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A RASCH MEASUREMENT ANALYSIS OF UNIVERSITY STUDENTS' RECEPTIVITY TO PEERS WITH DISABILITIES

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ABSTRACT

The study investigated university students' receptivity to peers with disabilities at two universities in Perth, Western Australia (Edith Cowan University and the University of Notre Dame in Fremantle), and two universities in India (The University of Kolkata, previously Calcutta, and the University of Jadavpur). Data were collected via a 60 item questionnaire (N=996) based on six aspects supporting receptivity to peers with disabilities: Academic, Interactive, Social, Personal, Professional and Supportive. The final questionnaire was composed of 30 stem-items each answered in two perspectives: (1) an ideal self-view (What I think I should do) and (2) their self-reported behaviour (what I actually do), making a total of 60 items. The questionnaire data were analysed with a Rasch computer program (RUMM 2020) in order to create a linear scale of University Students' Receptivity of Peers with Disabilities so that valid inferences could be made from the scale data. Four main inferences were drawn from the Rasch-created linear scale of Receptivity to Peers with Disabilities. One is that the ideal self-views (attitudes) are easier than the actual self-views (behaviours), for all items where both perspectives fit the measurement model. Two is that the students do make an effort to appreciate and recognise academic and non-academic achievements of peers with disabilities at university but find it moderately hard to do so. Three is that the students found it very hard to involve themselves in promoting optimal participation of peers with disabilities in quality higher education. Four is that Receptivity to Peers with Disabilities is significantly higher at the Universities of Calcutta and Jadavpur in India than at Edith Cowan University and the University of Notre Dame in Western Australia, and Receptivity is significantly higher at the University of Notre dame than at Edith Cowan University. The analysis helped to establish links between attitudes and behaviour.

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People with disabilities are increasingly turning to higher education to achieve their career and professional goals (Prentice, 2002), and more and more people with disabilities are beating prejudice to perform in various activities. Students with disabilities, whether at schools, colleges or universities, have already demonstrated that given the opportunity, they can acquire knowledge and skills, and can participate in all activities similar to their regular peers. However, there are barriers which still affect those with impairments and disabilities, negatively (Treolar, 1999). During the launching of the Disability Strategy on 30 April 2001, Helen Clark, Prime Minister of New Zealand, said that many people with impairment, "are unable to reach their full potential or participate fully in our communities because of the barriers they face doing everyday things" (New Zealand Disability Strategy, 2001, p. 5). The barriers relate to various factors, but mainly social attitudes. "Personal and societal attitudes towards people with disabilities must change… for attitude is the biggest barrier facing disabled people" observed Gary Williams (New Zealand Disability Strategy, 2001, p.4). However, attitudes towards individuals are bound to vary from culture to culture, and there is a range of differences present because attitudes are very much influenced by culture and tradition (Saravanabhaban & Saravanabhavan, 2001). Fostering and promoting acceptance and receptivity of students with disabilities is what should beat the heart of disability programs at education centres.
This involves understanding and recognizing a student with a disability, and developing right attitudes towards disadvantaged peers (Prentice, 2002).

Background

Disability Issues and Right to Higher Education

The rights of people with disabilities have been an issue in dispute for many years. Some claim that those with disabilities should have the same right as normal students (the same quality of education, the same status, the same degree of respect). All students, regardless of disability and circumstance, have a right to access and participate in higher education, to fairness and equity, and to services and entitlements including opportunities to be independent (source of information: Disability Policy, 1992).

The United Nations Declaration made during the International Year of Disabled people in 1981 included the right to receive an education that would enable students with disabilities to develop their skills and capacities to the full. The right was also embodied in the United Nations Conventions on the Rights of the Child in 1990 (Hert, 1993, cited by Jenkinson, 1997, p.25). The Declaration also reflected a disabled student's right to a future-based education that was comparable to that received by the majority of students. The rights of students with disabilities included the right to appropriate assessment of educational needs (Jenkinson, 1997, p.26). The 1981 Education Act in Britain and the New South Wales Department of School Education reflected the same rights (Human Rights Australia, 1993). The right to education in the European Convention of Human Rights, coupled with the Human Rights Act (1993) may give a right to have a disability properly taken into account in the education field. Article 2 of the First Protocol to the European Convention of Human Rights reads: "No person shall be denied the right to education. In the exercise of any functions that it assumes in relation to education and to teaching, the State shall respect the right of parents to ensure such education and teaching in conformity with their own religious and philosophical convictions" (Tyrer, 2000-2002).

Perspectives on disability

Although better community awareness and community education are making valuable contributions to encourage people with disabilities prove their worth (Biswas, 2002; Prentice, 2002), students with disabilities may still feel misunderstood in certain educational settings… (Treolar, 1999). As research on the welfare of people with disability, particularly students with disability, shows that western societies aim to recognize their rights of people with disability in full equality with non-disabled members of the society, youth with disabilities in India have somewhat less opportunity due to the general climate within the educational institution and the community (Disability India.com, 2004). However, educational institutions are currently bound by the terms of the disability policies and legislation, and regular university students have the freedom to accept or not to accept the policies. An explanation can be found in the results of a recent study by this researcher. In the past, students with disabilities were excluded from regular education because they lacked certain self-care skills, or the abilities of communication and ambulation, creating a fear of rejection among those with impairments or disabilities. What is important in minimizing this fear of rejection is the receptivity to and acceptance of these students by their non-disabled peers. Specialized services and appropriately integrated educational environments would prove truly beneficial for students with disabilities only when regular students hold accepting attitudes towards their peers with disabilities through interactions at universities. It is, therefore, most appropriate for regular university students to have an understanding of disability, and acceptance of the support needs of those with disabilities. "This involves treating students with disabilities as people, seeing them as able, and accepting their differences, learning the appropriate language of disability, recognizing a student who might have a disability…."(Treolar, 1999 cited by Prentice, 2002, p.2). This means that successful initiatives should be designed by the universities to aid students in accessing the educational offerings at a

higher education level. There have been policy moves in Australia, the USA, Canada, New Zealand, United Kingdom and India over the past 20 years, not only for better community awareness of people with disabilities, but also for community education to accept responsibility to meet the needs of students with disabilities in the regular class environment with non-disabled peers .

