



Physical Education undergraduate students' perceptions of their learning using the jigsaw learning method

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Abstract:	<p>Recognising the limited research around the use of cooperative learning in higher education, this case study sought to explore Physical Education students' perceptions of learning using the jigsaw learning method. It examined the impact of two different aesthetic activities and two different groupings on students' perceptions of their learning. A purposive sample of 36 third-year undergraduates was selected for the study. Data were collected using focus-group interviews and reflective journals. Inductive analysis illustrated students' perceptions of their own and others' abilities, students' empathy towards their peers and their perceptions of gymnastics and dance impacted on their perceptions of learning. Students felt that heterogeneous and friendship groupings have the potential to encourage high-order social and cognitive learning. However, those students with limited psycho-motor abilities appear to be better served in friendship groupings to facilitate such learning. Students also favoured the 'structured' nature of gymnastics in comparison to dance for their own teaching and learning purposes. Irrespective of aesthetic activity or grouping utilised, students felt their psycho-motor learning was limited. It is recommended that university staff consider using a mixture of groupings with a single cohort dependent on the practical ability of students and the use of more 'structured' activities. In doing so, students' perceptions of their social, cognitive and psycho-motor learning may improve and thereby encourage greater and more effective use of this innovative method in schools.</p>

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1 Introduction

2 A substantial body of knowledge exists regarding the possible learning benefits of utilising
3 innovative instructional models in Physical Education (PE). Recent literature reviews of Sport
4 Education (Hastie, de Ojeda & Luquin, 2011), Teaching Games for Understanding (Harvey
5 and Jarrett, 2014) and Cooperative Learning (CL) (Casey & Goodyear, 2015) indicate that
6 psycho-motor, social and cognitive learning can occur using such instructional models. Such
7 reviews support Casey's (2014) claim that there is a now a need to move beyond whether
8 such models 'work' to consider the finer details of such learning. In the case of CL, Casey
9 and Goodyear (2015) stress the need for research that explores the impact of the numerous CL
10 methods upon learning.

12 Cooperative learning methods

13 CL is a group learning process based on the premise that pupils learn better when they learn
14 together (Nastasi & Clements, 1991). Over 100 different methods of CL exist including
15 Student-Teams-Achievement Divisions (Slavin, 1985), Think-Pair-Share (Kagan, 1992) and
16 Jigsaw Learning (JL) (Aronson et al., 1978). They all emphasise working in small,
17 heterogeneous groups to achieve a specified goal (Jolliffe, 2007; Slavin, 1995, 1996;
18 Williams, 2002). In other respects, CL methods differ considerably based on the incentive
19 structure and task structure utilised. In the former, rewards or grades can be given to the
20 whole group for the completed work or individual grades can be awarded for the pupil's own
21 performance. In the latter, each member can be responsible for a unique part of the group
22 work (task specialization) or all group members can study together (group study) (Slavin,
23 1983). For example, JL focuses on task specialization and individual reward (Nastasi &
24 Clements, 1991; Slavin, 1983).

26 **Jigsaw learning**

27 Developed and first used by Aronson et al. (1978) to reduce racial tensions following
28 desegregation of schools in the United States of America, JL, in contrast to traditional
29 individual and competitive incentive structured environments, emphasises social learning
30 (Kagan & Kagan, 2009; O’Leary & Griggs, 2010). It is comprised of four stages (Aronson et
31 al., 1978; O’Leary et al., 2014). In stage one (introduction) the class is split into
32 heterogeneous or friendship ‘home’ groups of between three and seven pupils. The rationale
33 for using this pedagogical method is explained to the class. The topic and how the pupils will
34 be assessed are also explained. Stage two (exploration) divides the ‘home’ group into two
35 halves and each half learns about a specific topic from the teacher or materials such as a work
36 card. Stage three (reporting and reshaping) brings the ‘home’ group together and requires the
37 pupils to teach each other what they have learned. Stage four (integration and evaluation)
38 consists of each ‘home’ group using their acquired learning to produce the assessed piece of
39 work.

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41 Discussions around how groups ‘best’ function with regard to different incentives, personality
42 factors and differing abilities to produce the required work and thereby achieve the intended
43 teaching and learning outcomes have been debated over the past thirty years (see, for
44 example, Gillies, 2003; Nastasi & Clements, 1991; Slavin, 1983). Such debates have
45 produced a general consensus consisting of five principles that underpin CL methods such as
46 JL (Metzler, 2011). *Positive interdependence* means each pupil relies on their ‘home’ group
47 members if they are to be successful. When pupils realise they must facilitate each other’s
48 learning, they develop a sense of psychological interdependence and group identification
49 (Gillies, 2003). This, in turn, will create a feeling of personal responsibility to the group and
50 thereby encourage *individual accountability* emphasising that each pupil must contribute to

