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# Enhanced Learning Opportunities for School Students with Disabilities: Pedagogic and Technological Issues

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**Abstract:** Information and communications technology has the potential to enhance the life of students with disability by facilitating their opportunities for growth, development and inclusion. However, the full potential of such technologies is unlikely to be achieved without concurrent changes in pedagogical practice. Pedagogical practices such as peer-assisted, co-operative and collaborative learning all have great potential for synergy with information and communications technology to benefit students with disabilities. This paper discusses the application of emerging technology and connected pedagogical issues in the specific context of educational field trips. The RAFT (Remote Accessible Field Trips) project is used as an exemplar to demonstrate future directions.

**Keywords:** Assistive technology, pedagogy, inclusion, field trips.

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## 1. Introduction

Educational field work, and out-of-classroom activities in general, can be problematic for students with disabilities, as factors such as mobility, accessibility and communication can restrict or prevent participation. Many issues of general concern about educational field work have been identified by the UK Field Studies Council and British Ecological Society [1]. A number of these issues are being addressed by the RAFT (Remote Accessible Field Trips) project which could help to provide a platform for sustaining and developing field work while enabling all students, including those with disabilities, to benefit from this valuable educational experience.

## 2. RAFT Philosophy

The RAFT philosophy is to open up access to traditional field work by applying modern technology to its delivery and practice, highlighting its importance in the curriculum and lowering barriers to students of different abilities. Instead of a whole class having to go on a field trip for all students to benefit from it, it is possible for a section of the class to travel to the field site while the remainder participate live from the classroom using telecommunications links. Wearable or portable computers can be used in the field, with the classroom in real-time communication via web-based video-conferencing. Students in both field and classroom will thus be able to interact in a synchronous fashion. This will enable all students to obtain a strong feel for the field work site. It will also be possible for remote classrooms and experts to be in real-time communication with the class and able to interact with it. Students in the classroom(s) may be working in groups with each group working on a different aspect of the topic under investigation. A possible layout for this system is demonstrated in Figure 1.

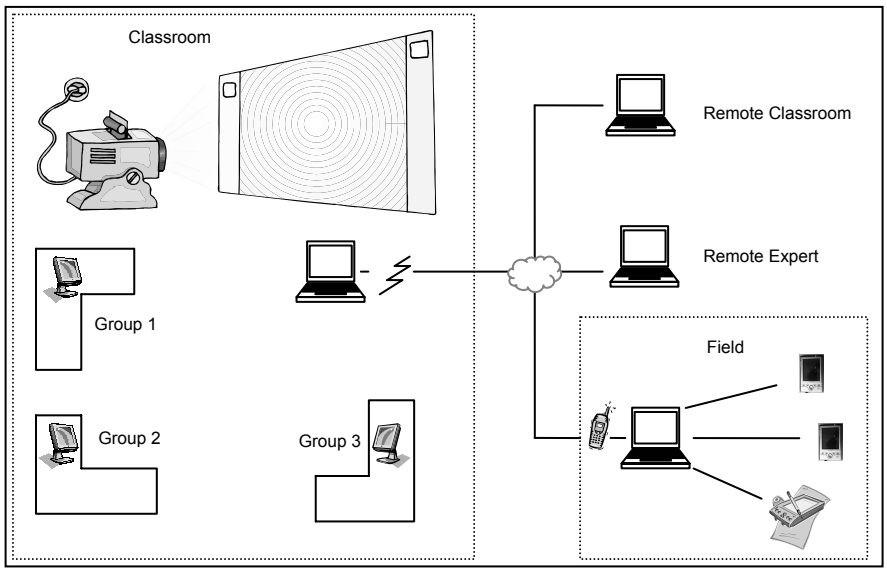


**Figure 1.** Possible RAFT system

For the student with disabilities, RAFT-style field work becomes more accessible: mobility problems can be addressed by allocating a student an important task in the classroom or by students working in pairs in the field where one member can visit places which are inaccessible to the partner. Those who are visually impaired, those with hearing problems and those with learning disabilities will benefit from having their personal profile automatically loaded on their system log-in. All aspects from roles to technology to

individual profiles could be set to allow everyone to have access to all aspects of the field work experience and to facilitate the involvement of students with disabilities.

The benefits of the RAFT approach are that it is interactive, in real time, and there are opportunities for face-to-face contact and collaboration both of which have been found to be problems with distance learning [2], which includes virtual field trips. It also allows all students regardless of ability or disability to participate in field work.