Receptivity to students with disabilities

There seems to be a lack of research, in India, from the regular students' perspective, whether at school, college or university level, and there were no studies involving the creation of a unidimensional scale of regular students' receptivity of peers with disabilities. Thus the present study is expected to provide critical missing information from prior survey studies, to generate new knowledge, producing a new scale of Receptivity of Peers with Disabilities in which the person measures and item difficulties are calibrated on the same scale, and help administrators to better cater for students with disabilities. Studies exploring personal and societal attitudes and behaviours toward students with disabilities show that, in spite of the changing policies promoting equal opportunities for students with disabilities, peer attitudes and behaviours toward those with disabilities, still need to improve. Regular, non-disabled university students certainly need to be motivated into accepting peers who have special needs. This is possible with student awareness and understanding of disabilities, and also appropriate behaviour toward individuals with disabilities on the university campus.

Just as government and university policies and legislation on disability in Western Australia seek to bring about change, provide people equal opportunities to realise their individual capabilities and potentials, through full participation in social and university

activities, the Government of India has also announced a plan to make education disabled-friendly by 2020 and 'to make mainstream education not just available but accessible, affordable and appropriate for students with disabilities'…(Singh, 2001). However, it is not just enough to give admission to students with disabilities. It is also important to provide necessary facilities for them in the colleges so that they are part of the mainstream in the true sense of the word. Recent reports show that the Government of India is providing scholarships to students with disabilities to pursue studies at post school level.

Findings indicate that regular university students often lack motivation and experience to establish interpersonal relationships with peers with disabilities (Biswas, 2002). The study also indicates that the general attitudes of university students toward peers with disabilities are positive, but it is hard for many to translate their attitudes into actual behaviour. This study is important from the point of view of students with disability who rarely need special treatment. What they need is our understanding, fair treatment, a positive approach to their problems, receptivity and acceptance. This study is important for it examines perspectives on disability, investigates the possibility of changes through interactions between disability-related legislation and educational programs, social and university policies, and establishes links between attitudes and behaviours that may lead to better receptivity and better acceptance of peers with disability at university.

Response to Disability

Current research in Australia indicates that the mainstreaming of secondary school with disabilities into the regular classes (now called inclusion) has a significant effect on these students and helps them to develop better self-esteem, social understanding and

interpersonal relationships (Noland, McLaughlin, Howard & Sweeny, 1993). Special provisions are determined for students with severe physical or sensory difficulties, and for students who have a specific learning difficulty, to assist them to access and complete the course being undertaken on an equal basis with their non-disabled peers in Western Australia. Available literature shows that there had been surveys focusing on integration, introducing steps to improve the campus climate for students, and promoting classroom-awareness in high schools. Kemp (2003) and Ward, Center and Bochner (1994) investigated the possibilities of integrating children with disabilities into regular classrooms. A search of the literature found no other related studies with Western Australian data. However, literature shows that research on attitude towards students with disabilities and studies on integration in schools were conducted by Gannon and MacLean (1996). Forlin, 1997), Darcy and Daruwalla (1999), Tait and Purdie (2000), who focused on integration, introducing steps to improve the campus climate for students, and promoting classroom-awareness in high schools.

The Indian scenario is somewhat different. It has been part of India's cultural heritage to help the poor, the aged and those with disabilities. However, it was only half a century ago that it was understood that people with disability conditions had potential and talent which needed to be understood, realized and promoted. Of late, there is a realization that people with disabilities are capable of living independently and that they can be useful contributors to society (Saravanabhavan & Saravanabhavan, 2001). As understanding attitudes toward people with disabilities is an important necessity to build an effective educational system and an integrated society (Saravanabhavan & Saravanabhavan, 2001), more and more articles on the acceptance of disability have being published, and studies had been undertaken by researchers in India. Programs focused on Inclusive Education incorporated attitude-changing strategies which

aimed at acceptance of peers with disabilities by the regular students (Lynch in Centre for Studies on Inclusive Education, (2002). Studies focused on educational and vocational training, social integration of the visually impaired, and rehabilitation of children with disabilities particularly the visually impaired were conducted. Singh (2001), in his book 'Enabling the Differently Able', discussed various kinds of disabilities, and social problems faced by those with disabilities. As the research shows there is a lack of similar or related studies in Australia and India.