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3 51 the completed work. *Face-to-face interaction* including verbal exchanges, necessitates pupils
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5 52 engaging with each other to improve understanding and thereby facilitate the work of their
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7 53 peers in contrast to working alone (Lafont, Proeres & Vallet, 2007; Mugny & Doise, 1978).
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9 54 *Interpersonal skills* such as decision-making, listening, giving and receiving feedback in
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11 55 addition to demonstrating the necessary responsibility are enhanced throughout the study.
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13 56 Based on Vygotskian theory (1978), Lafont (2012) suggests such exchanges of information
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15 57 can be symmetrical or dissymmetrical. The former takes place with peers at the same
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17 58 identified skill level, while the latter occurs when one peer is identified as more skilled than
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19 59 the other. Despite the differences in exchanges the intentions within group work are to
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21 60 advance the learning for and with each other to complete the work. Lastly, *group processing*
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23 61 involving pupils' reflection of the successes or limitations of the completed work and the
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25 62 effectiveness of their working relationships should be undertaken. Lafont (2012) argues such
26
27 63 reflection is a useful tool in developing further understanding of the learning gains with CL
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29 64 methods such as JL. These five principles and the key requirement of pupils teaching each
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31 65 other, provide opportunities for psycho-motor, social and cognitive learning (Dunn and
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33 66 Wilson, 1991; Metzler, 2011).
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68 Reviewing the above learning opportunities across nine studies (Barrett, 2005; Casey, Dyson
69 & Campbell, 2009; Darnis & Lafont, 2013; Dyson, 2001, 2002; Dyson, Linehan & Hastie,
70 2010; Dyson & Strachan, 2000, 2004; Lafont, Proeres & Vallet, 2007), Casey and Goodyear
71 (2015) reached a number of conclusions regarding psycho-motor learning (observable and
72 voluntary movement skills, (Harrow, 1972)). They suggested that such learning was improved
73 by increased intensity in game play. Pupils' ability to replicate skills in games and athletics
74 were also enhanced. Using JL in primary school gymnastics lessons, Casey (2004) found that
75 pupils could perform practical skills they previously felt were beyond them. In contrast,

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3 76 O’Leary and Griggs (2010) reporting on potential learning in higher education gymnastics
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5 77 lectures found that JL was limited in developing psycho-motor learning due to students’
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7 78 insufficient practical and teaching abilities. The same factors were also identified in limiting
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9 79 psycho-motor learning using JL in secondary school gymnastics (O’Leary et al., 2014)
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14 81 In contrast to the issues of psycho-motor learning, Casey and Goodyear (2015) identified that
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16 82 social learning (cooperating with others (Bloom, 1956; Rink, 2005)) was enhanced using CL
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18 83 methods. Listening to others, constructing understanding together, respecting each other and
19
20 84 encouraging each other to learn were improved (see, for example, Bayraktar, 2011; Casey,
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22 85 2013; Casey & Dyson, 2009; Casey, Dyson & Campbell, 2009; Dyson, Linehan & Hastie,
23
24 86 2010; Goodyear, Casey & Kirk, 2014; Goudas & Magotsiou, 2009). Using JL, O’Leary and
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26 87 Griggs (2010) found that higher education students had a responsibility to their peers in
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28 88 teaching and constructing a gymnastics sequence. However, accepting the beliefs of others
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30 89 and developing ideas together were limited given it was often dependent on face to-face and
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32 90 interpersonal skills when teaching their peers and learning from them.
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36
37 92 On the other hand, Casey and Goodyear (2015) have identified that such face-to-face and
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39 93 interpersonal skills have been found to enhance cognitive learning (the recall of knowledge
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41 94 and the development of intellectual skills such as critical thinking and problem solving
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43 95 (Bloom, 1956; Rink, 2005). The use of CL has been found to improve higher order thinking
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45 96 skills such as analysis, synthesis and evaluation (see, for example, Darnis & Lafont, 2013;
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47 97 Dyson & Strachan, 2004; Gossett & Fischer, 2005; Hastie & Casey, 2010; Smith & Parr,
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49 98 2007). However, the value of JL in developing cognitive learning is not clear cut. It has been
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51 99 found to encourage lower order thinking skills such as acquiring knowledge and
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3 100 comprehension. Conversely, in secondary school gymnastics, JL did not enhance higher order
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5 101 thinking, particularly amongst the lower ability psycho-motor pupils (O’Leary et al., 2014).

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8 9 103 **The current study**

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11 104 It is evident from the above discussion that the use of JL to enhance psycho-motor, social and
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13 105 cognitive learning is contested. For this reason we wanted to respond to the request of Casey
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15 106 and Goodyear (2015) and examine PE undergraduate students’ perceptions of their learning
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17 107 during a JL based module. Secondly, recognising the difficulty of implementing CL (see, for
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19 108 example, Johnson, Johnson & Holubric, 1994; Velazquez, 2012a) and despite the valuable
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21 109 advice available to overcome the potential issues (Casey, 2010; Dowler, 2012; Goodyear,
22
23 110 2012; O’Leary et al., 2014), there is little guidance on what types of activity might be most
24
25 111 suitable for inexperienced (student) teachers to use to improve pupils’ learning. Thirdly,
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27 112 whilst accepting that heterogeneous grouping is seen as an accepted ‘norm’ for this
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29 113 pedagogical method (Aronson et al., 1978; Johnson, Johnson & Holubric, 1994; Metzler,
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31 114 2011; Nastashi & Clements, 1991), recent research has indicated that the use of groups
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33 115 constructed by the learners based on friendships may be as effective / more effective in
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35 116 developing learning (O’Leary et al., 2014). Velazquez (2012b) has argued there is little
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37 117 difference between heterogeneous groups formed by the teacher and friendship groups formed
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39 118 by pupils. Moreover, research by Perez-Pueyo (2010) has indicated that greater cohesiveness
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41 119 can be achieved by pupils selecting their own friendship groups. Finally, university taught
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43 120 theory and its application in practice continues to be problematic when utilising CL models
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45 121 such as JL (O’Leary et al., 2014; Ovens, Dyson & Smith, 2012; Zach & Cohen, 2012). Those
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47 122 potential teachers who ‘see’ the learning that can be developed and the reasons why such
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49 123 learning did or did not occur are more likely to overcome this theory-practice gap (Abrami,
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3 124 Poulson & Chambers, 2004). In doing so, use of JL and other innovative cooperative methods
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5 125 may be increased in PE (Kirk, 2010).
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9 127 For the above reasons our aim was to examine 36 undergraduate PE students' perceptions of
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11 128 their learning using the JL method. The specific objectives were to examine:

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13 129 (1) The impact of heterogeneous and friendship groupings on undergraduate PE students'
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15 130 perceptions of their learning during a JL based module

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17 131 (2) The impact of gymnastics and dance on undergraduate PE students' perceptions of their
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19 132 learning during a JL based module.
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23 24 134 **Methodology**

25 26 135 *Research design*

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28 136 A case study research design (Stake, 2000) was adopted given the aim and objectives of this
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30 137 study. The intensive study of a specific case such as undergraduate PE students can produce
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32 138 multiple sources of information rich in context. In doing so, researchers can describe a
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34 139 particular reality, provide explanations and evaluate phenomena (Gall, Gall & Borg, 2007;
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36 140 Gratton & Jones, 2004; VanWynsberghe & Khan, 2007).
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40 41 142 *The participants' backgrounds*

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43 143 A purposive sample of 36 third year Bachelor of Arts (Honours) (B.A. Hons.) undergraduate
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45 144 PE students were selected from a university in the West Midlands, United Kingdom for the
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47 145 study. There were 19 males and 17 females. Over 12 weeks of a practical module the
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49 146 students engaged in gymnastics and then contemporary dance activities. Seven of the lectures
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51 147 focused on gymnastics, the remainder were dance orientated. Each lecture was four hours in
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53 148 length. Gymnastics and dance were used in conjunction with JL because students are more
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3 149 likely to demonstrate high levels of cooperation when they participate in tasks that are open-
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5 150 ended or exploratory in nature (Cohen, 1994). An emphasis upon creative solutions provides
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7 151 greater opportunity to share ideas and thereby construct the assessed gymnastics sequence or
8
9 152 dance routine (O’Leary & Griggs, 2010). In a preceding final year module the students had
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11 153 received a theoretical lecture on CL and JL in particular. In the same module (12 weeks x
12
13 154 four hours) they had received theoretical lectures examining Teaching Games for
14
15 155 Understanding and Sport Education and had opportunities to teach their peers using one of
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17 156 these instructional models for assessment purposes. In the first two years of their course,
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19 157 students had completed two modules focusing on gymnastics and dance, received lectures on
20
21 158 the use of teaching styles and various learning theories. Opportunities to teach their peers and
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23 159 primary aged children utilising these teaching and learning methods had been available in a
24
25 160 number of pedagogically-based modules. The two lecturers had taught on this aesthetic JL
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27 161 based module for seven years. One lecturer had experience of using JL in secondary schools.
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33 163 Prior to the start of the gymnastics lectures students were placed in heterogeneous ‘home’
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35 164 groups of six based upon perceived leadership ability, gymnastics ability and were balanced
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37 165 in relation to sex (Aronson *et al.*, 1978). Leadership ability was identified by the participating
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39 166 lecturers’ experiences of working with the students in the preceding two years. Gymnastics
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41 167 ability was ascertained from gymnastics assessments completed in the previous year. In dance
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43 168 students were able to select their own ‘home’ groups.
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48 170 Given improvements in social skills can positively impact on a group’s success (Gillies, 2003;
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50 171 Gillies & Boyle, 2010), social team-building activities (see Aronson *et al.*, 1978: 181-189 for
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52 172 examples) were used at the outset and throughout the lectures. Being able to cooperate,
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54 173 collaborate and deal with potential conflicts particularly when teaching each other (Metzler,
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3 174 2011) were critical and such team building activities were used to improve talking, listening
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5 175 and reaching an agreed consensus. Following these activities, one group of three from each
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7 176 'home' group was taught a specific topic by one module lecturer. Meanwhile, the other group
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9 177 of three from each 'home' group was taught another topic by the other lecturer. During the
10
11 178 seven gymnastics lectures students were taught and had to teach their 'home' group travelling,
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13 179 rolling, inverted balances, partner balances, jumping, flight and use of compositional concepts
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15 180 such as contrasting speed, levels, pathways, directions, shapes and appropriate linkage. In the
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17 181 five dance lectures students were provided with initial motifs which they adapted using
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19 182 Laban's principles of movement (see additional details below). They then taught their 'home'
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21 183 groups the initial motif and assisted their peers in adapting the motif focusing on Laban's
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23 184 principles of movement. Prior to this teaching, counterpart groups were utilised (Aronson et
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25 185 al., 1978). Students were given time to mix with another group of three in order to consider
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27 186 how they might effectively teach the material to their 'home' group. Following this teaching,
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29 187 each 'home' group was given independent study time to plan, perform and evaluate their
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31 188 gymnastics sequence and dance routine with additional feedback from the two lecturers.
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37 190 The gymnastics assessment required each group of three to compose and perform a sequence
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39 191 using the floor and apparatus. Compulsory skills for each student were: a forward and
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41 192 backward roll; headstand and/or bridge; handstand and/or cartwheel; basic jump(s) and a
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43 193 vault. Students were able to add other gymnastics skills as appropriate. Students were also
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45 194 required to illustrate the following compositional concepts: contrasting speed, levels,
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47 195 pathways, directions, shapes and appropriate linkage. They were allowed to use six mats, two
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49 196 boxes or tables and two benches. In contrast, the dance assessment required each group of
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51 197 three to compose and perform an Olympic Games themed dance. Students were asked to
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53 198 communicate the relevant theme clearly and include Laban's principles of movement
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3 199 (Actions, Space, Dynamics and Relationships) (Sabin, 2002) to demonstrate effective
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5 200 development of motifs. The dance was set to music and was approximately four minutes in
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7 201 length. The use of relevant clothing and appropriate props was encouraged. Students were
8
9 202 given half a sports arena for their performance. Each group dance and gymnastics sequence
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11 203 was videotaped and each student received an individual percentage mark in keeping with the
12
13 204 institutional assessment policy. In both activities the emphasis was on the students improving
14
15 205 their performance (DfEE, 2013), but the assessments also recognised the key nature of each
16
17 206 activity. In gymnastics, the performing of the core skills and use of compositional concepts
18
19 207 outlined above were central to the teaching and assessment (Binney & Barrett, 2010;
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21 208 Reynolds, 2000; Sabin, 2001). In dance, while stylistic and technical accuracy via Laban's
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23 209 principles of movement were seen as critical, the need to demonstrate expression, non-verbal
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25 210 communicative skills and clarity of focus in order to convey the Olympic Games theme
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27 211 effectively were also emphasised (Davies, 2000; Sabin, 2002; Smith & Pocknell, 2007). As
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29 212 requested by Hastie and Casey (2014), the teaching and subsequent assessment requirements
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31 213 fulfilled the five principles of CL previously outlined (Dyson & Casey, 2012; Metzler, 2011).
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215 *Data collection methods*

