <p>R. Hazen & J. Trefil, "Science Matters: Achieving Scientific Literacy", 2009, Anchor.</p> <p>A. Johnson, "Privilege, Power and Difference", 2005, McGraw-Hill.</p> <p>J. C. Sprott, "Physics Demonstrations", 2006, Wisconsin Press.</p> <p>L. A. Bloomfield, "How things work: the physics of everyday life", 2013, Wiley.</p> <p>C. Fletcher, "Climate change: what the science tells us", 2013, Wiley.</p> | |

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.