Literature on Attitude, Behaviour and Receptivity to Peers with Disabilities

Attitude Formation

The literature associated with attitude formation shows that social psychologists have been concerned with the formation of people's attitudes about objects, groups, issues and events (Darley, Gulcksberg, Kamin & Kinchla, 1984). As identified and documented by Gleason (1991), Reber (1995), and Gerber (1997), attitudes towards people with disabilities can be formed or developed in the participants during childhood, at the age of 4 or 5 years. However, attitudes can be modified and further developed in both in older children and adults. The question often asked is how do these attitudes form, change or develop? As Fernald (1997, p.562) states "they arise initially through contacts with our parents, early teachers, and other adults. Later, peers and friends influence the various components." There are, at least, three processes by which these attitudes form (Fernald (1997, p.563): (1) Direct instruction and modeling where the child learns by following the example of another; (2) Classical and operant conditioning which is associated with good outcomes or positive consequences; and (3) Role of Cognition: Attitudes may develop or change through the way

we think about things, without direct instruction, modeling or any significant conditioning. Cognitive processes can be fundamentally involved in the development of attitude (Chaiken & Stangor cited in Fernald, 1997, p.562-563). In other words, thought may be the basis for attitude formation. They can develop or change through the way we think about things and reason (Fernald, 1997). According to Triandis (1971, p.101) "Attitudes are learned" and they are acquired from other people. The sources of attitude change are a person, a group, a newspaper, a radio or an object of attitude.

Some literature exists on the importance of positive peer attitudes towards those with disabilities, but there is little empirical research regarding the actual behaviours of students towards peers or co-learners with disabilities at university. All students, regardless of disability and circumstance, have a right to access and participate in higher education, to independent (Source of information: Disability Policy, 1992). The United Nations Declaration made during the International Year of Disabled people in 1981 included the right to receive an education that would enable students with disabilities to develop their fairness and equity, and to services and entitlements including opportunities to be skills and capacities to the full. The right was also embodied in the United Nations Conventions on the Rights of the Child in 1990 (Hert, 1993, cited by Jenkinson, 1997, p.25). The Declaration also reflected a disabled student's right to a future-based education that was comparable to that received by the majority of students. The rights of students with disabilities included the right to appropriate assessment of educational needs (Jenkinson, 1997, p.26). The 1981 Education Act in Britain and the New South Wales Department of School Education reflected the same rights (Human Rights Australia, 1993). The right to education in the European Convention of Human Rights, coupled with the Human Rights Act (1998) may give a right to have a disability properly taken into account in the education field.

Attitude and behaviour links

Attitudes, as Triandis (1971) suggested, could be changed in various ways. Change needs to occur in all the attitude components. New information, pleasant and unpleasant, and even traumatic experiences with the attitude object can change the cognitive, affective and behavioural components (Triandis, 1971). "Attitudes influence behaviour, and behaviour influences attitudes" (Scarr & Zanden, 1984, p.316). A study of attitude shows that attitudes to some extent can explain or predict a person's behaviour and attitude implies that attitude influences a person's behaviour (Payne cited in Schibeci, 1985). However, Schibeci suggests that the relation between attitude and behaviour is not always consistent. LaPiere's investigation in 1934 on racial prejudice (cited in Schibeci, 1985), showed that attitudes expressed in the questionnaire actually approached them. Findings of Morgonosky's investigation in 1990 on the perception of apparel quality refutes the assertion that attitude can predict behaviour. Studies cited by Fernald (1996), also demonstrate inconsistencies in individual's cognitions. However, Skinner (1989, p.3) asserts "How people feel is as important as what they do". It is also believed that "Behaviour is often attributed to an initiating, originating, or creative act of will" (Skinner, 1989, p.15), and as behaviour is often said to grow or develop (Skinner, 1989), overt behaviour is not always an indication of an attitude.

The literature review indicates that numerous studies related to attitudes and behaviours toward people with disabilities have been conducted in the past. Surveys and research have focused on steps to make campus climate more congenial for students with disabilities, and to improve parents', educators', and peers' attitudes and behaviours towards

those with special needs. Opportunities are being provided to usher students with disabilities into regular classrooms and higher education. However, there seems to be a lack of studies of attitude and behaviour of university students toward peers with disabilities. University-based issues on disability have been mostly dealt with in American or British contexts. Studies indicate that similar literature in the Australian and Indian contexts is inadequate.

Current research in Australia indicates that the mainstreaming of secondary school with disabilities into the regular classes (now called inclusion) has a significant effect on these students and helps them to develop better self-esteem, social understanding and interpersonal relationships (Noland, McLaughlin, Howard & Sweeny, 1993). Special provisions are determined for students with severe physical or sensory difficulties, and for students who have a specific learning difficulty, to assist them to access and complete the course being undertaken on an equal basis with their non-disabled peers in Western Australia.

Review of Measurement Techniques

The most common measurement technique used in the social sciences is True Score Theory. This involves constructing a set of items which are shown to have internal consistency (usually with a Cronbach Alpha) and using the total score as the 'measure'. This 'measure' is said to consist of a so-called 'true score' plus a random error score, but it is non-linear since equal differences between the scale scores do not represent equal amounts of what is said to be 'measured'. True Score Theory 'measures' are often used in conjunction with response category techniques like Likert (1932) or semantic differentials (Osgood, Suci & Tannenbaum, 1957) which may not be ordered from low to high as required for measurement and can thus be called into question. So unless a modern computer program is applied to the data, such as a Rasch

Measurement Model, a linear scale is not formed. Since the 1970s, computer programs have been developed to use with Rasch measurement and produce linear scales for social science data. Wright (1999) claims that Rasch measures are producing a minor revolution in the social sciences. Their use should, he claims, produce laws that are reproducible and stable, as there are in physics, for example. Rasch measures have been applied successfully to measure attitudes and behaviours of regular students (see Waugh 2001a, 20001b, 1999, 2003, 2005, 2006), but none seem to have been used specifically with students with disabilities (except for Biswas, 2002 and Waugh & Biswas, 2003).