40 216 Two sources of data were used to identify potential learning in the aesthetic activities and
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42 217 consider the influence of heterogeneous and friendship groupings on such learning: focus
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44 218 group interviews and reflective journals.
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220 *Focus group interviews (FGI)*. There were two main reasons for the choice of FGI within this
221 research. Firstly, providing a “synergistic environment” (Anderson & Arsenault, 1998, p.200)
222 they allow an exploration of the students' similarities, differences, understandings and beliefs
223 (Bryman, 2008; Robson, 2002). Secondly, in highlighting group norms, FGI, in comparison to

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3 224 individual interviews, may give the researchers a more realistic account of what the students
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5 225 believe since they have to think about what has been said and adjust their views accordingly
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7 226 (Bryman, 2008; Sarantakos, 1998).
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11 228 A stratified sample of 10 students was selected for two FGI by the lecturers ensuring that all
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13 229 'home' groups from gymnastics and dance were represented. A quarter of the total sample
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15 230 and a member from each 'home' group were felt to be sufficient to gain a sound and
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17 231 representative understanding of the issues to be discussed (Bryman, 2008). A semi-structured
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19 232 interview was devised based upon the three domains of psychomotor, social and cognitive
20
21 233 learning (Bloom, 1956; Dave, 1975; Krathwohl, Bloom & Masia, 1964) (see Tables 1, 2 and 3
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23 234 below). Students were asked to consider perceptions of their learning across the three domains
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25 235 with particular focus on the impact of the two different aesthetic activities used and the
26
27 236 different groupings employed.
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33 238 *Insert Tables 1, 2 and 3 here*
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37 240 The categories within each domain can be thought of as degrees of difficulties. That is, the
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39 241 first one must be mastered before the next one can take place (Bloom, 1956). For example,
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41 242 within the cognitive domain it is necessary to be able to comprehend information before being
42
43 243 able to apply it effectively. While other domain models are available such as Kirkpatrick's
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45 244 learning evaluation model (Kirkpatrick, 1994), the social and cognitive models selected are
46
47 245 relatively simple and easy to explain. Moreover, the students are familiar with the cognitive
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49 246 categories since the university assessment criteria are based on this domain. We selected the
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51 247 Dave's psychomotor model (1975) because the categories 'sit' alongside the language used
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53 248 when assessing students' practical work. Moreover, unlike other psychomotor models of
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3 249 learning such as Simpson's (1972) or Harrow's (1972), this model emphasises imitation,
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5 250 which we felt would play a large part in the students' initial learning. The different categories
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7 251 within each domain provided us with a template to plan the focus group questions. This
8
9 252 approach provided a framework that allowed comparability across the FGI conducted but also
10
11 253 allowed a degree of latitude so that emergent themes could be explored (May, 1997). Both
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13 254 focus groups were recorded using a digital dictaphone and transcribed in full to facilitate the
14
15 255 later analysis of the data (Sarantakos, 1998). The interviews lasted approximately 75 minutes
16
17 256 in duration and took place in a familiar classroom to both students and lecturers. All
18
19 257 interviews included the first two authors with their roles designed as group leader and group
20
21 258 assistant. The role of the former sought to keep the group's comments relevant to the schedule
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23 259 and the role of the latter was to investigate any areas of interest or emergent themes that may
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25 260 have arisen (Bryman, 2008).
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31 262 *Reflective journals (RJ)*. Students were also required to keep a RJ during the gymnastics and
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33 263 dance lectures. Following each lecture each student was asked to critically reflect on their
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35 264 experiences of the JL method and specifically focus upon its impact on their learning.
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37 265 Following other CL research projects utilising cooperative learning (see, for example, Casey
38
39 266 & Dyson, 2009; Casey, Dyson & Campbell, 2009) it was felt that RJ would provide additional
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41 267 data that would support, contextualise and verify FGI data.
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46 269 *Data analysis*

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48 270 Data analysis was completed using a general inductive approach given the exploratory nature
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50 271 of the study (Thomas, 2006). In attempting to make sense of field data (Lincoln & Guba,
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52 272 1985) specific units of text were identified and these were sorted into initial categories. This
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54 273 procedure was completed independently by each author. Following discussion between the
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3 274 three authors regarding the significance of the initial categories, these categories were reduced
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5 275 in number until only provisional themes remained (Creswell, 1998; Lincoln & Guba, 1985).
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7 276 The provisional themes acted as a foundation to re-read the data several times and
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9 277 subsequently recode the data where appropriate to produce a reduced number of final themes.
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13 279 *Ethical considerations*