| Learning Theory | Brief Description | RAFT Examples |
|---|---|---|
| Piagetian concepts [3] | Learners interact with knowledge, events and other learners, assimilating to and accommodating their schemas of the world in response to cognitive challenge and conflict, often from equally able peers. | The challenge of responding to questions in the field from enquirers in the classroom who may have different schemas of the problem and the environment, and vice versa. |
| Vygotskian concepts [4] | Effective learning is primarily socially constructed, especially where a relative "expert" offers "scaffolding" support to a less advanced learner at a level which is just appropriately challenging (just beyond the level the latter can achieve independently, i.e. within the latter's "zone of proximal development"). | Communicating with and asking specialists in the area under investigation; working directly with expert personnel in the field and classroom; receiving scaffolding from a more experienced peer. |
| Situated Learning [5] | Learning of skills and knowledge is most effective in a real life environment where the learner interacts with authentic and salient tasks and demands. However, there might be problems of generalising this learning to new environments. | Field trips present many real-life practical problems to be solved and demands from several directions. Examples: visiting and interviewing a professional - an artist in their studio, a journalist at work, a scientist in the laboratory. |
| Collaborative Learning [6] | Collaborative learning is usually defined as highly mutual working on a single joint task. Collaborations between learners of homogeneous ability (but not necessarily homogeneous knowledge) are usual. Learners are empowered to solve increasingly open-ended, complex tasks. | Working with peers in the field and in the classroom; distributed working with other students in different parts of the world on topics of mutual interest. |
| Cooperative Learning [7] | By contrast with collaborative learning, cooperative learning often involves parallel working in groups on inter-connected tasks with division of labour to achieve a joint goal, and is more likely to need external coordination. For effectiveness, each student should have a particular role. Individual accountability, responsibility, and valuing of every group member are necessary for effectiveness. | Group tasks e.g. on pollution in river. Within the group there are roles e.g. researcher, communicator, measurer, collator and developer. Each contributes to achieve the joint result – a "jigsaw" process. |
| Peer Assisted Learning (PAL) [8] | PAL can be regarded as a subset of cooperative learning. It includes several structured approaches to helping students learn through active helping and supporting among matched companions. It is characterised by a specific intention to help others with their learning, rather than focusing only on a joint group goal. | In the field, a visually impaired student may be assigned a student to be his/her visual helper – the two work together gathering information for their group. |
| Vicarious Learning [9] | Targeted learning is often supplemented by untargeted incidental serendipitous learning. Some of this occurs from being present in a learning environment, observing others learn (and make errors), discussing, selectively absorbing transferable skills and content knowledge, and modelling upon effective learning. Learners can discern how systems work and gain entry into the culture. | A student takes the role of process observer in a group investigating the Roman Army. The student "learns" different techniques from observing other groups' approaches to their tasks. This is "meta-learning". |

**Table 1.** Learning Theories Underpinning RAFT

## 3. Pedagogical Issues

### *3.1 Learning Theory*

The approach is based on several connected strands of learning theory. Table 1 gives a brief description of each strand with examples of where it may arise in RAFT activity scenarios. All of these provide good opportunities for students with disability to participate and to experience new situations to further their growth, improve their life chances and widen their horizons.

### *3.2 Challenges to Education*

Learning does not just occur at school but also at home and in the community. In recent years this kind of distributed learning has been facilitated by information and communications technology. E-mail and computer networks, including school intranets with remote access, will enable pupils not only to work in school but also from home or from libraries. They then require feedback about their performance. The implications are wide ranging in terms of teachers' availability, school management, school structure, parental involvement, planning and technical support [10]. By utilising such facilities effectively, students with disability can learn in their own time and place, at their own speed, in a more encouraging environment and in a way that suits them. This is the challenge to education: to effectively manage and utilise the potential of pervasive computing.

### *3.3 Inclusion*

Placing a student in a classroom does not by itself guarantee inclusion, but where the student is a member of a group, with a role to play, as in co-operative learning, then that student is experiencing inclusion. Students who work together, or collaborate, develop more commitment and liking for each other [7]. Therefore, if students with disability are chosen as friends and accepted, some degree of understanding and empathy with others has occurred. Inclusion becomes a positive influence on the lives of all students with, or without, disability and working co-operatively promotes a sense of well-being. This in turn can promote self-confidence, self-respect, empowerment, opportunities to participate in groups and a sense of belonging to a community, in students with disability. Through co-operative practices, students with disability can have access to highly motivated students providing excellent role models and possibly enhancing aspirations. These changes in approach, in facilities and pedagogies, are capable of working to the advantage of the student with disabilities.

## 4. Technological Issues

### *4.1 Communication Technology*

Relevant communication technologies are Bluetooth and WiFi (IEEE 802.11b) and/or cellular (GPRS (General Packet Radio Service)) communication methods for transferring data over distances. Of these, WiFi looks the most promising technology, but all three, or a combination of them, may be utilised in appropriate situations. At present none of these is entirely reliable in outdoor conditions.

Web-based video-conferencing is demanding of processing power and bandwidth which makes wireless communication problematic in terms of reliability and acceptable resolution in audio and video reception. In the next few years, 3G (Third Generation Mobile Services) / UMTS (Universal Mobile Telecommunications System) telephones, increased processing speed, improved bandwidth, improved wireless communication and accessibility may all be available. There may also be more developed assistive technology, for example

sign language via 3G technology and a mobile video telecommunications device and development of learning companions, which may be of benefit.

### *4.2 Further Research*

Areas have already been identified in the prototyping stages for more research and development either generally in the development of technology or specifically in the project itself:

- wireless WAN (Wide Area Network) with broadband access which would improve the quality and speed of web-based video conferencing and make communicating at a distance easier
- ubiquitous WLAN (Wireless Local Area Network) providing the same facilities for mobile users as desktop users. Work needs to be done on ease of use, security, mobility and network management [11]
- an integrated mobile solution, incorporating all the features required, rather than having several devices each of which offers the best solution for one part of the experience, would also be desirable
- wearable technology, unobtrusive and unrestrictive for those in the field situation
- interfaces dedicated to the field work with comprehensive accessibility features
- integrated HCI (Human Computer Interaction) where everything the student requires has been anticipated and can be found or done efficiently rather than having multiple windows to work between.

## 5. Conclusion

The RAFT approach to field work offers students with disabilities the facility to see and participate in new environments and to interact in situations and with people from different cultures and with different expertise.

Increases in confidence, opportunities and life chances, awareness, understanding, achievement, acceptance and development are some of the potential outcomes for students with disabilities in this model.

The RAFT method may thus provide the infrastructure for offering enhanced learning opportunities, supported by pedagogical changes, to students with disabilities.

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