Rasch (1960) first published a measurement model which could be used to make linear measures in the social sciences and both Wright (1999) and Waugh (2006) have said that it is currently the only known way to make linear measures in the social sciences. In Western Australia, it has been expanded and developed by Andrich and others, and there is a very good computer program using a Rasch model (called RUMM2020, Andrich, Sheridan & Lyne, 2005) which produces useful graphical and tabular output relating to a linear measure, if one can be created from the data. In qualitative terms, the items in a Rasch measure are ordered by difficulty from say low to medium to high, and the person measures are calibrated on the same scale as the item difficulties, but certain conditions must apply. First the model is probabilistic and it allows for a person with a high measure to get an item wrong, sometimes, and it allows for a person with a low measure to get a hard or medium item right, sometimes. Second, persons with low measures can only answer the easy items correctly (or positively for attitude and behaviour), but not the medium and hard items. Persons with medium measures can answer the easy items and the medium items correctly (or positively for attitude

and behaviour), but not the hard items. Persons with high measures can answer the easy, medium and hard items correctly (or positively for attitude and behaviour).

Aims

There are two aims.

1. To create a questionnaire to measure University Students' Receptivity towards Peers with Disabilities based on six aspects- (i) Academic (Special and Alternative Programs), (ii) Interactive (Inclusive Courses and Interaction and Improvement of Self-image), (iii) Social (Promote Relationships through Recreational Programs and Recognition of Achievements), (iv) Personal (Involvement), (v) Professional (Integrated workforce) and (vi) Supportive (Special University Policies and Procedures).
2. To create a linear scale of the variable, University Students' Receptivity towards Peers with Disabilities, and investigate its psychometric properties.

Significance and Relevance

The present study is significant because the diversity in university students' attitudes and behaviours toward disabilities in the two countries may help to improve the understanding of disabilities. It is also expected to open new avenues for further research in education related to receptivity of disabilities in peers in universities. It will serve as an extension to the study of receptivity of peers with disabilities in higher study levels with a view to examining aspects of university students' attitude and behaviour toward disabilities on campus and in classrooms. The present study is important because it is designed to yield new information about university

students and their behaviour towards peers with disabilities, and their receptivity of them. The study could provide information that may help university administrations cater to the needs of the students with disabilities in a better way. Specifically, the research is expected (a) to describe feelings of responsibility and commitment to educational goals for peers with disabilities in an inclusive or general university environment, (b) to document the barriers and difficulties, and the successes perceived by non-disabled students in an inclusively structured place of education or in integrated education programmes, (c) to isolate the data concerning university students' receptivity of peers with disabilities in India to illustrate a different perception of disabilities.

Measuring attitudes and behaviours on the same scale has not previously tested self-reported attitudes and behaviours of students towards peers with disabilities except for one study. The usual procedure is to measure attitudes with one scale and behaviours with another, and then correlate them. This typically gives a correlation of the order of 0.1 to 0.4.The method used in the present study is new and considered to be superior to the correlation method. The present study used a structural model integrated with a perspective response model and a measurement model. It is concerned with regular university students' receptivity of peers with disabilities. The structural model is new and was developed especially for this study, after consulting the literature. The model was derived to explain students' attitudes, capabilities and behaviours.

The significance of the study was that the outcomes showed that there is a lack of knowledge about disabilities among university students. It identified regular university students' understanding of disabilities and of the needs of their peers with disabilities. The study will benefit all students for it could lead to improvements in universities' services, and decrease discrimination. The present study is expected to be useful for policy-makers, administrators and

lecturers at the universities in Perth, for I believe it will provide new knowledge about student interaction on the campus and in lecture theatres, and could lead to improvements in the educational environment for individuals with disabilities.

Another important aspect of this project is that a new scale was created using a Rasch Measurement Model. This produced a unidimensional scale of students' attitudes and behaviours toward peers with disabilities. This means that the linear measures for students regarding acceptance of peers with disabilities were interpreted as affected has not been done anywhere in the world before for this particular measure with the exception of a very recent one in Western Australia.

Method

Permission was obtained from the University Ethics Committee, Heads of Schools and lecturers of all the four universities concerned, to administer the questionnaires on appropriate days and time.

A total of 996 regular university students comprising pre-service teaching students, and 4th and 5th Year students of Education across four universities in Western Australia and India participated in the study voluntarily and anonymously. The samples from each university were considered to be representative of their population of Bachelor Degree Teacher Education students comprising males and females, different nationalities and cultural backgrounds, and varying social and religious beliefs. Sample sizes were as follows: Edith Cowan University (N=206), University of Notre Dame (N=150), University of Calcutta (N=344) and Jadavpur University (N=296).

The questionnaire was trialed with students at each of the universities to determine the relevance of the statements to the sub-headings, the appropriateness of the language, and the suitability of the questionnaire. The following familiar aspects of receptivity were included: Academic (Special and Alternative Programs), Interactive (Inclusive Courses and Interaction and Improvement of Self-image), Social (promote relationships through Recreational Programs and recognition of Achievements), Personal (Involvement), Professional (Integrated Workforce) and Supportive (Special university policies and procedures) to increase their applicability. The wording of certain items was reconstructed so that respondents were more comfortable with them, particularly those with English as a second-language.