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16 280 In completing this research study The British Educational Research Association (BERA)
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18 281 guidelines (2011) regarding deception, consent, privacy, disclosure and accuracy were
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20 282 adopted. The participants were made aware of the aims, methods and intended uses of the
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22 283 data obtained verbally and in written form. They were told that their participation in the study
23
24 284 was voluntary and they were free to withdraw from participating in the research at any time.
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26 285 They were notified that all data would be treated as strictly confidential and in line with the
27
28 286 code of conduct of the BERA (2011). Throughout dissemination of the study the participants'
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30 287 entitlement to privacy and rights to confidentiality and anonymity were guaranteed (all names
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32 288 that follow are pseudonyms). These five ethical issues were incorporated into an informed
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34 289 consent form which was signed by the participating students.
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39 291 *Data trustworthiness*

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42 292 To produce a more credible and dependable account of the research data the participants were
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44 293 made aware of the research process (Lincoln & Guba, 1985). Cross-checking data accuracy
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46 294 from the two different data collection methods was completed in the belief that examining a
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48 295 situation from multiple angles is likely to strengthen confidence in any conclusions drawn
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50 296 (Markula & Silk, 2011; Patton, 2002). Recognising that researchers cannot complete research
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52 297 without being guided by their values (Collins, 1992), the value of abridged quotes from FGI
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54 298 and RJ data could be considered questionable. To overcome such potential researcher bias,
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299 negative case analysis was utilised (Padgett, 1998). Instances that contradicted any initial
300 researcher beliefs were searched for and included in the results and discussion that follow.

301

302 **Results**

303 The purpose of this study was to examine undergraduate PE students' perceptions of their
304 learning during a JL based module. During gymnastics lectures, students were placed in
305 heterogeneous 'home' groups. In dance, students were able to select their own 'home' groups.
306 Inductive analysis indicated there were three overriding themes that impacted on students'
307 perceptions of their learning: students' perceptions of their own and their peer's abilities;
308 students' empathy towards their peers; and students' perceptions of gymnastics and dance.

309

310 *Students' perceptions of their own and others' abilities.* Students' beliefs about their practical,
311 social and cognitive abilities impacted on their perceptions of learning. In congruence with
312 the findings of Nastasi and Clements (1991), students recognised that differing abilities in
313 heterogeneous groups could aid their learning:

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315 I felt in gymnastics that everybody in the group had something they could contribute
316 to socially, cognitively, physically. They had something that everybody could learn
317 whereas when it was put into the friendship groups that was different because you
318 were in the group based on your friendship and not on your different abilities (FGI).

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320 Yeah I preferred it, I think because we were all such different abilities we were able to
321 bring our ideas together ... because we were all different abilities in the gymnastics
322 everyone knew who was better at certain parts than others, so we could help each