Results of Rasch Analysis

Data from the 996 questionnaires were analyzed together using the Rasch Unidimensional Measurement Model (RUMM) computer program (Andrich, Sheridan & Luo, 2005), in order to create a single linear scale on which measures from students at all four universities could be compared. The Partial Credit Model of Rasch was used and the equations for this are given in Masters (1997). The results are set out in figures and tables and descriptive text, and show how the data fit the measurement model through a series of item analysis checks.

Table 1 shows the global fit statistics for Receptivity to Peers with Disabilities data. When the item and person data fit the measurement model, the mean fit residual should be near zero and its standard deviation should be near 1 (as is the case here).

Table 1

Global Item and Person Fit (N=996, I=30)

	ITEM-PERSON INTERACTION			
	ITEMS		PERSONS	
	Location	Fit Residual	Location Fit	Residual
Mean	0.00	0.15	0.37	-0.31
SD	1.20	1.34	0.87	1.42

Notes on Table 1:
1.The item means are constrained to zero by the measurement model.
2. When the data fit the measurement model, the mean fit residuals should be close to zero and the standard deviations should be close to one. In this case, there is good item and person fit to the measurement model.
3. The data are given to two decimal places because the errors are about 0.05 (one cannot have measures more accurate than the errors).

Fit of Individual Items to the Measurement Model

All 30 items fitted the measurement model with a probability greater than 0.01 (see Table 2). These good individual item fits to the measurement model supported the good global item fit given in Table 1. It should be pointed out here that the student numbers are so large that even minor deviations from the chi-square test model will show up and so the lower probability fits should not be taken too literately. There is a good individual item fit to the measurement model.

Table 2

Individual Item-fit Characteristics

Item	Location	SE	Residual	df	Chi-Square	Probability
6	+0.69	0.05	+0.83	954.93	7.74	0.56
8	+1.09	0.05	+1.06	954.93	14.96	0.09
10	+0.86	0.05	+2.41	954.93	21.32	0.01
12	+1.19	0.05	+2.55	954.93	14.07	0.12
13	-1.12	0.06	-0.94	954.93	11.27	0.26
14	+0.95	0.05	-0.87	954.93	17.72	0.04
15	-0.65	0.07	-1.06	954.93	10.44	0.32
16	+1.63	0.05	-0.16	954.93	7.87	0.55
23	-0.45	0.05	+0.56	953.97	7.79	0.56
27	-1.48	0.07	-0.69	953.00	6.78	0.66
28	+0.43	0.05	+3.68	953.00	11.43	0.25
31	-0.36	0.05	+0.13	952.04	17.83	0.04
33	-1.70	0.07	-0.52	952.04	11.06	0.27
34	+0.94	0.05	+1.93	952.04	6.75	0.66
39	+0.99	0.06	-0.04	952.04	7.64	0.57
40	1.38	0.05	-0.01	952.04	9.36	0.40
41	-1.32	0.06	-1.15	951.07	11.62	0.24
43	-0.73	0.06	-0.75	951.07	12.85	0.17
44	+1.57	0.06	-0.41	951.07	15.84	0.07
45	-1.47	0.06	-0.39	951.07	9.27	0.41
49	-1.53	0.07	-1.03	951.07	18.92	0.03
50	+0.47	0.05	+0.61	951.07	11.45	0.25
51	-1.43	0.07	-1.24	951.07	12.69	0.18
52	+1.01	0.05	-0.02	951.07	12.59	0.18
53	-1.06	0.06	-1.88	951.07	18.37	0.03
54	+1.04	0.05	-0.75	951.07	9.73	0.37
55	-0.46	0.05	+0.81	951.07	11.80	0.22
56	+1.55	0.05	-1.40	951.07	13.45	0.14
57	-1.75	0.07	+0.91	951.07	10.07	0.34
60	+1.70	0.06	+2.15	942.39	14.99	0.09

Notes on Table.2.

1. Location means item difficulty measured in logits (log odds of answering positively) on the Rasch scale.
2. SE is the standard error in logits.
3. Chi-square is the test-of-fit statistic for each item using the degrees of freedom. All items fit within p=0.01.
4. df means degrees of freedom.
5. Residuals are the differences between the actual values and the expected values, calculated according to the measurement model.
6. Probability is the probability of fit to the measurement model based on the chi-square.

Dimensionality

Table 3 provides data relating to the collective agreement amongst all students across all items. For any particular total raw score, a mean of the actual responses for item i can be calculated. This can be compared to the expected response on item i calculated from the Rasch parameter estimates and this can be done for all total scores over all items. A resulting chi-square can be calculated (see Andrich & van Schoubroeck, 1989) and, if the observed and expected values are not significantly different, then it can be inferred that there is good agreement amongst all the students regarding the difficulties of the items along the scale. This would mean that a unidimensional scale has been measured. In the present case, there is significant interaction and student agreement on the item difficulties is not ideal, so it can only be claimed that a dominant trait has been measured and overall fit to the measurement model needs to be improved in any future use of the questionnaire.

Table 3

Item-trait Interaction for Dimensionality

ITEM-TRAIT INTERACTION FOR DIMENSIONALITY	
Total Item Chi-Square	367.596
Total Degrees of Freedom	270.000
Total Chi-square Probability	0.000071

Thresholds

Thresholds are points between adjacent response categories where the odds are 1:1 of answering in either category. Thresholds should be ordered in line with the conceptual ordering of the response categories showing that the students have used the response categories consistently and logically (as is the case with the present data, see Table 4).

Table 4

Item Thresholds (I=30 N=996 CAT=3)

		Thresholds	
Item	**Mean**	**1**	**2**
6	+0.69	-0.06	+1.44
8	+0.08	+0.86	+1.31
10	+0.86	+0.05	+1.67
12	+0.19	+0.45	+1.94
13	+0.12	-1.97	-0.28
14	+0.95	+0.15	+1.74
15	-0.65	-1.67	+0.37
16	+0.63	+1.10	+2.17
23	-0.45	-1.36	+0.46
27	+0.48	-2.03	-0.92
28	+0.43	-0.01	+0.87
31	-0.36	-1.25	+0.53
33	+0.70	+3.01	+0.39
34	+0.94	+0.01	+1.87
39	-0.99	-1.10	+0.02
40	+0.38	+0.82	+1.94
41	+0.32	-2.52	-0.12
43	+0.73	-1.84	+0.37
44	+0.57	+0.82	+2.32
45	+0.47	-2.65	-0.29
49	+0.52	-2.38	-0.67
50	+0.47	-0.37	+1.31
51	+0.48	-2.59	-0.26
52	+0.01	+0.07	+1.93
53	+0.06	-1.93	-0.19
54	+0.04	+0.44	+1.64
55	-0.46	-1.13	+0.21
56	+0.55	+1.31	+1.79
57	+0.75	-2.56	-0.94
60	+0.70	+0.77	+2.63

Notes on Table 4.

1. There are two thresholds per item: one between response categories 1 and 2, and one between response categories 2 and 3.
2. The response categories are ordered for each item implying that the students used tem consistently and logically.
3. The mean threshold is the item difficulty in logits.

Reliability of the Scale

The Person Separation Index was 0.87 and this indicates that the student measures are well separated along the scale compared to the errors of measurement (which are about 0.5 to 0.7 logits) as required for good measurement.

The Linear Scale of Receptivity to Peers with Disabilities

Table 5 shows the 30 items that best fitted the measurement model and could be said to form a linear scale with one dominant dimension, here called University Students' Receptivity to Peers with Disabilities. The other 30 items that did not fit the measurement model were deleted and not used in any further analysis. The original item numbers are used in Table 5.

Findings from the Rasch analysis demonstrated that the ideal self-views (attitudes) are easier than the actual self-views (behaviours) for all items where items for both perspectives fit the measurement model. It can be concluded that:

1. There was a good global item fit to the measurement model;
2. There was good global person fit to the measurement;
3. There was good individual item fit to the measurement model;
4. The scale data measured a dominant trait, taken to be University Students' Receptivity to Peers with Disabilities, with some "noise" present;
5. The response categories were answered consistently and logically;
6. The targeting of the item thresholds against the person measures was good.

Table 5

Items and their Difficulties (Final Scale, I=30)

Item No.	Item Wording	What I think I should do (ideal self-view)	What I actually do (real behaviour at university)
ACADEMIC			
Receptivity to implementation of alternative programs			
5-6	Support the idea of alternative programs being implemented for assessing peers with disabilities for access into higher education.	DNF	+0.69
7-8	Support the implementation of virtual field excursions in field courses to facilitate learning for peers with mobility impairment.	DNF	+1.08
INTERACTIVE			
Receptivity to inclusive courses			
9-10	Take an interest in the university trying to include peers with disabilities in all degree courses such as sports and dance.	DNF	+0.86
11-12	Encourage friends to participate in inclusive courses that make academic goals a reality for peers with disabilities at university.	DNF	+1.19
Receptivity to inclusive interaction			
13-14	Motivate regular students to assist peers with disabilities cope with assignments.	-1.12	+0.95
15-16	Discuss with friends, positive strategies to assist peers with disabilities to participate in on-line group activities and/or other adaptive physical activities.	-0.65	+1.63
SOCIAL			
Receptivity to promotion of social relationships through recreational programs			
23-24	Discuss with the university's equity group their plans for interactive recreational programs to promote social relationships between non-disabled students and their peers with disabilities.	+0.45	DNF
Receptivity to achievements			
27-28	Make an effort to appreciate and recognise academic and also non-academic achievements of peers with disabilities at university.	-1.46	+0.43

Table 5 (continued)
Items and their Difficulties (Final Scale, I=30).

Item No.	Item Wording	What I think I should do (ideal self-view)	What I actually do (real behaviour at university)
	PERSONAL		
	Receptivity to personal involvement		
31-32	Sign up as a mentor or 'buddy' to support and assist mobility-limited peers to participate in outdoor activities at university.	+ 0.36	DNF
	PROFESSIONAL		
	Receptivity to integrated workforce		
33-34	Value the contributions of peers with disabilities in an integrated workforce at the university that provides the training.	-1.70	+0.94
	SUPPORTIVE		
	Accommodation		
39-40	Encourage peers with mobility impairment to ask the university to provide affordable facilities and assistive devices, such as virtual field excursions and modified physical activity programs.	+0.99	+1.38
	Collaboration		
41-42	Support the policy of collaborative teaching programs to improve transition of students with special needs into employment or work experience at university.	-1.32	DNF
43-44	Display interest in the collaborative approaches used for program implementation for peers with disabilities; eg the collaboration between universities and industries which train and employ graduates with a disability.	-0.73	+1.57
	Instructional methods		
45-46	Support the validated instructional approach to ensure access to peers with disabilities to higher education.	-1.47	DNF
	Employment		
49-50	Support the policy of equal opportunity and equitable recruitment provided by the university for students with disabilities.	-1.52	+0.47