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3 323 other, say ok maybe you can do this a bit better, whereas in the friendship groups you
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5 324 couldn't do that (FGI).
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9 326 While higher order social learning such as valuation and organisation (see Table 2) was
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11 327 perceived to be possible in heterogeneous groupings, friendship groups also provided similar
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13 328 learning opportunities:
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18 330 I think the friendship group worked a lot better for me because there was more
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20 331 confidence in the group in being able to solve any problems if there were any. Being
21
22 332 able to discuss ideas and get things wrong. In the heterogeneous group I think because
23
24 333 I sort of knew I was lower in practical ability I would put pressure on myself to get
25
26 334 things right, get frustrated ... got things wrong and then I struggled to find a social
27
28 335 place in that group (FGI).
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33 337 Higher order social learning (see Table 2) was perceived as possible in both heterogeneous
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35 338 and friendship groupings given the need to listen to each other, construct understanding
36
37 339 together and encourage each other to learn. However, it was evident in heterogeneous
38
39 340 groupings that students' lack of practical ability negatively impacted on potential social and
40
41 341 cognitive learning. In such dissymmetrical exchanges, the more skilled peer may not have
42
43 342 always assisted the development of intellectual skills and ability to work with others (Lafont,
44
45 343 2012). Nonetheless, some students recognised that those students with high practical ability
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47 344 could aid the learning of their lower ability peers:
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52 346 Simon's so good at skills, he was doing a headstand off the blocks, pulling himself up,
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54 347 whereas I couldn't even do a headstand but by the end with his teaching and support I
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3 348 managed to do one. I never thought I was going to get to that stage. I was doing skills
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5 349 that I could never do in my second year gymnastics (RJ).
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9 351 While recognising the improved psycho-motor performance of lower practical ability
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11 352 students, it was evident that this learning was predominantly imitation or manipulation in
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13 353 nature (see Table 1). Such low level psycho-motor learning has been reported using JL in
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15 354 school and undergraduate gymnastics (O’Leary et al., 2014; O’Leary & Griggs, 2010).
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17 355 Students’ empathy towards their peers appears to have impacted on psycho-motor learning.
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22 357 *Students’ empathy towards their peers.* The psychological construct of empathy is the ability
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24 358 to understand difficulties that the learner encounters from their point of view (Lemonie, Light
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26 359 & Sarremejane, 2016). A collection of cognitive (envisaging another person’s circumstances)
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28 360 and affective (feeling as another person might feel) capacities (Batson & Ahmad, 2009),
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30 361 empathy can encourage behaviours where actions are intended to assist another person
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32 362 (Cikara, Bruneau & Saxe, 2011). Both cognitive and affective capacities appeared to help and
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34 363 hinder psycho-motor learning:
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39 365 Sam taught me the headstand, I felt like she could relate to what I was going through,
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41 366 because we have a lot in common socially. The same kind of body shapes, she knew
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43 367 what I was struggling with. She was able to kind of talk me through it and I felt
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45 368 comfortable with her. I just felt if Tom had been trying to teach me the headstand, he
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47 369 doesn’t know how I feel or what I am trying to do but I felt that Sam could (RJ).
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52 371 Such data indicates that heterogeneous grouping does not necessarily prevent students
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54 372 ‘knowing where somebody is coming from’ and thereby aiding imitation and manipulation
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3 373 learning (see Table 1). However, cognitive empathy generally appeared problematic in
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5 374 heterogeneous groupings. Dan commented “that two of us worked really well and the other
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7 375 one (a low practical ability student), I really struggled to connect with. I was trying to find out
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9 376 where he was at and where he felt comfortable and try to get him more involved” (FGI). Low
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11 377 level practical students’ social and cognitive learning appeared to be negatively impacted in
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13 378 such groupings. Lewis wrote, “I thought of an idea and they would quickly change it and
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15 379 restrict me from exploring ideas further” (RJ). Matthew stated “I was being taught by Ben and
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17 380 he couldn’t relate to where I was at and I couldn’t understand it and I couldn’t progress in that
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19 381 skill” (RJ). Higher level cognitive learning (analysis, synthesis and evaluation) was generally
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21 382 hampered for students with limited psycho-motor abilities (see Table 3). The fact that higher
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23 383 order social and cognitive learning was hampered for such students is likely to impact on their
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25 384 psycho- motor learning, given the reciprocal nature of the learning domains where learning in
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27 385 one domain is dependent on learning in other domains (Metzler, 2011).
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33 387 In contrast, friendship groupings in dance appeared to engender greater empathy. Michelle
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35 388 suggested, “we were really happy to contribute to our ideas – everyone was contributing –
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37 389 that worked better for everyone” (FGI), indicating students were able to integrate with each
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39 390 other (organisation). Students were also able to solve problems and use values to control
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41 391 behaviour (internalization) thereby developing psycho-motor learning (see Table 2). Katie (a
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43 392 high level dance performer) commented “that a lot of the moves that I wanted to do, not all of
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45 393 them could do them, so we would either swap them or we would either just modify them so
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47 394 everybody could do them” (FGI). Typical of lower-level practical students, Josh wrote when
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49 395 commenting on his heterogeneous group that “I would have liked to have worked with
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51 396 somebody on the same practical level as me” (RJ). However, student perceptions of each
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53 397 other’s abilities and student empathy were not the only significant factors influencing
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3 398 potential learning. Students' perceptions of the two aesthetic activities also impacted on their
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5 399 perceived learning.

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9 401 *Students' perceptions of gymnastics and dance.* There was little doubt that students felt that
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11 402 gymnastics was more 'structured' than dance. "In gymnastics it was this is how you do this
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13 403 skill, but in dance it was this is the idea - now change it" (FGI). Thando commented "dance
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15 404 was more cognitive, gym was more physical" (FGI) while Arnas stated "the dance was more
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17 405 creative" (FGI). The presence of compulsory skills in gymnastics as opposed to dance motifs
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19 406 appeared to aid students' psycho-motor, social and cognitive learning:
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24 408 Differences for me ... and I probably speak for a few people in the group, a lot of
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26 409 emphasis was put on being able to do the skills well in gymnastics. I got my forward
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28 410 roll, I've got my headstand now, whereas dance we just had to put together four
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30 411 minutes of ... (nothing said) ... A lot of people did look and say I haven't got my
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32 412 inverted balance yet, when can I put that in. So in terms of the content that's why I say
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34 413 I was a bit more comfortable learning gymnastics, I felt there was teaching points, not
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36 414 to fall back on, but to just sort of frame it and guide you a little bit (FGI).
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41 416 Generally students did comment that it was easier to imitate and develop precision in the
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43 417 psycho-motor domain during gymnastics (see Table 1). Josh stated "it was much easier to
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45 418 copy the gymnastics skills even if I performed most of them in a decontextualised form
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47 419 initially" (FGI). A number of students also identified it was easier to (cognitively) evaluate
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49 420 their performance, (socially) respond to material and ultimately teach their peers in a
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51 421 progressive manner in gymnastics:
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3 423 I think I found it easier to learn and teach in gymnastics. I think because it's solid
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5 424 progressive practices and you could see where people are at or they could see where I
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7 425 was at. I found that easier, whereas dance I thought it was a bit abstract for me and I
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9 426 just didn't know how to support them and if they said to me to do something, I was
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11 427 just like don't know what to do (FGI).
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16 429 Interestingly, some of the students with limited gymnastics abilities offered a different view
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18 430 on potential psycho-motor learning (see Table 1). Katie wrote "in dance it was easier to copy"
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20 431 (RJ). Jamie stated "it was easier to improve in dance. I think with practice you can get better,
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22 432 but with gym, it didn't matter how much I practiced a backward roll, I still was not able to do
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24 433 it" (RJ). Such comments support Cohen's (1994) assertion that tasks perceived as being more
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26 434 open-ended or exploratory in nature may foster higher levels of cooperation.
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30 31 436 **Discussion**

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33 437 The specific objectives of this research were to examine the impact of (1) heterogeneous and
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35 438 friendship groupings and (2) gymnastics and dance on undergraduate PE students'
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37 439 perceptions of their learning during a JL based module. In congruence with Jolliffe (2007) it
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39 440 appeared that the range of psycho-motor, social and cognitive abilities in heterogeneous
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41 441 groupings could aid students' learning. However, higher-order social and cognitive learning
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43 442 was perceived as possible in both groupings given the need to communicate with each other,
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45 443 develop knowledge and understanding together and inspire learning amongst each other
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47 444 (Casey, 2013; Goodyear, Casey & Kirk, 2014). This was not the case for those students with
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49 445 limited psycho-motor abilities in heterogeneous groups.
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3 447 In agreement with O’Leary and Griggs (2010), it was evident in heterogeneous groupings that
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5 448 students’ lack of practical ability appears to have negatively impacted on social and cognitive
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7 449 learning. While researchers have identified that higher-order cognitive and social learning
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9 450 have been reported using CL (Darnis & Lafont, 2013; Hastie & Casey, 2010), students with
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11 451 limited psycho-motor abilities found it difficult to mix with their ‘home’ group and have their
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13 452 ideas accepted. While a few students were able to empathise in an affective capacity with
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15 453 such students, cognitive empathy was generally limited. The difficulties for such students
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17 454 have been reported elsewhere in heterogeneous groupings. O’Leary et al. (2014) reported that
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19 455 independent thinking amongst weaker practical ability secondary school pupils was impeded.
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21 456 O’Leary and Griggs (2010) also identified that undergraduate students’ limited gymnastics
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23 457 abilities negatively impacted on higher-order social learning. The reciprocal nature of learning
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25 458 across the different domains means this perceived lack of social and cognitive learning will
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27 459 negatively impact on psycho-motor learning (Metzler, 2011).
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33 461 In contrast, data indicated that friendship groupings were generally favoured by those who
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35 462 perceived they were limited performers. Such students felt they were able to contribute more
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37 463 in discussions and were not afraid to make mistakes in front of peers of similar psycho-motor
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39 464 ability. Evidence indicated that perceived high-order social and cognitive learning for students
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41 465 with limited psycho-motor abilities was better learned in friendships groups. Such findings
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43 466 support the effectiveness of friendships groups in developing learning across all domains
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45 467 (O’Leary et al., 2014; Perez-Pueyo, 2010; Velazquez, 2012b). While there were examples of
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47 468 conflicting evidence regarding the impact of different groupings to students’ perceived
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49 469 learning, this was rarely the case regarding the influence of differing aesthetic activities.
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3 471 While a few students commented on the difficulty of performing some of the core gymnastics
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5 472 skills, data clearly indicated that these skills (and use of compositional concepts), together
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7 473 with progressive practices, made teaching their peers and their own learning easier. Students
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9 474 recognised the ‘centrality’ of these skills (Binney & Barrett, 2010; Reynolds, 2000; Sabin,
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11 475 2001) and felt that they made evaluation (cognitive learning) and internalization (social
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13 476 learning) easier. In contrast, students found it much more difficult to ‘get to grips’ with
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15 477 Laban’s principles of movement and the need to demonstrate expressive, non-verbal
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17 478 communicative skills (Davies, 2000; Sabin, 2002; Smith & Pocknell, 2007). However, it
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19 479 should be noted that while data indicated that the ‘structured’ nature of gymnastics
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21 480 encouraged higher-order social and cognitive learning, it only appeared to foster limited
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23 481 psycho-motor learning.
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29 483 Irrespective of the aesthetic activity or grouping utilised, students rarely commented on
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31 484 higher-order psycho-motor learning. Comments regarding articulation and naturalization were
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33 485 noticeable by their absence. Instead, perceived student learning during either activity or
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35 486 grouping was largely based around imitation, manipulation or precision irrespective of the
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37 487 student’s psychomotor ability. Limited practical learning has been identified elsewhere using
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39 488 CL (Casey, 2004; Casey & Goodyear, 2015) and JL (O’Leary et al., 2014; O’Leary & Griggs,
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41 489 2010).
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46 491 *Limitations and opportunities for further study*

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48 492 Two limitations of this study are highlighted. Firstly, it must be acknowledged that the
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50 493 psychomotor, social and cognitive domains of learning (Bloom, 1956; Dave, 1975;
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52 494 Krathwohl, Bloom & Masia, 1964) have always been seen as incomplete and imperfect in
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54 495 terms of accurately ‘identifying’ learning (Dettmer, 2006). The fact that other models of
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3 496 learning exist within learning domains such as Simpson's (1972) or Harrow's (1972)
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5 497 psychomotor models only highlight this point. Secondly, in recognising the fidelity of
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7 498 implementing JL as requested by Casey, Goodyear and Dyson (2015), it should be
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9 499 acknowledged that this case study only refers to single cohort of third year B.A. (Hons.)
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11 500 undergraduate PE students. Despite their considerable university experiences of gymnastics
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13 501 and dance, their perceptions are based on two aesthetic activities in which their long term
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15 502 experiences are limited. Indeed, only four male students had experienced aesthetic activities
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17 503 during their secondary schooling. Acknowledging such limitations may explain in some way
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19 504 their perceived limited learning in the psycho-motor domain. Research examining
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21 505 undergraduate PE students' perceptions of potential learning using JL in other activity areas
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23 506 appears warranted.
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28 29 **Conclusion**