51-52	Try to encourage friends to support equitable employment practices at university to enable peers with disabilities find jobs in a non-discriminatory environment.	-1.42	+1.00
53-54	Encourage peers with disabilities to apply for jobs within the university.	-1.06	+1.00
55-56	Ensure that peers with disabilities avail opportunities provided by the university and pursue careers within the university.	-0.46	+1.55
	Participation in all aspects of higher education		
57-58	Support access of peers with disabilities in all academic courses at university.	-1.75	DNF
59-60	Involve myself to promote optimal participation of peers with disabilities in quality higher education.	DNF	+1.70

Differences in Receptivity Measures by University

The mean measures of Students' Receptivity to Peers with Disabilities, and their standard deviations, are given in Table 6 and in Figure.1. Since these are all measured on the same linear scale, they can be directly compared. As expected, the means for the Indian universities (Calcutta and Jadavpur) are higher than those in Western Australia (Edith Cowan and Notre Dame), and the mean for Notre Dame University is higher than the mean for Edith Cowan University.

If it is assumed that the university samples are representative of students in their respective teacher-education populations and, if it is assumed that the samples could be considered as part of the same large population of teacher-education students (Western Australia-India combined), then the separate university samples could be considered as being taken from the same large Western Australia-India population of teacher-education students and a t-test between the means can be used to determine if the mean university measures are statistically significantly different.

Table 6
Mean Measures by University in Logits

University	Number	Mean Measures	Standard Deviation
University of Calcutta	344	0.47	0.79
University of Jadavpur	294	0.52	0.69
University of Notre Dame	147	0.30	1.11
Edith Cowan University	208	0.05	0.94

Note. A logit is the standard Rasch measurement unit

Indian Universities versus University of Notre Dame

It was expected that the Indian university students in the teacher-education programme should have a higher Receptivity towards Peers with Disabilities than students in the teacher-education programme at the University of Notre Dame, and this was found to be the case (see Table 6). The t-test results for Students' Receptivity to Peers with Disabilities are: (1) between the University of Calcutta and the University of Notre Dame ($t=1.92$, $df= 489$, $p=0.02$) in favour of Calcutta; and (2) between the University of Jadavpur and the University of Notre Dame ($t=2.55$, $df= 439$, $p=0.005$) in favour of Jadavpur. The corresponding effect sizes are $d=0.18$ and $d=0.24$ which are small (Cohen, 1988).

Indian Universities versus Edith Cowan University

It was expected that the Indian university students should have a higher Receptivity towards Peers with Disabilities than students at Edith Cowan University in Perth, Western Australia and this was found to be the case. The t-test results for Students' Receptivity to Peers with Disabilities are: (1) between the University of Calcutta in India and Edith Cowan University in Perth, Western Australia ($t=5.6$, $df = 550$, $p= 0.000$) in favour of Calcutta, and between the University of Jadavpur in India and Edith Cowan University in Perth, Western

Australia (t=6.45, df = 500, p= 0.000) in favour of Jadavpur. The corresponding effect sizes are d=0.48 and d=0.59 which are medium (Cohen, 1988).

University of Notre Dame versus Edith Cowan University

It was expected that the students from Notre Dame University in Perth, Western Australia, should have a higher Receptivity towards Peers with Disabilities than students at Edith Cowan University in Perth, Western Australia and this was found to be the case. The t-test results for Students' Receptivity to Peers with Disabilities are: between the University of Notre Dame and Edith Cowan University (t=2.28, df = 353, p = 0.003) in favour of Notre Dame. The effect size is d=0.25 which is small (Cohen, 1988).