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31 509 The aim of this study was to examine undergraduate PE students' perceptions of their learning
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33 510 during a JL based module using gymnastics and dance and two different groupings. In
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35 511 gymnastics utilising heterogeneous groupings, students were taught and had to teach a variety
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37 512 of gymnastics skills and compositional concepts in order to produce a group sequence. In
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39 513 dance using friendship groups, students were taught and had to teach initial motifs which they
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41 514 adapted using Laban's principles of movement (Sabin, 2002) to a group routine. Inductive
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43 515 analysis indicated that students' perceptions of their learning were influenced by three factors:
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45 516 students' perceptions of their own and their peer's abilities; students' empathy towards their
46
47 517 peers; and students' perceptions of gymnastics and dance. Recognising research examining
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49 518 perceived learning in aesthetic activities using JL in higher education is minimal, this research
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51 519 supports the findings of Casey (2013) and Goodyear, Casey and Kirk (2014), indicating that
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53 520 both heterogeneous and friendship groupings have the potential to encourage high-order
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3 521 social and cognitive learning. While low ability pupils may receive more information and
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5 522 learn more in heterogeneous groupings in the classroom (Nastasi & Clements, 1991), this
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7 523 study supports previous research suggesting students with limited psycho-motor abilities
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9 524 generally favour friendship groupings in developing social and cognitive learning (O’Leary et
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11 525 al., 2014; O’Leary & Griggs, 2010; Perez-Pueyo, 2010; Velazquez, 2012b). The majority of
12
13 526 students also strongly favoured gymnastics in comparison to dance for their own learning and
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15 527 teaching purposes. While both are artistic in nature, the code that defines movements in
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17 528 gymnastics (Binney & Barrett, 2010; Reynolds, 2000) aided their higher-order social and
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19 529 cognitive learning. In comparison, the use of Laban’s general principles of movement was
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21 530 less effective in developing such learning (Davies, 2000; Smith & Pocknell, 2007).
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26 532 Irrespective of aesthetic activity or grouping utilised, students perceived psycho-motor
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28 533 learning using the jigsaw method to be at a low-level, something O’Leary and Griggs (2010)
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30 534 previously reported with undergraduate students. This should not necessarily be surprising
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32 535 given university PE students need to be exposed to a wide range of activities, including those
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34 536 they may not have experienced in schools. As identified previously, research examining
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36 537 undergraduate students’ perceptions of potential learning using the jigsaw method in their
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38 538 ‘stronger’ practical activity areas would complement this study. Nonetheless, recognising the
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40 539 reciprocal nature of learning, improving students’ social and cognitive learning is likely to
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42 540 improve their practical learning (Metzler, 2011). To this end this study makes two
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44 541 recommendations for university staff using JL. Staff should consider the use of both
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46 542 groupings with a single cohort if the group contains students with limited psycho-motor
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48 543 abilities. Staff should also contemplate the use of more ‘structured’ activities with specific
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50 544 techniques and skills, teaching points and progressive practices in developing students’
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52 545 learning with the jigsaw method. In doing so, staff are likely to improve undergraduate
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3 546 students' perceptions of their own learning. This, in turn, may help overcome the theory-
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5 547 practice gap (Abrami, Poulson & Chambers, 2004) and thereby encourage greater and more
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7 548 effective use of this innovative method in schools.
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9 549

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13
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15
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Table 1: Categories in the psychomotor domain

Category	Definition	Example	Behavioural terms
Imitation	Student can copy a demonstration	Student can copy a backward roll from a demonstration	Student copies, repeats
Manipulation	Student can perform a skill following an explanation	Student can perform a motif following an explanation from a teacher	Student understands
Precision	Student can perform a skill to a good standard	Student can perform a forward roll with good form	Student performs skill correctly, fluently, with precision, consistency
Articulation	Student can perform a number of skills together	Student can link a number of skills into a gymnastic sequence	Student can modify, combine, integrate, adapt, develop
Naturalisation	Student can perform without conscious thought	Student can perform actions and/or motif with ease	Student can work automatically, with limited mental and physical exertion

(Adapted from Dave, 1975: 33-34)

Table 2: Categories in the social domain

Category	Definition	Example	Behavioural terms
Reception	Student is willing to attend to idea or stimulus	Student will be able to attend to teacher directions	Student follows directions
Response	Student chooses to act in some way to an idea or stimulus	Student will stop work on a task and follow teacher's directions	Student assists, complies
Valuation	Student accepts or assumes responsibility for a value	Student is able to work with others showing responsibility for a safe productive working environment	Student differentiates, initiates, joins
Organisation	Student synthesises and resolves conflicts between different value positions	Student will be able to describe what a group member is expected to do in a group activity	Student integrates, defends, explains, identifies, alters
Internalization	Student uses a value to control behaviour in a consistent way	Student will be able to work cooperatively with others on a task in a productive way without the teacher	Student discriminates, solves

(Adapted from Rink, 2006: 244)

Table 3: Categories in the cognitive domain

Category	Definition	Example	Behavioural terms
Knowledge	Student can recall information	Student can state a teaching point for headstand	Student states, describes, lists, identifies
Comprehension	Student can grasp the meaning of information	Student can describe correct forward roll from an observation	Student explains, summarises, distinguishes, gives examples
Application	Student can use information in new and concrete situations	Student can apply the principle of wide base of support to a headstand	Student uses, demonstrates, discovers, modifies
Analysis	Student has the ability to break down material into its component parts	Student will be able to describe the importance of body shape in their dance	Student distinguishes, identifies, selects
Synthesis	Student has the ability to put together parts in a whole	Student will be able to put actions together into a dance motif	Student creates, designs, explains, modifies
Evaluation	Student has the ability to judge the value of material	Student will be able to evaluate the performance of group based on clear criteria	Student appraises, contrasts, discriminates, supports

(Adapted from Rink, 2006: 244)