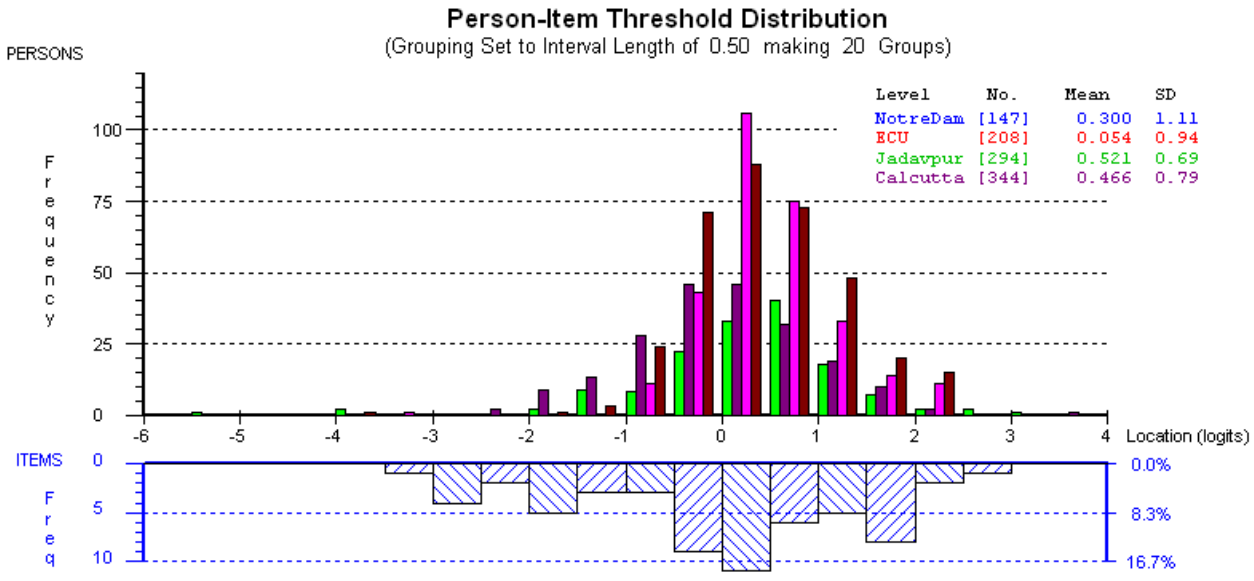

Figure 1 Student Measures by University

Note:
1. Person measures are on the topside of the linear scale in logits.
2. Item difficulties are on the bottom side of the linear scale in logits.
3. There is an error in the RUMM computer program on colours. Maroon is Calcutta , brown is Jadavpur (not green), green is ECU (not red), and purple is Notre Dame (not blue).

Linking Attitude to Behaviour

Findings demonstrated that the ideal self-views (attitudes) are easier than the actual self-views (behaviours) for all items where items for both perspectives fit the measurement model. The ideal self-views are compared to the actual self-views for items where both perspectives fit the measurement model. The easiest and hardest self-view items, and the easiest and the hardest behaviour self-view perspectives are identified.

The Rasch findings of this study give support to a recent study in Western Australia that assessed the ideal views and actual behaviours of non-disabled university students toward peers with disabilities (Biswas, 2002; Waugh & Biswas, 2003). Findings indicated that attitudes were easier to achieve than behaviours at the same level. The findings implied that the university could improve its opportunities to regular students with learning experiences and programs which would allow behaviour changes and influence further collaboration and improved relationships of regular university students with peers with disabilities.

Conclusions

A linear scale of University Students' Receptivity to Peers with Disabilities was created that had good measurement characteristics in regard to individual item fit to a Rasch measurement model, logical use of response categories, good reliability (good Person Separation Index), good discrimination (good Item Characteristic Curves) and good targeting, but not-so-good overall fit to a Rasch measurement model. Some revisions need to be made to the questionnaire before it is used to collect further data for creating a linear scale.

Four main inferences were drawn from the Rasch-created linear scale of Receptivity to Peers with Disabilities. One is that the ideal self-views (attitudes) are easier than the actual self-views (behaviours), for all items where both perspectives fit the measurement model. Two is that the students do make an effort to appreciate and recognise academic and non-academic achievements of peers with disabilities at university but find it moderately hard to do so. Three is that the students found it very hard to involve themselves in promoting optimal participation of peers with disabilities in quality higher education. Four is that Receptivity to Peers with Disabilities is significantly higher at the Universities of Calcutta and Jadavpur in India than at Edith Cowan University and the University of Notre Dame in Western Australia, and Receptivity is significantly higher at the University of Notre dame than at Edith Cowan University.

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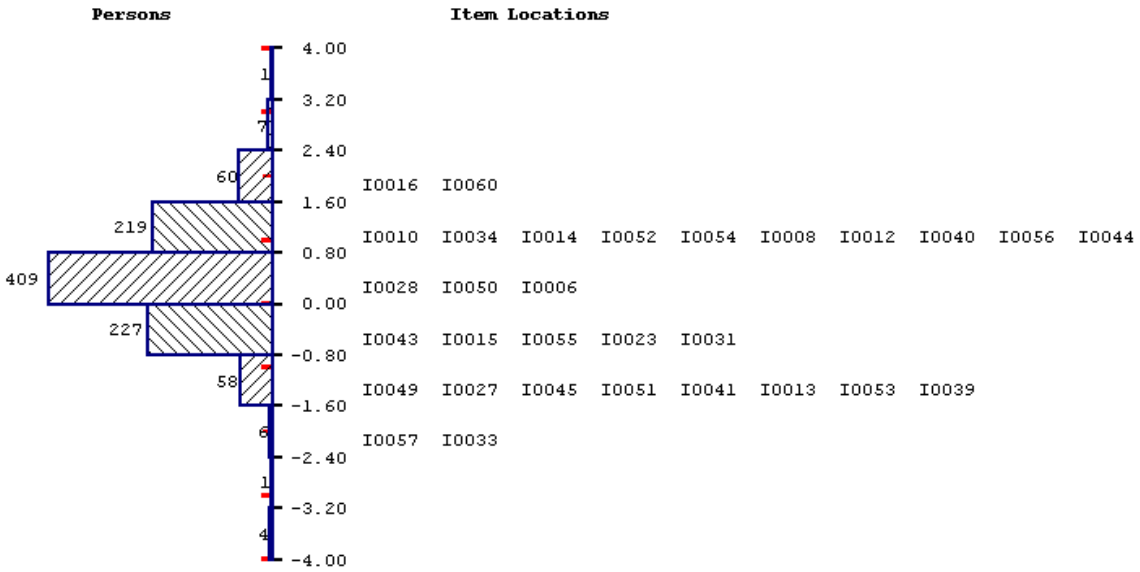
Appendix A

Map of Student Measures by Item Difficulties



Note
1. Item I0057 refers to item 57; item I0033 refers to item 33; and so on.
2. This map has to be read in conjunction with Table 5 which lists wording of the items.
3. Student measures are given on the left hand side from low (bottom) to high (top).
4. Item difficulties are given on the right hand side from easy (bottom) to hard (top).